Laboratory Services
Firearms and Toolmarks

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1. Scope

1.1. This policy and procedure establishes a standard approach for firearm and toolmark evidence submitted to the laboratory. This policy is applicable to all ATF Firearm and Toolmark Examiners and relates to the workflow of casework for serial number restoration, firearm examination and analysis, and toolmark examination and analysis. The standard approach serves as a general outline for the sequence of these examinations and analyses. It is recognized the standard approach does not capture all possible situations.

2. Procedure

2.1. Refer to the process maps in Charts A, B, and C for a standard casework approach to serial number restoration, firearms examination and analysis, and toolmark examination and analysis.

2.2. Evidence Inventory

2.2.1. Perform visual inspection of the packaging to ensure it is sealed with no damage.

2.2.2. Confirm that the contents match the laboratory exam request documentation.

2.2.3. Document any discrepancies and, if necessary, contact the customer.

2.3. Initial Evidence Examination

2.3.1. Firearms

2.3.1.1. Conduct an examination for potential trace evidence.

2.3.1.2. If necessary, perform pre-firing safety checks.

2.3.1.3. Document initial observations.

2.3.2. Questioned Bullets and Cartridge Cases

2.3.2.1. Conduct an examination for potential trace evidence.

2.3.2.2. Perform a microscopic examination for toolmarks of comparative value.

2.3.2.3. Document initial observations.

2.3.3. Tools

2.3.3.1. Conduct an examination for potential trace evidence.

2.3.3.2. Document initial observations.

2.3.4. Questioned Toolmarks

2.3.4.1. Conduct an examination for potential trace evidence.

2.3.4.2. Perform a microscopic examination for toolmarks of comparative value.

2.3.4.3. Document initial observations.

2.4. Closing Inventory and Case Completion

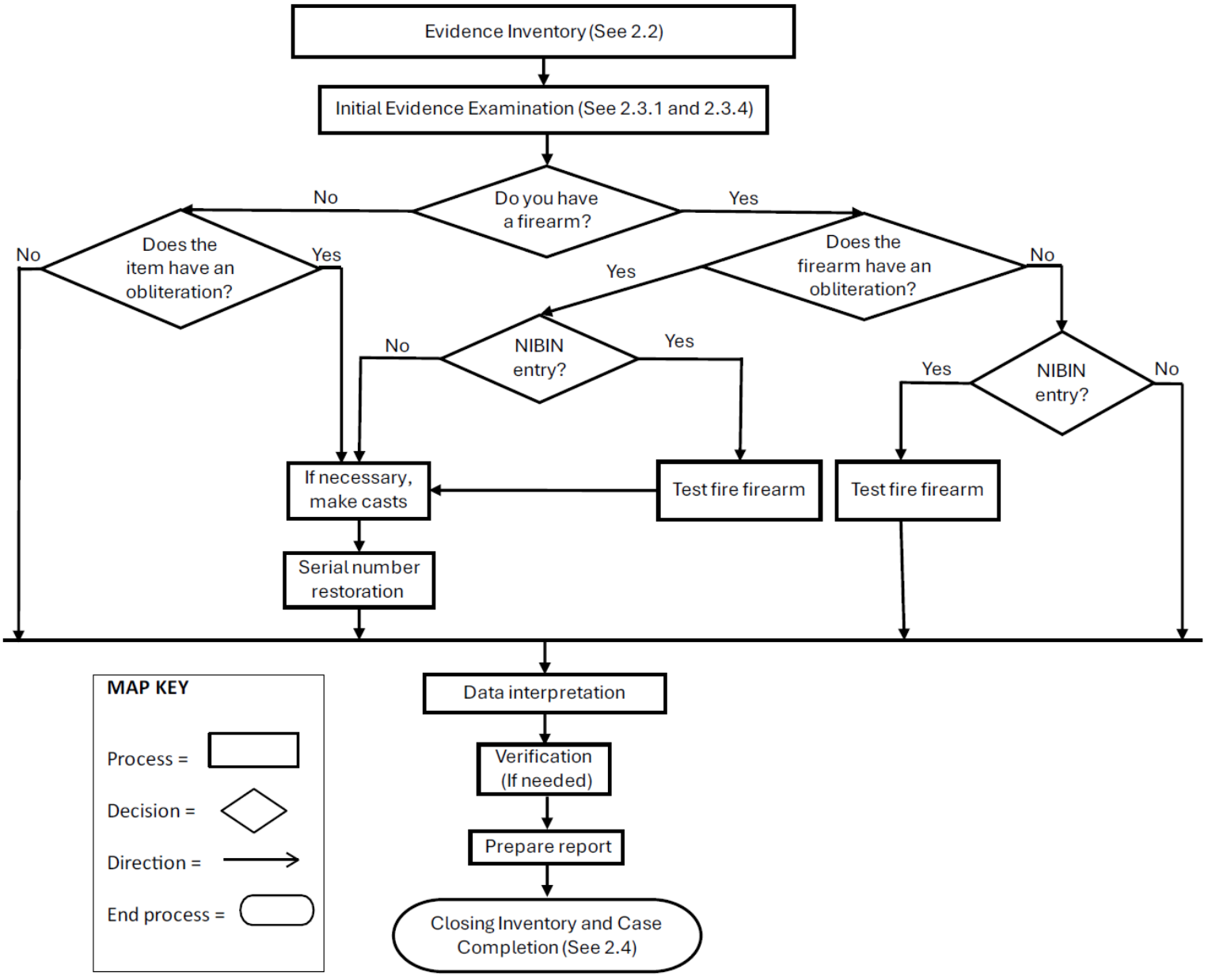
2.4.1. Ensure all evidence and lab generated items are accounted for.

2.4.2. Seal evidence packaging with initials and date (may occur after technical review).

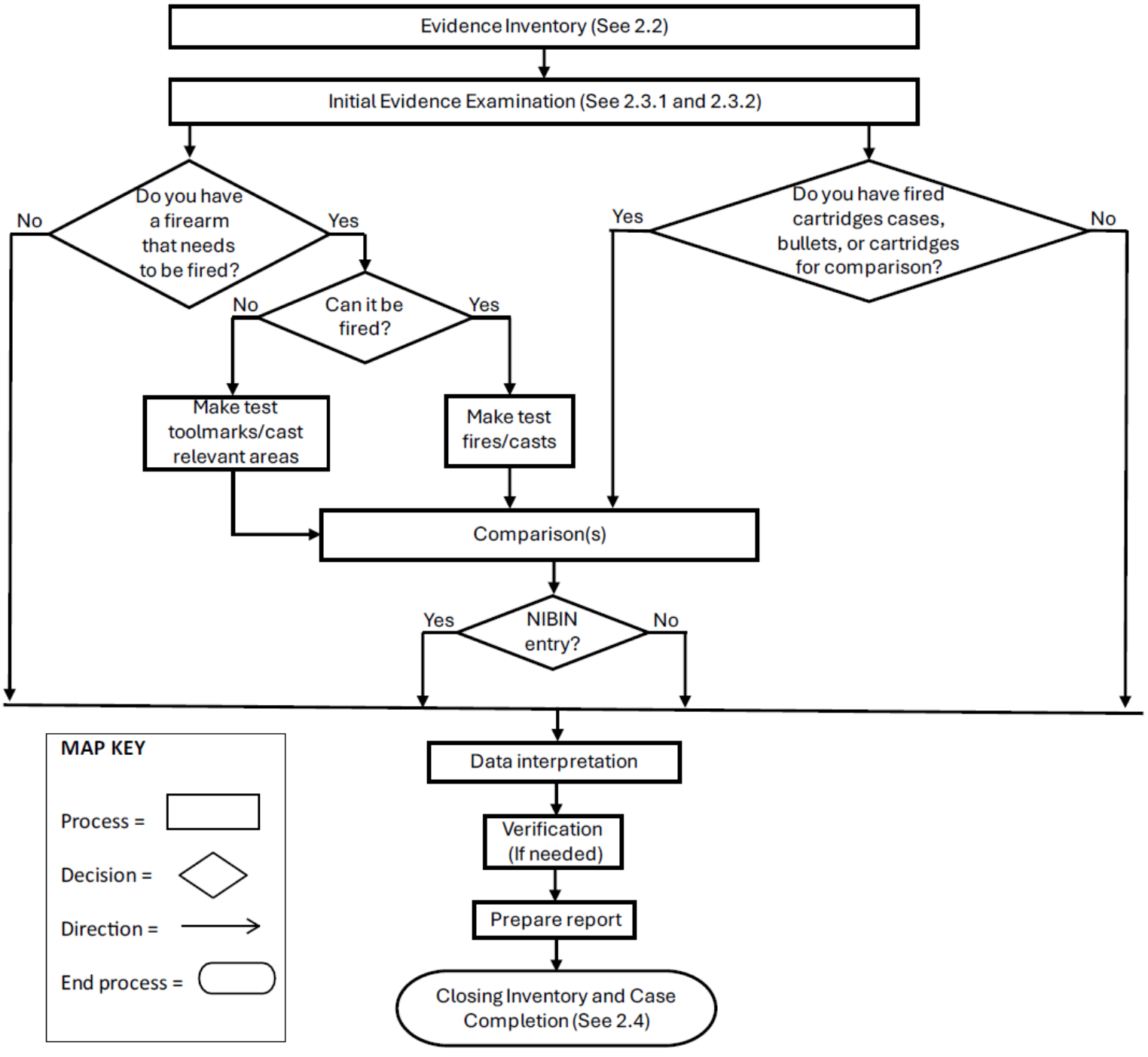
2.4.3. Send case documentation for technical and administrative review.

2.4.4. Return evidence to evidence receiving.

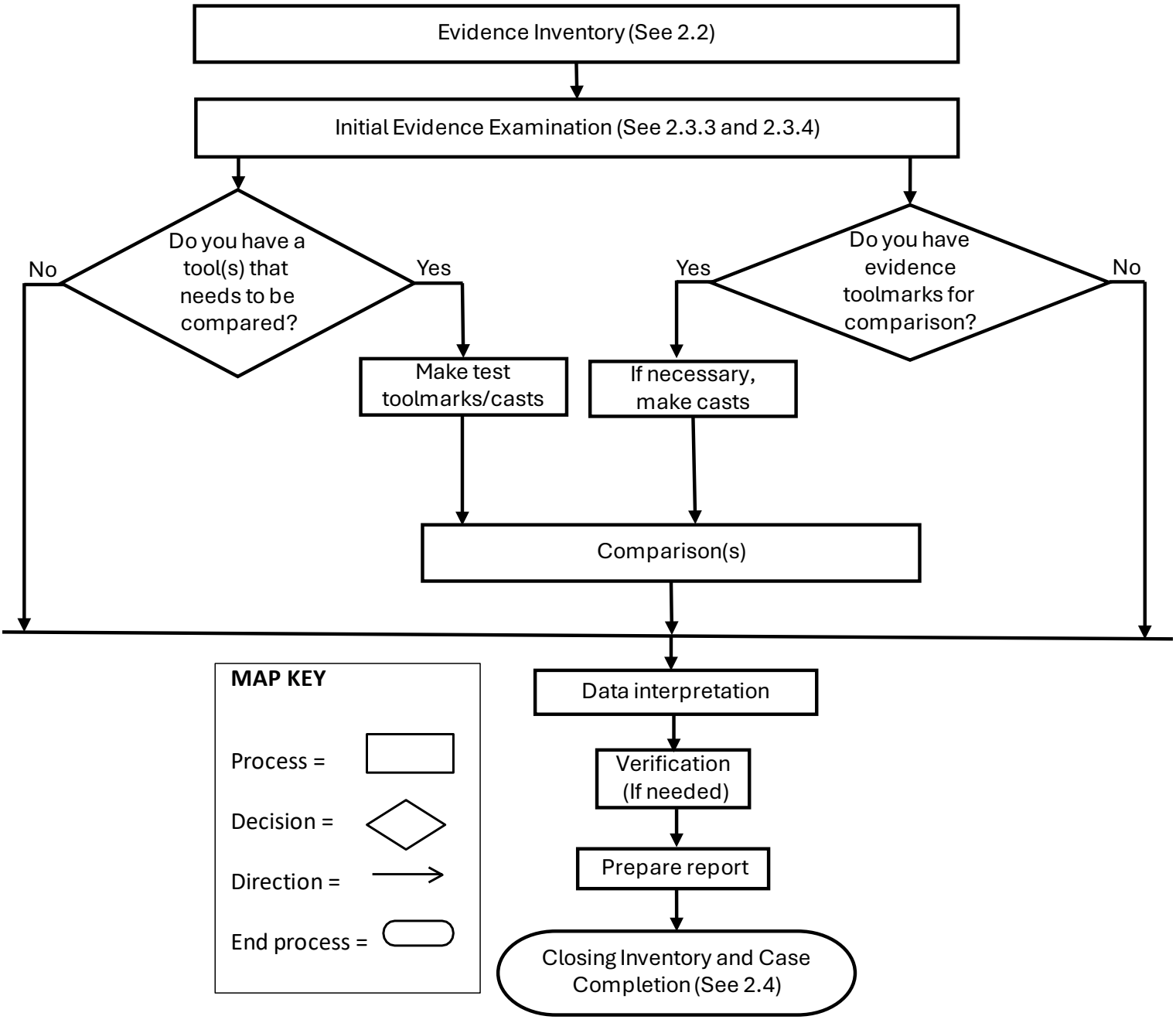
SERIAL NUMBER RESTORATION PROCESS MAP (CHART A)



FIREARM EXAMINATION AND COMPARISON PROCESS MAP (CHART B)



TOOLMARK EXAMINATION AND COMPARISON PROCESS MAP (CHART C)



1. Scope

1.1. This guideline sets forth the procedures for examining firearms and documenting relevant information. This protocol is applicable to all ATF Firearm and Toolmark Examiners.

2. References

AFTE Glossary, Current Edition

AFTE Journal

ATF-LS Quality Manual

ATF Reference libraries

3. Safety precautions

3.1. Basic safety rules:

- Handle all firearms as if they are loaded, and check to see if they are.
- Always point the firearm in a safe direction.
- Keep your finger off of the trigger until you have made the decision to shoot.
- Always be certain of the target and the surrounding area.
- Thoroughly read the manufacturer's instruction manual for the firearm, when it is available.
- Check the firearm to be sure that it is operating properly and is free of obstructions.
- Take into consideration the proper ammunition and caliber for the gun recommended by the manufacturer.
- Consider if the firearm has been re-chambered for a different cartridge.
- Always wear eye and ear protection.
- Never use a firearm under the influence of drugs or alcohol.
- Do not rely on mechanical safeties.
- Do not alter or modify the firearm, unless case reconstruction makes it necessary.
- Always unload firearms when not in use.
- All firearms should be stored unloaded and secured in a safe storage location.
- Always transport a firearm unloaded, separate from the ammunition.

4. Apparatus/reagents

4.1. Stereo microscope, comparison microscope, calipers, rulers, non-marring dowel, bore light, bore scope, hand tools, gunsmith tools.

5. Procedures

5.1. Record general information on firearm.

5.2. Record condition of firearm.

5.3. Preliminary examination for operability (i.e. - having the mechanical ability to discharge a projectile (e.g. - bullet or shot).

5.4. If not operable, describe malfunction and anything done to remediate the issue(s).

5.5. If necessary for the examination, and if the firearm is operable, test fire in accordance with test fire guidelines and safety manual.

5.5.1. Test fire guidelines:

5.5.1.1. The basic philosophy in test firing is that the examiner should attempt to obtain pristine specimens for the purposes as needed to perform the necessary examination for which the firearm was submitted to the extent feasible in a controlled laboratory environment.

5.5.1.2. The examiner should evaluate the desirability of examining the inner surface of the barrel, chamber(s), and breech area prior to test firing and the need for retaining any residue that was present.

5.5.1.3. Test fired components may be indexed for orientation and marked to record the sequence of firing. Notes may be made as to which chamber each cartridge was fired in as well as the action mode used for each test, when appropriate.

5.5.1.4. A minimum of two test cartridges will be fired in such a manner that the test components will be useable for examination. It may also be necessary to fire additional cartridges.

5.5.1.5. The examiner should be aware of the potential danger in firing downloaded ammunition as well as the possible change(s) in toolmarks on those components due to a reduction in pressure.

5.5.1.6. Test fired components are permanently marked for identification purposes and returned to the submitter along with the rest of the evidence. At the discretion of the examiner, extra test fired components may be made and retained in the laboratory for use in a reference collection.

5.5.2. Test firing safety:

5.5.2.1. Prior to test firing a firearm, it must be inspected to ensure that it operates safely.

5.5.2.2. Examine the firearm prior to loading for any cartridge/caliber modifications.

5.5.2.3. If there is a reason to doubt the safety of a firearm or the ammunition used in it, it should be test fired remotely.

5.5.2.4. Any problems or doubts concerning the safe handling or testing of a firearm should be brought to the attention of an experienced firearms examiner.

5.5.2.5. Employees must familiarize themselves with the operational characteristics of the firearm to be tested and the ammunition to be used before any test firing. Individuals in the immediate area of the test firing are to be notified that the test firing is going to occur.

5.5.2.6. The test firing of firearms must be performed with the examiner and any assistants wearing safety glasses and ear protection.

5.5.2.7. A visual inspection of the interior of the barrel will be made before shooting, and between shots if circumstances make this necessary.

5.5.2.8. The firearm will only be loaded in the test firing area, just prior to firing.

5.5.2.9. No test firing will be done without a second examiner or assistant present, either in the room, or in immediate area. An exception to this allows for FSL-W Firearms Section staff to monitor IBIS Section personnel in the water tank test firing room via the closed circuit camera/monitor system.

5.5.2.10. Rifle cartridges may be downloaded for firing, with cotton or similar material packed in the cartridge to hold the powder near the base. It is essential when firing downloaded cartridges to make sure that each fired bullet clears the barrel.

5.5.2.11. A firearm examiner may determine that a gun is unsafe to fire, even remotely.

5.6. Snail trap shooting rules

5.6.1. No unauthorized firing of any weapons will be permitted.

5.6.2. Ensure that the pump intake is fully submerged in the liquid. When the pump is plugged in and running, fluid must be spilling from the bottom of the trap into the small basket of the holding tank. Test firing will not be done into a dry trap.

5.6.3. The barrel of the firearm must be pointed into the firing tube before any action is closed on a live cartridge. In the case of revolvers, the cylinder may be closed before, but closed in such a way as to ensure that a live cartridge does not come into a battery position.

5.6.4. Unless it is necessary to fire a number of cartridges one right after the other, only one live cartridge is to be loaded for firing at one time.

5.6.5. When firing, the barrel should be as close to level as possible in relation to the firing tube.

5.6.6. The barrel of the firearm must remain in the firing tube until it is confirmed that the firearm is empty and safe.

5.6.7. After firing, unplug the pump and check the fluid level.

5.7. Bullet recovery tank (BRT) safety rules

5.7.1. All weapons that are to be fired into the BRT will be inspected for obstructions of the bore, cylinder and/or chamber and given a general safety check prior to being fired into the BRT.

5.7.2. Personnel firing weapons will ensure that someone is either present in the firearms examination or office area or that someone outside of this area is aware that someone will be test firing weapons and that no one else is present in the vicinity of the BRT. Personnel firing weapons shall ask someone outside of the BRT room to check periodically to ensure that the shooter is safe.

5.7.3. Eye and ear protection will be worn by shooters, and by all observers in the room. Observers will remain in back of the shooter, until such time as the shooter indicates that it is safe to go in front of or along side of the BRT.

5.7.4. Prior to firing into the BRT, the shooter will:

- Check the tank for other projectiles;
- Ensure that the water level is at the proper level;
- Ensure that the air filter/evacuation system is turned on;
- Ensure that the lid is in a full down position;

- Ensure that the door to the shooting area is shut;
- Ensure that all observers are in a safe position and are wearing proper safety equipment.

5.7.5. Weapons should be made ready to fire (i.e., cartridge chambered) only when the muzzle of the weapon is placed into the firing tube of the BRT, with the muzzle pointed towards the water. In the case of revolvers, the cylinder may be closed prior to insertion into the firing tube as long as a cartridge does not come into battery position when first closed.

5.7.6. Do not fire any weapons in full-automatic mode.

5.7.7. Do not fire any armor piercing ammunition into the tank.

5.7.8. If a misfire occurs, keep the weapon's muzzle pointed into the BRT for at least 15 seconds before attempting to clear the weapon. Keep the muzzle pointed into the firing tube while clearing the weapon. Recheck the weapon's bore, cylinder, chamber etc for obstructions prior to attempting to re-fire the weapon.

5.7.9. Each shooter shall ensure that the area is cleaned up after firing. This includes the picking up of fired casings, removal of metal debris from the tank bottom and wiping up any water which may be on the tank, catwalk or floor.

5.7.10. Cleaning of the tank's floor will be conducted on an as needed basis.

5.7.11. Air filters and water filtration systems will be cleaned and/or replaced as needed.

5.7.12. Ensure that the water in the BRT has some water conditioner present.

5.7.13. The floor under the tank and adjacent walls should be inspected for signs of wear, stress or fracture at least every year.

5.7.14. No smoking, eating or drinking is allowed in the BRT room.

5.7.15. Wash hands thoroughly after firing weapons.

5.8. Safety rules for firearms ranges

5.8.1. While being transported to a range, firearms will be unloaded and secured separate from the ammunition.

5.8.2. Prior to entering the range, the firearm will be checked to ensure the barrel is clear of

obstructions.

5.8.3. All firearms will remain secured until the area of the firing line is entered.

5.8.4. All firearms will be pointed down range at all times when they are out of a case or holster.

5.8.5. All firearms shall have the action open or be secured in a case or holster when not on the firing line.

5.8.6. Firearms will not be removed from a case or holster until the shooter has taken a position on the firing line.

5.8.7. Firearms will never be dry-fired or handled behind the firing line.

5.8.8. Never leave a firearm unattended.

5.8.9. Firearms shall always be treated as if they are loaded, and there is no difference in the techniques used to handle an empty or loaded firearm.

5.8.10. Shooters will personally examine every firearm handed to them to make sure they are unloaded.

5.8.11. A shooter will keep their finger off of the trigger and out of the trigger guard until they are ready to fire.

5.8.12. On the command of "cease fire", all shooters will stop firing.

5.8.13. If the firearm fails to fire a live round after the trigger is pulled, or if a "squib load" is heard, the shooter will keep the barrel pointed down range until the firearm is checked and made safe.

5.8.14. Shooters on the firing line will not turn around from the firing position with the firearm in hand.

5.8.15. Shooters shall not depend entirely on the mechanism of any firearm.

5.8.16. Shooters will never leave the firing line with live ammunition in a firearm.

5.8.17. The shooter must know:

- How the firearm works.
- Is the firearm loaded?

- Where is the firearm pointed?
- Where is the target?
- What is the target?
- Where will the bullet go if the target is missed?

5.8.18. Wash hands thoroughly after firing weapons. Use soap and water if available. If these are not available, use several prepackaged moist towelettes.

5.9. Dry firing

5.9.1. Dry firing is defined as release of the hammer or striker on an empty chamber, in a manner consistent with the normal operation of the firearm. It is recognized that there are situations in which dry firing a firearm will be necessary. Examples include checking indexing; checking timing; checking mechanism; and pre-firing check.

5.9.2. Firearms should only be dry fired if necessary for the case examination, due to the possibility of damage to the mechanism or chamber of the firearm.

5.9.3. Prior to firing, the examiner shall verify that the chamber of the firearm is empty, or loaded with a "dummy" cartridge.

5.9.4. If the examiner determines that it is necessary, the snail trap or bullet recovery tank may be used as a safety precaution.

6. Quality Assurance

6.1. Error is avoided when equipment is maintained in good repair and regularly checked for calibration.

A = Arced or arched

AFTE = Association of Firearm and Tool Mark Examiners

Ammo = ammunition

AP = aperture

B = bullet

BC = barrel cast

BELM = Barrel extension lug marks

BF = breechface

BFI = breechface impression

BFM = breechface mark

Bio = biological material

Br = brass

BRT= Bullet recovery tank

BS = bearing surface

C = circular

Cart = cartridge

CC = cartridge case

Char = characteristic(s)

CHM = chamber marks

Comp = comparison

Cons = consistent

Cont = container

Conv = conventional

CW = consistent with

CX = crosshatch

DA = double action

DAO = Double Action Only

Disc = discernible

DTW = determine type weapon

E = elliptical

EJM= ejector mark

EJP = ejection port mark

EJT = ejector

En = envelope

Evi = evidence

Ex = exhibit

EXCL = exclusion/excluded

EXM = extractor mark

EXT = extractor

FA = firearm

FCC = fired cartridge case

FP = firing pin

FPA = firing pin aperture

FPAS = firing pin aperture shear

FPD = firing pin drag

FPI = firing pin impression

Frag = fragment

FRT = Firearms Reference Table

G = granular

GEA = groove engraved area

GIMP = groove impression

GIW = groove impression width

GMB = Glock Marksman Barrel

GRC = General Rifling Characteristics

H = hemispherical

HS = headstamp

IC = individual characteristics

ID = identification/identified/source identified

Imp = impression

INC = inconclusive

Indiv = individual

L = left

LEA = land engraved area

LIMP = land impression

LIW = land impression width

LP = latent print

Mag = magazine

Manuf = manufacturer

MC = metal case

Micro = microscopic

MIM = metal injection molding

MOV = marks of value

MPI = magnetic particle inspection

- = negative

N/O = not observed

Nom = nominal

Obj = objective

Oblit = obliteration

Obs = observed

OOR = out of round

P = parallel

Poly = polygonal

+ = positive

Poss = possible

Prob = probable

Proj = projectile

PS = primer shear

Qual = quality

Quant = quantity

R = right

Recd = received

Rect = rectangular

ROE = results of examination

S = smooth

SA = single action

SAO = single action only

SBX = sealed box

SC = subclass

SEN = sealed envelope

SN = serial number

SNR = serial number restoration

SPAB = sealed paper bag

SPLB = sealed plastic bag

St = steel

Suff = sufficient

T = test

TF = test fire

TG = trigger guard

TM = toolmark

TOV = toolmarks of value

TWS = tool working surface

Vis = visible

WS = worksheet

1. Scope

1.1. The examination of unfired and fired ammunition components serves multiple purposes. First, in the absence of a firearm, a potential source of fired ammunition components can be compiled by identifying the class characteristics of those components and comparing those with reference literature, databases and collections. Second, is to compare like ammunition components, including possible test fired ammunition components from a known firearm, to determine whether the ammunition components share a common firearm source. Last, examination of ammunition components in order to identify potential reloading marks and the possible manufacturer/marketer of the components. This protocol is applicable to all ATF Firearm and Toolmark Examiners.

2. References

AFTE General Rifling Characteristics database (GRC)

AFTE Glossary

AFTE Journals

ATF Laboratory Services Standard Ammunition File (SAF).

ATF-LS Quality Manual

ATF Reference libraries

3. Apparatus/reagents

3.1. Balance, scale, micrometer, calipers, ruler, stereomicroscope, and comparison microscope.

4. Procedures

4.1. The condition as well as type of fired ammunition components varies sufficiently that each should be considered on its own merit. In general, the following guidelines apply.

4.1.1. Mark fired ammunition component with identifying marks (if possible and appropriate) in a non-critical location.

4.1.2. Record the relevant class characteristics observed on the fired ammunition component(s) and determine if the marks are suitable for comparison.

4.1.3. If a firearm is submitted, determine if the marks produced by the firearm are suitable for comparison.

4.1.4. If trace of potential evidentiary value is observed, follow appropriate laboratory guidelines for collection and preservation.

4.2. To compare fired ammunition components, including test fired components that have been generated as a result of a firearm examination:

4.2.1. Ensure class characteristics are in sufficient agreement to continue forward.

4.2.2. Mount the two specimens on separate stages of the comparison microscope.

4.2.3. Verify compatible magnification.

4.2.4. Determine a starting point for the area of interest to be compared.

4.2.5. Document observations - evaluate for the potential of subclass characteristics on the relevant toolworking surfaces (TWS).

4.2.6. Determine conclusions - If an identification was achieved with a particular test fire component, that test fire component is to be marked in a manner that will distinguished it from other like ammunition components. Document the manner in which this marking was done in case record.

4.2.6.1. If a bullet is excluded from a submitted firearm(s) or no firearm is submitted, provide a list of possible firearms from which an ammunition component(s) may have been fired. Compare the class characteristics of the ammunition component(s) with those found in reference literature and databases.

4.2.6.2. Measure all suitable land and groove impressions.

4.2.6.3. Record measurements.

4.2.6.3.1. At a minimum, examiners must record the minimum and maximum land and groove impression measurements.

4.2.6.4. Using the AFTE GRC database, input the minimum and maximum measurements along with a variance of 0.003”.

4.2.6.4.1. Examiners have discretion as to the amount of variance used, but must justify the reason in the case record.

4.2.6.5. Document a list of possible firearms and retain the AFTE report in the case record.

4.2.6.6. Generally, a list of no more than (7) firearms need to be provided in a report.

4.3. When applicable:

4.3.1. Examine the ammunition and ammunition components for manufacturer markings, indications of possible reloading, class characteristics and physical features of the ammunition components to compare with available literature and reference collections.

4.3.2. Look for evidence of reloading. Intact cartridges with marks such as resizing, bullet seating, primer seating, and firearm toolmarks should be considered as possible reloaded ammunition.

5. Quality Control

5.3.1. Reliable results are ensured when the proper significance is attached to the correspondence of individual marks being observed and equipment used is properly calibrated and maintained.

1. Scope

    1.1. These guidelines establish a standard approach to restoring obliterated serial numbers and other obliterated markings. This method of analysis is applicable to all ATF Firearm and Toolmark Examiners.

2. References

    AFTE Journals

    ATF-LS-Quality Manual

    ATF Reference Libraries

    ATF Serial number Structure Guide: Current Edition

    Code 39 key table

    International Standard ISO/IEC 16022. Information technology – Automatic identification and data capture techniques – Data Matrix bar code symbology specification: Second Edition.

    Methods for the Restoration of Obliterated Serial Numbers (Treptow)

3. Safety precautions

    3.1. PPE should be worn when working with acids and bases. Be aware of the location and usage of acid spill kit, fume hood and all other safety equipment.

4. Apparatus/reagents

    4.1. Various etching reagents, canned magnetic particle suspension, clear coating, electromagnetic yoke, magnifying lamp, horseshoe magnets, cotton swabs, stereo microscope, camera, adjustable power supply, ATF issued iPhone, assorted bottles and beakers, rotary polishing tool or other polishing materials.

5. Procedures

    5.1. Mark firearm with identifying marks in a non-critical location.

    5.2. Document the minimum required information for the firearm.

5.3. If test firing is necessary, do so prior to conducting serial number restoration.

5.4. Photograph the suspected obliterated serial number area.

5.5. Conduct a visual and/or microscopic examination of the obliterated area and record any observations including any characters present as received.

5.6. If trace material of potential evidentiary value is observed, follow appropriate laboratory guidelines for collection and preservation.

5.7. If preliminary examination reveals the presence of toolmarks suitable for comparison, casts should be taken, packaged appropriately, and returned with the evidence.

5.8. Determine whether the surface to be processed is magnetic (ferrous) or non-magnetic (non-ferrous).

5.9. Consult reference materials to determine the serial number structure and location of any secondary numbers.

5.10. If necessary, use sandpaper, a sanding block, or rotary polishing tool to polish the area of obliteration. Document any characters revealed as a result. Polishing can take place during any part of the restoration process.

5.11. Magnetic Particle Inspection Method (ferrous surfaces only)

5.11.1. Apply magnetic field to obliterated surface, ensuring that the obliterated area is located between the poles of a horseshoe magnet or the arms of a yoke.

5.11.2. Vigorously shake a can of magnetic particle suspension, spray the suspension into a beaker, and use a pipette to apply the suspension onto the obliterated surface.

5.11.3. Record any characters observed.

5.12. Chemical Etching Method (ferrous and non-ferrous surfaces)

5.12.1. Choose appropriate chemical etchants.

5.12.1.1. Commonly used chemical etchants/reagents for ferrous surfaces include Davis, Turner's, Fry's, and 25% Nitric Acid.

5.12.1.2. Commonly used chemical etchants/reagents for non-ferrous surfaces

include Ferric Chloride, Acidic Ferric Chloride, 25% Nitric Acid, and Sodium Hydroxide.

5.12.2. Starting with the weakest chemical etchant first, soak a clean cotton swab in the chemical etchant and apply the swab in a sweeping motion onto the obliterated area.

5.12.3. Continue applying chemical etchants to the obliterated surface until characters are observed. If pitting, bloating of the characters, or visualization of the metal grain structure occurs, the restoration can be halted.

5.12.4. Record any characters observed.

5.13. Chemical Etching with Electrolytic Method (ferrous and non-ferrous surfaces)

5.13.1. Attach the red alligator clip (positive connection) to a metal portion of the firearm away from the obliteration.

5.13.2. Attached the black alligator clip (negative connection) to a swab soaked in chemical etchant.

5.13.3. Turn adjustable power source on and set it to between four and six volts.

5.13.4. Apply the swab in a sweeping motion onto the obliterated area, replacing the swab once it turns black or dries out.

5.13.5. Continue applying chemical etchants to the obliterated surface until characters are observed. If pitting, bloating of the characters, or visualization of the metal grain structure occurs, the restoration can be halted.

5.13.6. Record any characters observed.

5.14. Documentation and Verification

5.14.1. Each step in the restoration process and any characters observed should be documented on a worksheet. Photographs are also recommended to document restored characters and the final result.

5.14.2. Any characters present as received or visualized as a result of the restoration process will be verified by a second examiner.

6. Bar Code and Data Matrix Decryption

6.1. In the event that a serial number cannot be fully restored, and the firearm bears a secondary number in the form of a bar or data matrix code, a scanning application may be used to automatically decrypt it.

6.1.1. Automatic Decryption Using Scanning Application

6.1.1.1. Ensure that the bar code or data matrix code on the firearm is clear of debris prior to scanning.

6.1.1.2. Open an approved scanning application on ATF issued iPhone.

6.1.1.3. Using the scanning application, scan the data matrix or bar code standard to ensure that the application correctly decrypts the code.

6.1.1.4. Using the scanning application, scan the data matrix code or bar code on the firearm.

6.1.1.5. Record the results.

6.1.2. Manual Decryption of 1D Bar Codes

6.1.2.1. Inspect the bar code to ensure that portions of the full bar code are present.

6.1.2.2. Photograph the bar code under magnification or enlarge it digitally.

6.1.2.3. Delineate the bars into character units.

6.1.2.4. Interpret and document the bar code element size patterns and, using the Code 39 key table, determine the character represented by each pattern sequence.

6.1.2.5. Record the results.

6.1.3. Manual Decryption of 2D Matrix Bar Codes

6.1.3.1. Inspect the bar code to ensure that portions of the full bar code are present.

6.1.3.2. Photograph the bar code under magnification or enlarge it digitally, then convert the bar code to a digital format for decryption.

6.1.3.3. Consult reference materials to determine symbol character placement based on the size of the bar code.

6.1.3.4. Calculate the value for each symbol character by using the dark cells only.

6.1.3.5. Record the results.

6.1.4. Documentation and Verification

6.1.4.1. Each step in the decryption process and all calculations should be documented on a worksheet.

6.1.4.2. Any characters determined as a result of the manual decryption process will be verified by a second examiner.

7. Quality Assurance

7.1. Chemical etchant reagents should be prepared in accordance with the reference literature formulations. Records identifying who made the reagent and the date of preparation shall be maintained.

7.2. Initial testing of a reagent(s), generally conducted prior to casework, requires that one of the following be observed when testing the reagent on an appropriate control: chemical reaction in the form of gas liberation, bubbling or a color change in the metal (Other reactions might be possible). The results of reliability testing shall be recorded.

7.3. Continued reliability testing of reagents can occur through use in casework. Should it be determined that a reagent is not reacting reliably or as expected (as described above), the reagent will be discarded immediately, and a fresh reagent will be prepared and tested as indicated above. The use of an expired reagent is not detrimental to a test result; therefore, a new reagent(s) may be subsequently utilized in the same location.

7.4. Reagents may be used indefinitely as long as their continued reliability is monitored during casework.

1. Scope

1.1. These guidelines pertain to the examination of toolmarks and their comparison to test marks from suspect tools to determine the possible source. Examinations may include, but are not limited to, microscopic comparisons between toolmarks and/or test toolmarks from known sources. This protocol is applicable to all ATF Firearm and Toolmark Examiners.

2. References

AFTE Journals

ATF Laboratory Services Standard Ammunition File (SAF)

ATF-LS-Quality Manual

ATF Reference libraries

Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Pattern Match Examination

3. Safety Precautions

3.1. See *ATF-LS-Quality Manual* for Firearms Safety Guidelines.

4. Apparatus/Reagents

4.1. Various substrates for test tool marks, various measuring instruments, casting media and associated materials, stereomicroscope, and comparison microscope.

5. Procedures

5.1. See *ATF-LS-Quality Manual* for the minimum required documentation.

5.2. The condition of the evidence as well as type of substrates on which toolmarks may be present varies sufficiently that each should be considered on its own merit. In general, the following guidelines apply.

5.2.1. Mark the evidence with identifying marks (if possible and appropriate) in a non-critical location.

5.2.2. Record the relevant class characteristics of the various toolmarks observed. In the

absence of a tool, the class characteristics may be able to provide a basis for the type and potentially the size of the tool that was responsible for making the toolmarks.

5.2.3. Determine if the marks produced by the tool are suitable for comparison.

5.2.4. If trace of potential evidentiary value is observed, follow appropriate laboratory guidelines for collection and observation.

5.2.5. If tools have been submitted, examine the class characteristics of the tools and if similar to examined toolmarks prepare suitable test marks in suitable substrate.

5.2.5.1 A minimum of two test toolmarks should be made to demonstrate reproducibility of the relevant tool working surface (TWS). It may be necessary to make additional tests or casts.

5.2.6. Evaluate submitted tools for potential of subclass characteristics and consider the potential for impact on comparison and conclusions.

5.3. To compare toolmarks, including toolmarks that have been generated as a result of preparing test marks:

5.3.1. Ensure class characteristics are in sufficient agreement to continue forward.

5.3.2. Mount the two specimens on separate stages of the comparison microscope. If the specimens are too large, then casts of the respective toolmarks/test marks may be prepared to facilitate examination.

5.3.3. Verify compatible magnification.

5.3.4. Determine a starting point for the area of interest to be compared.

5.3.5. Document observations; remember to evaluate for the potential of subclass characteristics.

5.3.6. Determine conclusions.

5.3.6.1. If a source identification (i.e. - identification) was achieved with a particular test mark, that test mark is to be marked in a manner that will distinguished it from other like test marks. Document the manner in which this marking was done in notes.

6. Quality Control

6.1. Reliable results are ensured when the proper significance is attached to the correspondence of individual marks being observed and equipment used is properly calibrated and maintained.

1. Scope

1.1. Through an examination and comparison of surface contours and internal fracture patterns, it is possible to determine whether two separate surfaces were once joined. These guidelines set forth the procedure by which portions of firearm components, tools, and other items of evidence can be examined to determine if the portions were once joined together. This protocol is applicable to all ATF Firearm and Toolmark Examiners.

2. References

AFTE Journals

ATF Laboratory Services Standard Ammunition File (SAF)

ATF-LS-Quality Manual

ATF Reference libraries

Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Fracture Examinations

3. Safety precautions

3.1. PPE should be worn when working with sharp or jagged objects.

4. Apparatus/reagents

4.1. Stereo and comparison microscope(s), micrometers, calipers, rulers, casting media, and photographic equipment.

5. Procedure

5.1. See ATF-LS-Quality Manual for minimum required documentation and supplemental documentation depending on the purpose for which the firearm was submitted for examination.

5.2. The wide variety of items that could be submitted for a physical fit comparison varies sufficiently that each should be considered on its own merit.

5.3. In general, the following guidelines apply.

5.3.1. Record physical properties of item(s) to be compared, such as, but not limited to,

e.g., color, material type, dimensions.

5.3.2. Determine and record type of separation, e.g., shear, cracked, and torn.

5.3.3. Determine and record that class characteristics of items are compatible.

5.3.4. Evaluate shape of separation and check for any surface features that may be continuous on both sides of the separation.

5.3.5. If all the class characteristics agree, compare all fractured surface visually and/or microscopically to determine if they were once joined.

5.3.6. If the item is of suitable thickness and composition, compare the internal fracture pattern(s) microscopically (using direct or reverse lighting) to determine if they were once joined.

6. Range of conclusions

6.1. The examiner may offer any of the following conclusions.

- Fracture fit
- Exclusion (i.e. - excluded)
- Inconclusive

7. Quality control

7.1. Reliable results are ensured when equipment is properly calibrated and maintained and the examiner appropriately assesses the significance of the various characteristics being observed.

1. Scope

    1.1. This policy sets forth safety guidelines for the operation and shooting of firearms.

2. References

    AFTE Journals

    ATF Laboratory Services Standard Ammunition File (SAF).

    ATF-LS-Quality Manual

    ATF Reference libraries

3. Safety precautions

    3.1. PPE should be worn when test firing firearms.

4. Apparatus/reagents

    4.1. Snail trap, bullet recovery tank

5. Procedure

    5.1. Listed below are some general firearm safety procedures for the initial receipt and pre-firing examination of a firearm.

        5.1.1. Ensure that firearm is not loaded.

        5.1.2. Check the mechanical integrity of firearm components. Specifically, check the barrel for obstructions, cracks, bulging or warping.

        5.1.3. Determine if firearm contains original components and/or if it has been modified for full-automatic fire.

        5.1.4. Check the operability of firearm prior to test firing.

        5.1.5. Ensure the water level of the tank or snail trap are correct for test firing.

    5.2. Listed below are the basic firing safety procedures for the actual shooting component.

        5.2.1. Handle and treat all firearms as if they were loaded.

5.2.2. Always point a firearm barrel in a safe direction, preferably down range, with finger off the trigger.

5.2.3. Never use a firearm under the influence of any substance that may alter alertness or a medical condition that negatively affects your ability to manipulate a firearm.

5.2.4. If you are not familiar with the firearm, ask for advice or assistance.

5.2.5. When not firing or in transit, keep firearm muzzle pointed in a safe direction, unloaded with magazine removed and, preferably, in the out-of-battery position.

5.2.6. Always wear ear and eye protection when firing. Additional protective equipment, such as vests and full masks, are available if desired or needed.

5.2.7. Keep firearm and ammunition at or near the shooting position and/or in immediate vicinity of the shooter rather than at distant work tables.

5.2.8. Load one cartridge at a time while at the shooting position and ensure that projectile clears the bore after each firing unless examination dictates otherwise.

5.2.9. No shooting unless someone else is present in the firing room or Firearm Section.

5.2.10. Spotters and other observers should always be behind and, preferably, to one side of the shooter when at a shooting position.

5.2.11. Announce to others in the section prior to shooting.

5.2.12. Before firing, announce that you are in the shooting or ready to fire position, then allow several seconds for others to put their ear and eye protection in place. Obey any shooting commands.

5.2.13. Fire toward the bullet trap: vary orientation of target, not firearm.

5.2.14. Empty firearm of ammunition with muzzle pointed downrange, and announce firearm cleared before leaving shooting line.

5.2.15. In case of misfire, keep firearm pointed downrange or in firing port for reasonable amount of time before attempting to unload and return firearm to the out-of-battery and/or safe condition position.

5.2.16. When measuring distances, keep hands behind the muzzle at all times.

5.2.17. All shooting participants should be briefed on safety rules and know the locations of first aid kits.

1. Scope

1.1. This policy and procedure guideline sets a minimum standard for examination documentation in firearm and toolmark casework. This policy is applicable to all ATF Firearm and Toolmark Examiners and relates to documentation of casework of all types of examinations.

2. References

AFTE Glossary, Current Edition

AFTE Journal

ATF-LS Quality Manual

ATF Reference libraries

3. Documentation requirements

3.1. Prior to performing any comparisons between an unknown and a known item, class, individual, and/or any other discernable characteristics of the unknown item will be analyzed and evaluated for comparison purposes. The determination of value for comparison will be at the discretion of the examiner.

3.2. Case notes must contain comprehensive detailed observations. For a firearm and toolmark examination, this can require a variety of documentation that is specific to the type of examination. These guidelines define the variety of documentation that is required and optional for various firearms evidence to support the conclusion(s) that must be stated in the notes by the examiner.

3.3. Worksheets are a good tool for aiding the examiner in data collection and recording observations and measurements. At the discretion of the Section Chief, examiner developed worksheets may be used to record data and observations. These personally created worksheets are not controlled documents.

4. Minimum documentation

4.1. Firearm examinations

4.1.1. The examination of the firearm can require additional information, including submission to Firearms Technology Criminal Branch (FTCB) or Firearms and Ammunition Technology Division (FATD).

4.1.2. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Firearm type
- Make
- Model
- Caliber
- Serial number
- Importer information (if present)
- Generic action type
- Magazine submission (yes/no)
- Number of lands and grooves and direction of twist
- Test fire information (number of test fires, ammunition used, date created)
- Number of casts and date created (if needed for comparison)
- Documentation of firing pin shape, breechface marks, extractor/ejector location (when comparisons are necessary)
- Land/groove impression measurements (when comparisons are necessary)
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Mechanical operating condition
- Trace evidence

4.2. Cartridge examinations

4.2.1. The following minimum information will be included in case note documentation *only when examinations are performed*.

- Packaging
- Exhibit number
- Examiner mark/location
- Headstamp
- Caliber
- Bullet type/composition
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Trace evidence

4.3. Fired bullet examinations

4.3.1. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Bullet type/composition
- Diameter
- Caliber
- Weight
- Examination driven changes/modifications to evidence
- Rifling
- Land/groove impression measurements - when more than one evidence bullet and/or test fired bullets have similar general rifling characteristics, the land and groove impression measurements for at least one evidence or test fired bullet shall be documented.
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Suitability for comparison
- GRC search results in cases where no gun is identified (inconclusive, exclusion)
- Trace evidence

4.4. Other projectiles

4.4.1. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Design/composition
- Diameter
- Caliber/gauge/shot size
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Suitability for comparison
- Trace evidence

4.5. Fired cartridge case/shotshell examinations

4.5.1. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Headstamp
- Composition
- Caliber/gauge
- Firing pin impression shape/characteristics
- Breech face impression characteristics
- Location of ejector mark
- Location of extractor mark
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Suitability for comparison
- Trace evidence

4.6. Tool examinations

4.6.1. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Manufacturer/brand name
- General description
- Tool type
- Tool action
- Additional class characteristics
- Tool working surface detail
- Damage
- Method of manufacture/finishing
- Test toolmark information (number of tests, material used, date created)
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Trace evidence

4.7. Toolmark examinations

4.7.1. The following minimum information will be included in case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Location of toolmark
- Type of toolmark
- Class characteristics
- Number of casts and date created (if needed for comparison)
- Assessment of the presence or absence of subclass characteristics (when comparisons are necessary)
- Suitability for comparison
- Trace evidence

4.8. Restoration of obliterated markings

4.8.1. The following minimum information will be in the case note documentation.

- Packaging
- Exhibit number
- Examiner mark/location
- Firearm type
- Make
- Model
- Caliber
- Importer information (if present)
- Location of obliterated markings
- Method of obliteration e.g.– grinding, scraping, drilled etc.
- Toolmarks suitable for comparison
- Number of casts and date created (if toolmarks suitable for comparison are present)
- Documentation of characters or partial characters as received
- Indication of whether the area of obliteration is magnetic/non-magnetic
- Surface preparation methods
- List chemical type/process used for restoration, and order of application.
- Document final restoration results/conclusions
- Trace evidence

1. Scope

1.1. This policy and procedure guideline sets a minimum standard for photo documentation in firearm and tool mark comparative examinations. This policy is applicable to all ATF Firearm and Toolmark Examiners and relates to documentation of comparative examinations of all types of tool marks.

2. References

AFTE Glossary, Current Edition

AFTE Journal

ATF-LS Quality Manual

ATF Reference libraries

SWGGUN Elimination Factors Related to FA/TM Examinations

3. Background

3.1. Based on the AFTE Theory of Identification, a comparison of two tool marks will result in one of four basic types of conclusions: the tool marks were produced by the same tool, the tool marks were produced by different tools, inconclusive and unsuitable for examination. In order to reach such a conclusion, an examiner has to evaluate the similarity or dissimilarity of various class and individual characteristics, and the potential for subclass characteristics.

3.2. The adopted AFTE Standardization of Comparison Documentation requires that, *At a minimum, the documentation must include interpretable depictions or descriptions of the agreement or disagreement of individual and/or class characteristics to the extent that another qualified firearm and tool mark examiner, without the benefit of the evidence itself, can review the case record, understand what was compared, and evaluate why the examiner arrived at the reported conclusion*.

3.3. It must be understood that the documentation is not for the purpose of the individual doing the review to independently arrive at his or her own conclusion with regard to the evidence. It is to allow an individual reviewing the case record to determine if there is sufficient documentation of observations that supports the conclusion that was reached.

3.4. Furthermore, the language of the standard is such that the observations are recorded in a manner that is interpretable. This means that the individual doing the review should be

able to understand as precisely as possible what was observed. Simply, nebulous language that can be construed to mean different things to properly trained examiners is to be avoided unless supplemented by photo documentation.

4. Clarification on the role of photomicrography in comparison documentation requirements

4.1. Class characteristics

4.1.1. Class characteristics are easily measured or classified, and the measurements or classifications recorded. Measurements are discrete and can be communicated in a manner that leaves little to no room for incorrect interpretation by another examiner reviewing the work. Likewise, classifications of class characteristics are done according to a classification scheme such that another properly trained examiner would know precisely what the original examiner observed. Therefore, the recording of such measurements or classifications according to standardized protocols without supplemental photomicrography is sufficient for an individual to review the case record for the purpose of determining whether the conclusions are supported.

4.2. Subclass characteristics

4.2.1. Subclass characteristics provide for a level of positive association of two items that is more restrictive than class characteristics but less than individual characteristics. Subclass characteristics have been defined as incidental to manufacture potentially arising from a source that can change over time. Due to their similarity to and potential confusion with individual characteristics it is essential that the evidence be evaluated for the potential of subclass characteristics.

4.2.2. If subclass characteristics are present, they must be documented and any potential influences addressed. If they are not present, then that should be documented as well. Due to their similarity to individual characteristics, if subclass characteristics are present and their correspondence forms the basis for the reported conclusions, then the guidelines for photo documentation of individual characteristics will apply.

4.3. Individual characteristics

4.3.1. Correspondence, or lack thereof, of individual characteristics is not easily communicated. An observation such as significant agreement can mean different things to each examiner. This does not serve as interpretable descriptions of what was observed because the individual performing the review will likely have his or

her own concept of the phrase based upon their training, experience and knowledge.

5. Therefore, the documentation of the comparison will be supplemented by photomicrography of a representative area that was observed. For example, the analyst could describe a particular pattern of correspondence as good correspondence and refer to a photograph of the actual comparison as an example of what he or she means by good correspondence. Then the individual performing the review has an interpretable description or depiction. If a series of exhibits is compared and source identified, a representative photograph of the observed correspondence is to be included. Not every comparison of a series need by documented by photographs.

6. There may be instances in which no correspondence was observed. In these cases, the wording itself provides an interpretable description of what was observed.

7. There may be instances in which some correspondence was observed, but insufficient for a conclusion that the two marks were produced by the same tool. Photomicrography will serve as a helpful interpretable depiction, in that the examiner can take a photomicrograph of the best area and indicate in the notes that this is an example of one of the better areas of correspondence, yet, insufficient for a source identification.

8. If it is not possible to photo document a representative sample, then the best attempt will be made and supplemented by a narrative that describes the issues preventing adequate photo documentation.

1. Scope

1.1. This policy and procedure guideline establishes a standard theory for the identification of toolmarks and the range of conclusions that are applicable to the examination of toolmarks. This protocol is applicable to all ATF firearms examiners, and relates to all types of firearm and toolmark examinations.

2. References

AFTE Glossary, Current Edition

AFTE Journal

ATF-LS Quality Manual

ATF Reference libraries

Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Pattern Match Examination

SWGGUN Elimination Factors Related to FA/TM Examinations

3. Range of conclusions possible when comparing toolmarks

3.1. The examiner is encouraged to report the objective observations that support the findings of toolmark examinations. The examiner should be conservative when reporting the significance of these observations.

3.2. The examiner may offer any of the following conclusions.

- Source identification (i.e., identified)
- Source exclusion (i.e., excluded)
- Inconclusive
- Unsuitable

4. Glossary of relevant terms

4.1.1. Class characteristics

Measurable features of a specimen, which indicate a restricted group source. They result from design factors and are determined prior to manufacture.

4.1.2. Individual characteristics

Marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage.

4.1.3. Inconclusive

Inconclusive is an examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the examiner is unable to identify or exclude the two toolmarks as having originated from the same source. The basis for an inconclusive conclusion is an examiner's decision that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification; a lack of any observed microscopic similarity; or microscopic dissimilarity that is insufficient to form the conclusion of source exclusion.

4.1.4. Pattern matching

The act of visually comparing the surface contours of two or more striated or impressed tool marks for corresponding and/or differentiating features.

4.1.5. Subclass characteristics

Features that may be produced during manufacture that are consistent among items fabricated by the same tool in the same approximate state of wear. These features are not determined prior to manufacture and are more restrictive than class characteristics.

4.1.6. Toolmark, impressed

Contour variations on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately perpendicular to the plane being marked. The class characteristics (shape) can indicate the type of tool used to produce the mark. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks. Also known as compression marks.

4.1.7. Toolmark, striated

Contour variations, generally microscopic, on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately parallel to the plane being marked. Friction marks, abrasion marks, and scratch marks are terms commonly used when referring to striated marks. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks.

1. Scope

   1.1. A procedure for collecting and preserving trace evidence on firearm and toolmark related items submitted for examination is necessary to ensure the integrity of said evidence. The manner of collection is varied and specific to the types of trace evidence being collected. These guidelines provide broad guidelines for these procedures. These standards are applicable to all ATF Forensic Laboratories of the Laboratory Services Division. Each examiner should possess general knowledge in the recognition, collection and preservation of trace evidence. An examiner proficient in the recognition, collection and preservation of trace evidence should perform these functions.

2. References

   AFTE Glossary, Current Edition

   AFTE Journal

   ATF-LS Quality Manual

   ATF Reference libraries

3. Safety Precautions

   3.1. See *ATF-LS Quality Manual.*

4. Apparatus/Reagents

   4.1. Various tools for the collection and preservation, packaging of trace evidence, suitable for the evidence collected, will be required.

5. Procedures

   5.1. A person knowledgeable in the recognition, collection and preservation of trace evidence may remove and preserve said trace evidence.

   5.2. In circumstances where a knowledgeable trace person is not available, and/or the trace material is not securely attached or is in danger of being lost, preserve the item of evidence as is until a knowledgeable trace person is available.

6. Quality Control

   6.1. Improper handling or packaging easily compromises trace evidence; therefore, care must be taken in the handling, preservation and recording of trace evidence.

1. Scope

    1.1. A current and complete ammunition reference collection is an important source of information for firearms examiners in routine examinations, particularly in cases where the identification of potential ammunition manufacturer(s) is important in the case investigation, nexus determination and the information of search warrants. Additionally, the determination of source may play a role in proper test firing. This policy is applicable to all ATF Laboratory Services Forensic Laboratories.

2. References

    AFTE Journals

    ATF Laboratory Services Standard Ammunition File (SAF)

    ATF-LS-Quality Manual

    ATF Reference libraries

3. Safety precautions

    3.1. See ATF-LS-Quality Manual.

4. Apparatus/reagents

    4.1. Inertia bullet puller and packaging materials for disassembled ammunition components.

5. Procedures

    5.1. Reference collection samples shall be fully documented, uniquely identified, and properly controlled.

    5.2. The items in the Standard Ammunition File are ideally sorted by caliber. A numbering system assigning a unique identifier to each sample will be used to assist in the cataloging of the collection. The cataloging can take the form of an electronic or paper system.

    5.3. Each item in the collection should consist of at least the following: one intact cartridge, and one disassembled cartridge.

5.4. At a minimum, the information displayed on the ammunition box for a given reference sample will be fully documented and cataloged for each collection entry, which may include the following.

- Manufacturer of cartridge
- Lot number
- Caliber and weight of the bullet
- Bullet design and/or composition
- Number and size of shot; composition

5.5. Ammunition components may be traceable by the information on the ammunition box and/or the headstamp via the manufacturer.

5.6. Each of the reference collection containers shall be marked with at least the reference collection file number.

5.7. Only ammunition from reliable sources will be added to this collection to protect the integrity of the reference materials in the Standard Ammunition File. For instance, seized loose ammunition from numerous sources is not a reliable source.

5.8. New or updated reference samples obtained by ATF Forensic Science Laboratory-Atlanta should be sent to the ATF Forensic Science Laboratory-Washington in order to maintain the most current and up-to-date Standard Ammunition File. The reference items should be shipped along with the appropriate cataloging information and/or documentation using secure and accepted shipping and packaging methods.

6. Quality control

6.1. Any additional items that are added to the reference collection shall be properly filed and the cataloging system updated by members of the Firearms Section as necessary. The Standard Ammunition File is stored in a secure, restricted access location for use by the Firearms Section to maintain proper control over the reference materials. Safe handling practices and proper caution in accordance with the Firearms Safety Guidelines should be exercised where applicable.

1. Scope

1.1. This document defines the policies, work instructions, schedule, and documentation required for the maintenance and performance monitoring of measuring devices and external calibrations. Regular performance checks of certain measuring devices will be performed as part of the quality program. Measurement traceability is a requirement for ISO/IEC 17025 accreditation, so an external calibration laboratory that can supply an ISO/IEC 17025 compliant certificate is preferred, but not required, for all performance certifications of reference materials.

2. Procedures

2.1. Laboratory equipment utilized for casework by the Firearm Section will be subjected to routine maintenance and/or calibration, as outlined below. Documentation of all maintenance, performance checks, and/or calibrations will be maintained. Where applicable, work instructions and/or performance log documentation will include information on acceptable tolerances.

2.2. Unless otherwise noted, all equipment outlined here shall be performance checked (qualified) before being placed into service.

2.3. Reference Materials

2.3.1. The weight set(s) and the gauge block set(s) used to conduct in-house performance checks will be calibrated externally at regular intervals not to exceed ten (10) years.

2.3.2. Record the vendor used as well as the date of calibration. Retain the calibration documentation provided by the vendor.

2.4. Stereo Microscopes

2.4.1. Maintenance of stereo microscopes shall be completed by an approved vendor as necessary. Any maintenance performed shall be documented.

2.4.2. Stereo microscopes do not need to be performance checked.

2.5. Comparison Microscopes

2.5.1. Maintenance of comparison microscopes should be completed by an approved vendor annually. Any maintenance performed shall be documented.

2.5.2. All comparison microscopes shall be performance checked at a minimum of once per calendar year and when a significant event occurs (dropped, moved to a different room, etc.). This can be performed by a vendor or in-house.

2.5.3. To perform the check in-house, place one hemocytometer on each stage of the microscope and set each stage to the same magnification. Adjust each hemocytometer such that the bands (lines) are horizontal. Looking through the eyepieces, align the uppermost band of the hemocytometers. The horizontal bands on the scale shall be aligned with one another such that the bottommost band, in the field of view, is not misaligned by more than one band in either direction. Repeat the same procedure for all magnifications available.

2.5.4. Record the hemocytometers used, microscope checked, result of the check (pass/fail), initials of the person performing the check, and the date.

2.5.5. If the comparison microscope does not fall within tolerance, as described in 2.5.3, it shall be taken out of service until it can be examined and serviced.

2.5.6. External checks of hemocytometers are not needed under normal usage. Replace the hemocytometers if damage should occur.

2.6. On-stage calipers (Stage micrometers)

2.6.1. All on-stage calipers will be performance checked at a minimum of once per calendar year. A stage micrometer slide will be used for the performance check.

2.6.2. To perform the check, place the slide on the left stage and adjust the microscope's magnification to the lowest setting. Focus the microscope on the 1" scale located on the slide. Using the measuring eyepiece, align the horizontal reticle with a scale division on the slide. Turn on the on-stage caliper and zero it. Move the left stage until the eyepiece reticle aligns with the next scale division. Observe the measurement noted on the caliper to the actual measurement listed on the scale. Repeat this procedure for all magnifications. The tolerance can be +/- 0.003".

2.6.3. Record the stage micrometer slide used, caliper checked, microscope checked, measurements obtained, initials of the person performing the check, and the date.

2.6.4. If the on-stage caliper does not measure within tolerance, it shall be taken out of service.

2.6.5. Since the stage micrometer slide will not change unless damaged or broken, external checks of this item are not needed under normal usage. Replace the stage micrometer slide if damage occurs.

2.7. Measuring devices (with moving parts)

2.7.1. Calipers, micrometers, and other measuring devices with moving parts will be performance checked at a minimum of once per calendar year.

2.7.2. To perform this check, choose a calibrated gauge block set and select at least three different blocks that are at least 0.010" apart. Insert the center of the block into the

measuring device and measure. Observe the measurement noted on the measuring device relative to the measurement listed on the block. Repeat for all chosen blocks. The tolerance can be +/- 0.003".

2.7.3. Record the measuring device checked, block set used, blocks selected, measurements obtained, initials of the person performing the check, and the date.

2.7.4. If the device does not measure within tolerance, it shall be taken out of service.

2.8. Measuring devices (without moving parts)

2.8.1. Generally, rulers and other measuring instruments that do not have movable parts are used for general descriptions or photographic documentation purposes. These devices do not impact results, and they do not require performance checks. They should be replaced if they exhibit notable wear or damage.

2.8.2. If a performance checked ruler or similar measuring instrument is needed in casework (e.g. steel micro ruler for toolmark measurements), it will be performance checked prior to being put into service. They do not require subsequent routine performance checks and should be replaced if they exhibit notable wear or damage.

2.8.3. To perform this check, choose a calibrated gauge block set and select at least three different blocks that are at least 0.010" apart. Check the block against the measuring instrument. Repeat for all chosen blocks. The tolerance can be +/- 0.003".

2.8.4. Record the measuring device checked, block set used, blocks selected, measurements obtained, initials of the person performing the check, and the date.

2.8.5. If the device does not measure within tolerance, it shall not be placed into service.

2.9. Balances and/or Scales

2.9.1. Balances and/or scales will be performance checked at a minimum of once per calendar year.

2.9.2. To perform this check, choose a calibrated weight set and select at least three different weights that are at least 5 grams apart. Ensure the weighing surface of the device is clean and clear of debris. Zero the device and place the weight on the center of the device. Observe the measurement noted on the device relative to the known mass of the weight. Repeat for all chosen weights. The tolerance can be +/- 0.1 gram.

2.9.3. Record the measuring device checked, weight set used, weights selected, measurements obtained, initials of the person performing the check, and the date.

2.9.4. If the device does not measure within tolerance, the device may be "reset" by pressing the "calibrate" button or following the instrument work instructions. Perform the "reset" as directed. Once this is done, repeat the performance check. If

the device does not measure within tolerance a second time, the device shall be taken out of service.

2.9.5. If the device is "reset" using this method, document the instrument it was completed on along with the date the "reset" was performed.

3. Quality Control

3.1. The performance log should be maintained in accordance with records management policies.

4. References

4.1. Instrument/equipment specific manufacturer manuals
4.2. Laboratory traceable standards (e.g. weights and gauge blocks)

1. Scope

1.1. This policy is applicable to all Laboratory Services Firearm and Toolmark Examiners.

2. References

ATF-LS-Quality Manual

3. General

3.1. This policy defines conclusion statements for laboratory reports. Not every possible case scenario can be anticipated, so additional conclusion statements may be used as required. Additionally, slight variations to the current conclusions will occasionally be necessary.

ABBREVIATION	AUTOTEXT
GRC	Firearms that produce general rifling characteristics similar to those observed on Exhibit(s) # include, but may not be limited to, *{Caliber or cartridge designation}* pistols/revolvers/rifles marketed by *{Name of company}*. Firearms that produce general rifling characteristics similar to those observed on Exhibit(s) # include numerous makes and models. Firearms that produce characteristics similar to those observed on Exhibit(s) # include, but may not be limited to, *{Caliber or cartridge designation}* pistols/revolvers/rifles marketed by *{Name of company}*.
TEST FIRES	The Exhibit # *{Description of exhibit(s)}* was/were test fired and found to be in operable condition. The test fires were designated as Exhibit(s) #. The Exhibit # *{Description of exhibit(s)}* was/were found to be in an inoperable condition and could not be test fired.

TEST CASTS

The Exhibit # *{Description of exhibit(s)}* was/were cast. The cast(s) was/were designated as Exhibit(s) #.

TEST TOOLMARKS

The Exhibit(s) # *{Description of exhibit(s)}* was/were used to make test toolmarks. The test toolmarks was/were designated as Exhibit(s) #.

FIREARMS

Exclusion

The Exhibit(s) # *{Description of exhibit(s)}* was/were excluded as having been fired in/from the Exhibit # firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were excluded as having been fired in/from the same firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were excluded as having been cycled through the Exhibit # firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were excluded as having been cycled through the same firearm.

Identification

The Exhibit(s) # *{Description of exhibit(s)}* was/were identified as having been fired in/from the Exhibit # firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were identified as having been fired in/from the same firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were identified as having been cycled through the Exhibit # firearm.

The Exhibit(s) # *{Description of exhibit(s)}* was/were identified as having been cycled through the same firearm.

Inconclusive

The Exhibit(s) # {Description of exhibit(s)} could not be identified or excluded as having been fired in/from the Exhibit # firearm based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

The Exhibit(s) # {Description of exhibit(s)} could not be identified or excluded as having been fired in/from the same firearm based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

The Exhibit(s) # {Description of exhibit(s)} could not be identified or excluded as having been cycled through the Exhibit(s) # firearm based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

The Exhibit(s) # {Description of exhibit(s)} could not be identified or excluded as having been cycled through the same firearm(s) based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

Unsuitable

The Exhibit(s) # *{Description of exhibit(s)}* is/are not suitable for microscopic comparison.

TOOLMARKS

Exclusion

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) was/were excluded as having been made by the Exhibit(s) # tool.

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) was/were excluded as having been made by the same tool.

Identification

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) was/were identified as having been made by the Exhibit(s) # tool.

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) was/were identified as having been made by the same tool.

Inconclusive

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) could not be identified or excluded as having been made by the Exhibit(s) # tool(s) based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

The Exhibit(s) # *{Description of exhibit(s)}* toolmark(s) could not be identified or excluded as having been made by the same tool based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

SERIAL NUMBER RESTORATION

The obliterated serial number located on the Exhibit # *{Description of exhibit(s)}* was processed. The characters were concluded to be *{List characters}*.

The obliterated secondary number on the *{slide, barrel, etc.}* of the Exhibit # *{Description of exhibit(s)}* was processed and the characters were concluded to be *{List characters}*. These characters may or may not agree with the manufacturer's original serial number.

The secondary number on the Exhibit # *{Description of exhibit(s)}* was concluded to be *{List characters}*. These characters may or may not agree with the manufacturer's original serial number.

The obliterated serial number/secondary number located on the Exhibit # *{Description of exhibit(s)}* was processed. The obliteration was partially restored and concluded to be *{List characters}*. The asterisk(s) represent(s) a/an *{list possible*

characters} as possible character(s). The question mark(s) represent(s) an unrestored character.

The obliteration(s)/serial number located on the Exhibit # *{Description of exhibit(s)}* was/were processed and could not be restored.

The bar code on the Exhibit # *{Description of exhibit(s)}* was processed and concluded to be *{List characters}*.

FRACTURE EXAMINATION

Exclusion

The Exhibit # *{Description of exhibit(s)}* and the Exhibit # *{Description of exhibit(s)}* were excluded as having originally been part of the same item.

Identification

The Exhibit # *{Description of exhibit(s)}* and the Exhibit # *{Description of exhibit(s)}* were identified as having originally been part of the same item.

Inconclusive

The Exhibit # {Description of exhibit(s)} and the Exhibit # {Description of exhibit(s)} could not be identified or excluded as having originally been part of the same item based on an agreement of all discernible class characteristics and neither sufficient agreement nor sufficient disagreement of individual characteristics. The result of the comparison was inconclusive.

VISUAL/PHYSICAL EXAM

Exhibit(s) # consists of *{Description of exhibit(s)}*.

NO ANALYSIS

No Firearms or Toolmark examinations were requested or conducted on Exhibit(s) #.

1. Scope

1.1. This policy establishes a standard approach for evaluating the opinions/conclusions of Firearm and Toolmark Examiners after the examination and comparative analysis of physical evidence has been performed. This procedure establishes the type of analyses which must be evaluated and addresses conflict resolutions during this procedure.

2. Reference

AFTE Glossary 6th Edition, current version

3. General

3.1. Selected opinions/conclusions reached during the course of the examination must be evaluated by a second qualified examiner (verifier) prior to completion of the technical record. The verification must be conducted to the extent that the verifier could independently defend and testify to the same conclusion(s).

3.2. The following examinations/analyses require verification.

- Comparative microscopy examinations where an opinion of identification or exclusion, based on individual characteristics, are reached by an examiner.

- Comparative microscopy examinations where an opinion of inconclusive is reached by an examiner.

- Serial number restorations: partial or full

3.3. The following examinations/analyses do not require verification.

- Comparative microscopy examinations where an opinion of exclusion, based on a disagreement of class characteristics, are reached by an examiner.

- Land and groove measurements and caliber/gauge determination of fired ammunition components will be evaluated during the technical review process.

4. Procedure

4.1. Verification shall take place after the primary examiner has completed an examination/analysis, but prior to technical review and completion of the technical

record(s). Depending on case circumstances, verification may occur at various times during the primary examination of the case.

4.2. To reduce the possibility of bias, the primary examiner's opinions/conclusions should be withheld from the verifier until after the completion of the verification examination.

4.3. Verification entails an examination of the physical evidence, except in some instances when photographic images may be used, as listed below.

4.3.1. Serial number restoration

4.3.1.1. Examination of photographic images of the restored or partially restored characters are acceptable for verification if it sufficiently records the observations.

5. Records

5.1. In the technical record, verification shall be documented and clearly labeled as such. The documentation shall include, at a minimum:

- identification of verifier via handwritten initials or digital equivalent
- date of the verification
- method of verification (e.g., visual, microscopic, photographic, review of technical records)
- results of verification including the verifier's justification (e.g., specific area, class/individual characteristics)
- items examined

6. Conflict resolution

6.1. When the primary examiner and verifier reach conflicting conclusions that cannot be resolved between the parties, the Section Chief shall attempt to resolve a disagreement between the primary examiner and verifier. If needed, they may consult a qualified third party. The Laboratory Chief shall be consulted as appropriate and necessary. Disagreements and resolutions must be documented in the case record.