FIREARM & TOOLMARK SECTION
STANDARD OPERATING PROCEDURES

Firearms Identification Protocol

Standard Firearm Examination Methods

The examination of any firearm will include the completion of either a long or short version of the firearm worksheet. Which form is used depends on the type case involved. This worksheet will include the manufacture data of the firearm and will serve as a source to document the condition of the firearm as received and any tests performed on or with the firearm.

LISTED PROCEDURES

Physical Examination & Classification of Firearms
Safe Firearm Handling
Unloading Firearms
Swabbing Firearms for DNA
Pre-Firing Safety Checks
Trigger Pull Examination
Barrel and Overall Length Measurements
Test Firing Methods
Miscellaneous Firearm Examination Methods

SAFETY CONSIDERATIONS

These procedures involve hazardous materials, operations and equipment. These procedures do not purport to address all of the safety problems associated with their use. It is the responsibility of the user of these procedures to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered. The firearms examiner/ IBIS technician should be familiar with the CMPD Laboratory Safety Manual.

These procedures may also involve hazardous materials to include evidence that may be contaminated with a biohazard. These procedures do not purport to address all of the safety problems associated with their use. It is the responsibility of the user of these procedures to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use. Proper caution to include strict adherence to Universal Precautions and Blood Borne Pathogen safety must be exercised and the use of personal protective equipment must be considered to avoid exposure to any potential hazards.

Appropriate hearing and eye protection must be worn when applicable.

PHYSICAL EXAMINATION & CLASSIFICATION OF FIREARMS

PROCEDURE

Choosing a Firearms Worksheet-
The worksheet used (Form O-14-PD Long or Short) depends on the type case involved. In general, the long sheet may be used for any type case, but should be used for serious crimes that involve the shooting of a human, Internal Affairs cases, cases where a malfunction was alleged or cases that were sent in a rush immediately before going to court. The short sheet may be used when the case involves the "routine" analysis of a firearm in non-shooting cases such as armed robbery, drug cases and city code violations. The short sheet may also be used in shooting cases for firearms

not related to the shooting incident. During the course of an examination an examiner may find that he may need to upgrade from the short sheet to the long, such as when serious malfunctions are encountered.

Working the Case-

1. The worksheet should be filled out including all appropriate case and evidence information, which may include determining the following:

SHORT SHEET	LONG SHEET
Caliber/Gauge	Same information as Short Sheet plus:
Make	Safeties
Model	Trigger pull
Rifling characteristics	Type of action
Serial number information	Barrel, overall length
Finish	How the firearm was loaded as received
Firearm Type	Location of extractor, ejector, firing pin
Operating condition	
Inventory of other submitted items	
Any other relevant data	

2. Each firearm should be engraved with the Firearms Number (F#) associated with that case and the examiner's initials
    a. Normal cases – firearms should be marked on all mark-producing parts of the firearm (e.g., barrel, bolt, slide, etc.), or in the window of a revolver.
    b. CMPD issued firearms –
        i. Smith & Wesson M&P pistols should be marked on the underside of the slide.
        ii. Glock pistols should be marked on the underside of the slide.
        iii. Shotguns should be marked on the loading port.
        iv. Rifles or other unlisted firearms should be marked in an inconspicuous place such as the ejection port or magazine well (to be noted on the worksheet).

NOTE: All notes, worksheets, photos, printouts, and any other hard copy documentation will be scanned and attached to the assignment in PLIMS for every case.

SAFE FIREARM HANDLING

INTRODUCTION

Firearm evidence in the laboratory environment is not dangerous if handled correctly and treated with respect. Occasionally, loaded firearms are received in evidence for a particular examination. These, of course, need very special handling. **All firearms must be treated as though they are loaded**. This rule cannot be over stressed and must be followed at all times, whether it is in the Firearms Section, the shoot room, or in court. 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. In addition to the below listed considerations, the General Safety Practices in the Laboratory Safety Manual must be followed.

PROCEDURE

The following safety considerations must be adhered to:

1. The muzzle of the firearm must always be pointed in a safe direction.
2. Presume the firearm you are about to handle is loaded until you have personally verified it is unloaded. This applies to any initial handling or any interrupted rehandling.
3. Prior to any examination, it must be verified that the firearm is unloaded.
4. Test firing or any examination of the firearm that utilizes live ammunition, or a live ammunition component, will only be performed in the shoot room or at the academy firing range.
5. When examinations are completed, firearms will be placed in the Firearms vault or returned to the Property Bureau in an **unloaded** condition.
6. Do not squeeze the trigger of a firearm unless its unloaded status has been verified.
7. Do not load a firearm unless and until it is to be fired.
8. Firearms will ordinarily be received unloaded. However, if they are received loaded (due to rusting, fouling or other circumstances), they must be submitted in a steel-lined gun box, if possible.

UNLOADING FIREARMS

INTRODUCTION

Firearms are often collected and submitted to the Property Bureau in a loaded condition. This is normally in a locked gun box. Because there are a limited number of gun boxes in use by the CMPD, it is often necessary that the gun boxes be unloaded before the firearm has been sent to the laboratory. Unloading is often accomplished by someone other than the examiner who ends up working the case. Because the initial condition of the firearm may become important at some time later, proper documentation of the firearm, as found in the gun box, is critical.

PROCEDURE

1. Take possession of the firearm in PLIMS.
2. Find a location that is safe to handle a loaded firearm.
3. Employ proper personal protective equipment, as necessary.
4. Keep in mind that the firearm may be sent for DNA or fingerprint analysis at some later time.
5. Remove envelope or other packaging material from gun box.
6. Unlock and open gun box.
7. Use a Firearm Unloading Worksheet.
8. Note external features such as hammer position, location of magazine, any jammed ammunition components, safety positions.
9. For revolvers, mark the cylinder showing its position in the frame. Open the cylinder and note the location of each ammunition component as it is removed from the cylinder. It is a good idea to mark each ammunition component (with a marker pen) regarding its position in the cylinder. Make the appropriate notations on the worksheet.
10. For firearms with magazines, remove the magazine or empty tubular magazines.
11. Empty the chamber, noting its condition on the worksheet.
12. Complete the Firearms Unloading Worksheet
13. Verify that the firearm is completely unloaded.
14. Package the firearm and components properly.
15. If the case is not being worked at that time, place the Unloading Worksheet in the box with the evidence.

SWABBING FIREARMS FOR DNA

PROCEDURE

1. Write case information on the proper sized envelope
2. Put on gloves
3. Ensure firearm is unloaded but leave it in the box for swabbing
4. Open the swab packaging
5. Use two swabs for the textured grip areas and one swab for very small areas or cartridges. Using dropper bottle, place a drop of sterile water on one of the swabs – it should not be saturated.
6. Using both swabs together side-by-side firmly swab the textured areas of the firearm using only the very tips of the swabs
7. Avoid talking, sneezing, coughing, etc., on gun, swabs, and sterile water. Change gloves between items of evidence.
8. Place swabs in coin envelope breaking off as much of the sticks as necessary to get them in
9. For long guns the stock and forestock (if textured) should be swabbed. Use different appropriately labeled envelopes for each area.
10. Allow swabs to dry before sealing the coin envelope
11. Create child items in PLIMS for each set of swabs
12. Print barcodes for each new item
13. When swabs are dry, seal the envelope(s) and send to the Property Bureau
14. The swabbing of items for DNA will be reported in the Laboratory Report

FIREARMS TRACKING FOR CMPD

G.S. 15-11.1, which was passed by the NC legislature, says that beginning October 1, 2013, firearms may not be destroyed by the recovering agency "unless it does not have a legible, unique identification number or is unsafe for use because of wear, damage, age, or modification."

Therefore all firearms recovered by the CMPD are tracked via the **Firearm Tracking for CMPD Database**. Most firearms recovered by the department will be entered into this database by the CMPD firearms technician. This technician will also test fire all IBIS-eligible firearms that do not require analysis by the Crime Laboratory. The test fires will be submitted to the Firearms Section as evidence. The following procedures will be followed by Firearm Section personnel regarding this database:

IBIS Technician:

a. In the **Firearm Tracking for CMPD Database** check the IBIS entered box and enter the date of IBIS entry into the relevant fields
b. For test fires received from a firearms examiner
    i. Check to make sure that the firearms examiner has filled out the top part of the **Firearm Tracking for CMPD Database.** If they haven't, notify the examiner to do so
    ii. Fill out the database as listed in "a" above

For those firearms that come directly to the Firearms Section, or where the CMPD firearms technician has not assessed, the firearms examiner will need to fill out the top portion of the **Firearm Tracking for CMPD Database** that would normally have been filled out by the firearm technician.

PRE-FIRING SAFETY EXAMINATION

INTRODUCTION

It is the responsibility of the firearms examiner to ensure that all appropriate safety function checks are performed on a firearm or item of ammunition prior to test firing. Following is a list of safety checks that shall be considered. The examiner must be mindful that individual case situations may require a more extensive function test process than that which is listed here. **NOTE: No firearm which is deemed to be unsafe by the examiner will be test fired unless absolutely necessary for comparison purposes.**

PROCEDURE

I. Deciding Whether Or Not A Firearm Can Be Safely Test Fired From The Normal Hand Held Position

A. The Firearms Recall/Safety Warning List may be consulted for each firearm. Due to their significant history of malfunctions special care will be taken with Lorcin, Bryco or Cobra Enterprises firearms. If **any** indication of a problem is found, these pistols will be fired using the Ransom Rest. If no malfunctions are encountered upon inspection and dry firing of a long gun, the gun may be shoulder fired into the tank. If any indication of a malfunction or alteration to the action of the firearm is found, the long gun will be fired in the long gun rest. If a malfunction occurs, consult with the section administrator for further direction.

B. Are the chamber & bore clear?

C. Are there any signs of cracks or weaknesses in major parts of the firearm; such as the frame, slide or barrel?

D. Does the firearm function, lock-up or dry fire as you would expect it to?

E. Is the correct ammunition being utilized?

II. Is It Appropriate To Utilize The Evidence Ammunition?

A. Are there signs of reloading? *If so, reconsider the need to test fire the evidence ammunition.*

B. Are there splits in the cartridge case neck and/or other significant damage to the cartridge case?

C. Is the ammunition of the correct caliber? *This assessment of caliber can not be based on the head stamp!*

D. Are there existing toolmarks on pertinent surfaces of the ammunition?

E. Is the ammunition needed for other tests; i.e., range determinations?

III. Muzzle Loaders.

A. Does the chamber/barrel appear sound?

B. Do the percussion nipples have oversize flash holes?

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

D. Is this an "original" muzzle loader or a modern reproduction? "Originals" must always be remotely fired.

INTERPRETATION OF RESULTS:

If the above considerations lead to any question regarding the safety of the examiner and the problem cannot be rectified, the firearm should not be test fired. If test firing with other than a primed case is absolutely necessary, that firearm must be remotely fired.

TRIGGER PULL EXAMINATION

INTRODUCTION

One of the examinations that may be conducted in a firearms identification examination is determining the trigger pull of a firearm. Trigger pull is defined as the amount of force that must be applied to the trigger of a firearm to cause sear release. This examination can provide vital information regarding the mechanical operating condition of the firearm. The trigger pull of a firearm is obtained using either a Chatillon trigger pull tester or hanging weights, both of which make contact with the trigger at a point where the trigger finger would normally rest. The trigger pull test is normally performed when requested by the investigating officer, when a malfunction is alleged, or when the examiner notes that a single shot was fired in a shooting case. When these parameters are not in effect, the examiner may use his training and experience to determine whether or not the trigger pull is within the "normal" range (neither excessively high nor excessively low during dry firing) for that firearm. When this is the case he may enter that result on the firearms worksheet.

PROCEDURE FOR CHATILLON TESTER

I. EQUIPMENT: Chatillon trigger pull tester.

II. TECHNIQUE:

A. SINGLE ACTION TRIGGER PULL

1. Ensure that the firearm is unloaded.

2. Cock the firearm.

3. Hold the firearm in the vice with the muzzle horizontal.

4. Rest the trigger hook of the trigger pull tester on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm, with the arm parallel to the bore of the firearm.

5. Slowly and consistently apply pressure to the trigger until the sear releases. Note the weight on the dial when the sear releases.

6. Check two or three times, resetting the sear connection after each attempt. Record the lightest weight necessary for sear release. Note any cylinder position on a revolver where the trigger pull is not uniform with the rest of the positions.

B. DOUBLE ACTION TRIGGER PULL

1. Ensure that the firearm is unloaded.

2. Hold the firearm in the vice with the muzzle horizontal.

3. Rest the trigger hook of the trigger pull tester on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm, with the arm parallel to the bore of the firearm.

4. Slowly and consistently apply pressure to the trigger until the weight pulls the trigger through the double action sequence and the sear releases. Note the weight on the dial when the sear releases.

5. Check two or three times, resetting the sear connection after each attempt. Record the lightest weight necessary for sear release. Note any revolver cylinder chamber that alters the trigger pull.

PROCEDURE FOR HANGING WEIGHTS

I. EQUIPMENT: Arsenal (hanging) weights.

II. TECHNIQUE:

A. SINGLE ACTION TRIGGER PULL

1. Ensure that the firearm is unloaded.

2. Cock the firearm.

3. Hold the firearm with the muzzle vertical.

4. Rest the trigger hook of the arsenal weight hanger on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm, with the weights hanging parallel to the bore of the firearm.

5. Slowly add weights until the sear releases. Note the weight when the sear releases.

6. Check two or three times, resetting the sear connection after each attempt. Record the lightest weight necessary for sear release. Note any cylinder position on a revolver where the trigger pull is not uniform with the rest of the positions.

B. DOUBLE ACTION TRIGGER PULL

1. Ensure that the firearm is unloaded.

2. Hold the firearm with the muzzle vertical.

3. Rest the trigger hook of the arsenal weight hanger on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm, with the weights hanging parallel to the bore of the firearm.

4. Slowly add weights until the weights pull the trigger through the double action sequence and the sear releases. Note the weight when the sear releases.

5. Check two or three times, resetting the sear connection after each attempt. Record the lightest weight necessary for sear release. Note any revolver cylinder chamber that alters the trigger pull.

INTERPRETATION OF RESULTS:

The results acquired are only an approximation and a different technique may lead to a different trigger pull weight. The trigger pull is normally recorded to the nearest 1/2 pound. Results reported will be based on the examiner's training and experience and may include the use of databases available to the examiner that contain the measured trigger pulls of various types of firearms. The reported result will state that the force required to activate the trigger is within, above or below the normal range for the type of firearm in question.

BARREL & OVERALL LENGTH MEASUREMENT

INTRODUCTION

One of the examinations conducted in this section is determining the barrel length and in some cases the overall length of a firearm. Barrel length is defined as the distance between the end of the barrel and the face of the closed breech block or bolt for firearms other than revolvers. On revolvers, it is the overall length of the barrel including the threaded portion within the frame. Barrel length normally should include compensators, flash suppressors, etc., only if permanently affixed. 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, polychokes, flash suppressors, etc., are not part of the measured barrel length or overall length. For all "measurements that matter*" the examiner will use the firearm measuring box, which is a NIST traceable measuring device. [*These measurements are defined as *measurements where the testing contains measurement results that are quantitative, reported and may reasonably be expected to be used, by an immediate or extended customer (anyone in the judicial process) to determine, prosecute or defend the type or level of criminal charge(s).]* For other measurements it is permissible to use a standard ruler or yardstick.

PROCEDURE

Care must be taken if any object is placed down the barrel to help expedite the measurement. Due to the nature of the laboratory's barrel measuring rods this test should be done only after all tests fired for comparison have been obtained.

I. EQUIPMENT:

A. Firearm measuring box which contains a NIST traceable yard stick, and (if necessary)
B. Barrel measuring rod.

II. TECHNIQUE:

A. BARREL LENGTH:

1. REVOLVERS:

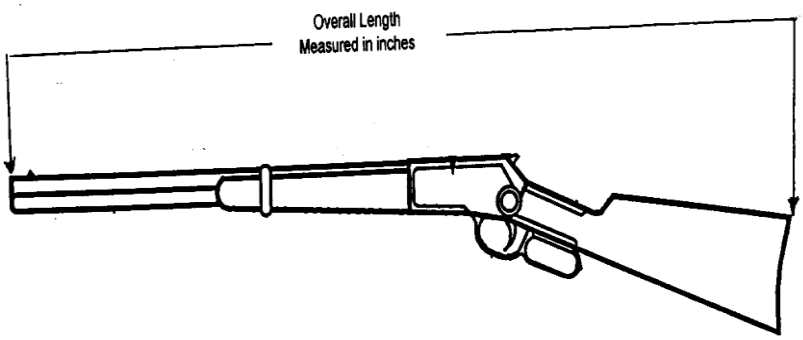
Measure the distance from the breech end of the barrel to the muzzle, excluding the cylinder. This measurement can be done directly or by placing a non-marring dowel down the barrel, marking the distance from the breech end of the barrel to the muzzle and then measuring this item using the measuring device. **If the measurement falls between graduations on the scale, the measurement will be rounded <u>up</u> to the next 1/32 inch.**

2. FIREARMS OTHER THAN REVOLVERS:

Measure the distance from the breech face in a closed and locked and cocked position to the muzzle. This measurement can be done directly when possible or by using a measuring rod. To use the measuring rod:

1. place the measuring rod down the barrel,
2. slide the collar with the set screw to the longest part of the barrel,
3. tighten the set screw at that position
4. measure from the end of the rod to the edge of the collar using the NIST traceable yard stick in the firearm measuring box. **If the measurement falls between graduations on the scale, the measurement will be rounded <u>up</u> to the next 1/32 inch.**

B. OVERALL LENGTH:



1. Firearms whose length exceeds the length of the measuring box will not be measured as the length is clearly above statutory minimums.
2. Place the firearm in the measuring box ***with the bore of the firearm parallel to the side of the box*** and one end of the firearm touching the frame of the box.
3. Move the sliding plate until it contacts the end of the firearm.
4. Measure the distance using the NIST traceable yardstick that is in place in the measuring box.
5. **If the measurement falls between graduations on the scale, the measurement will be rounded <u>up</u> to the next 1/32 inch.**

INTERPRETATION OF RESULTS:

Measurements that are to be reported must be obtained using a NIST traceable yard stick. Other measurements will be considered only approximations based on the device used to obtain the measurements. **If the measurement falls between graduations on the scale, the measurement will be rounded <u>up</u> to the next 1/32 inch.**

MEASUREMENT UNCERTAINTY:

A study of measurement uncertainty (see Appendix C) was conducted in this laboratory. The uncertainty of measurement was determined be as follows:

For all cases where the barrel length is reported, the following format will be used:
Measured barrel length +/- 3/32 inches (@ 95.45%, K=2).
For all cases where the overall length is reported, the following format will be used:
Measured overall length +/- 3/32 inches (@ 95.45%, K=2).

It should be noted that under both North Carolina and Federal laws, the barrel length for a rifle must be at least <u>16</u> inches. The barrel length for a shotgun must be at least <u>18</u> inches. The overall length for any rifle or shotgun must be at least <u>26</u> inches.

Test Firing Methods

OPEN FILE (IBIS) PARAMETERS

INTRODUCTION

On May 8, 2013 The Heritage IBIS unit was dismantled and removed; thus the Firearms Section will no longer be able to enter bullets into the IBIS. The new BrassTrax unit does not handle bullets.

PROCEDURE

For firearms that fit within the current IBIS parameters, **two** shots will be fired. Following entry of one of the tests into the IBIS, the tests will be retained in the laboratory's Fired Standards Reference Collection.

For firearms that do not fit within the current IBIS parameters, a minimum of two shots will be fired for all cases where a comparison is to be made. These tests will be retained in the laboratory's Fired Standards Reference Collection.

If no comparison is to be made, the examiner may choose to fire test shots or do a "pencil test" to determine the operability of the firearm. If this is the case, no tests need be retained.

If for any reason the examiner feels that more tests are necessary, more test shots may be fired, as necessary.

CURRENT IBIS PARAMETERS

Beginning January 1, 2014 the CMPD Crime Lab Firearms Section will follow the IBIS entry guidelines as set forth by ATF (Broadcast2_Nov 2013).

- All suitable fired evidence cartridge cases and shotshells of applicable calibers (see below) will be entered into the IBIS.
- All **semiautomatic pistols** of any caliber (including 22 caliber) for which ammunition is available will be test fired for entry into the IBIS. In addition the following rifle and shotgun calibers will be test fired:
    - 223 Rem
    - 7.62x39mm Russ
    - 12 Gauge
- Any and all firearms will be test fired for comparison or operability purposes when necessary.

At this time the following are **NOT** being accepted for IBIS inclusion:

- **Bullets of any caliber**
- All shotgun calibers except 12 Gauge
- All rifle calibers except 223 Rem and 7.62x39mm Russ

WATER RECOVERY TANK

INTRODUCTION

In order to perform a microscopic comparison of a submitted firearm, a minimum of two (2) test shots should be fired and recovered. Recovery methods include the water tank and the bullet trap. The type of firearm and ammunition tested will usually dictate the type of recovery method used. The water recovery tank is usually used to recover bullets from handguns and rifles.

SAFETY CONSIDERATIONS

One should be aware of the cartridge types/calibers that can be fired into the water tank, as well as the proper water depth needed for firing.

PROCEDURE

1. The bullet and cartridge case of each test shot should be marked with the laboratory case number, the test number, and the examiner's markings.
2. The examiner should consider indexing and sequencing each shot and perform these functions, if necessary.
3. Proper hearing and eye protection must be worn.
4. Ensure that the water level is appropriate.
5. Ensure that the lid of the water recovery tank is closed.
6. Ensure that the Exhaust system is turned on and running at full speed.
7. Ensure all warning systems are activated.
8. Load no more than two (2) cartridges into the firearm during the initial testing of the firearm.
9. Fire the firearm into the tube on the water recovery tank. If the firearm is capable of firing both single and double action modes, a minimum of one (1) shot per mode should be obtained.
10. Recover the bullets with the appropriate device.
11. Collect all ejected cartridge cases.

BULLET TRAP

PROCEDURE

1. The cartridge case or shotshell of each test shot should be marked with the laboratory case number, the test number, and the examiner's initials.
2. The examiner should consider indexing and sequencing each shot and perform these functions, if necessary.
3. Proper hearing and eye protection must be worn.
4. Ensure that the Exhaust system is turned on and running at full speed.

5. Ensure all warning systems are activated.

6. Load no more than two (2) cartridges into the firearm during the initial testing of the firearm.

7. Fire the firearm into the front of the trap. If the firearm is capable of firing both single and double action modes, a minimum of one (1) shot per mode should be obtained.

8. Collect all ejected cartridge cases.

REMOTE FIRING

INTRODUCTION

During the course of examining a firearm, it may be determined that it would be unsafe for the examiner to fire the firearm by holding it as designed. If it is necessary to obtain test standards from this firearm, the firearm should be fired remotely. The long gun rest can be utilized for firing long arms and some handguns, while the *Ransom Rest* (or a similar device) can be utilized for firing handguns.

SAFETY CONSIDERATIONS

Due to the potential hazard of the firearm malfunctioning or undergoing a catastrophic failure, the examiner must be stationed behind a Plexiglas shield or at a safe distance from the firearm when discharging the firearm.

PROCEDURE

1. The bullet, cartridge case, or shotshell of each test shot should be marked with the laboratory case number, the test number, and the examiner's markings.

2. The examiner should consider indexing and sequencing each shot and perform these functions, if necessary.

3. Set up the chosen remote-firing device in front of the appropriate recovery system.

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

5. Proper hearing and eye protection must be worn.

6. Ensure that the exhaust system is turned on and running at full speed.

7. Ensure all warning systems are activated.

8. Load no more than one (1) cartridge into the firearm during the initial testing of the firearm.

9. Activate the remote device while standing behind a Plexiglas shield or while standing at a safe distance away from the firearm.

10. Obtain fired tests.

DOWNLOADING

INTRODUCTION

Due to the limitations of a Firearms Identification Section's bullet recovery devices, it may be necessary to reduce or change the powder load of the cartridge in order to obtain a velocity suitable for safely collecting test standards for comparison purposes. Even with a reduced load, it may be necessary to fire the firearm remotely.

PROCEDURE

1. Pull the bullet of the cartridge using an inertial bullet puller or a reloading press.

2. Remove existing powder.

3. Weigh the removed powder.

5. Weigh out the appropriate powder charge and place in the existing cartridge case.

6. Loosely pack a small piece of tissue into the case to fill the gap between the bullet and powder.

7. Seat the bullet back into the cartridge case using a rubber mallet or a reloading press.

8. A reduced load using 50% of the original powder can be used. It should be noted that great care must be taken when performing this type of downloading. 50% downloading CAN NOT be used with slow burning powders.

PRIMED CARTRIDGE CASE / SHOTSHELL

INTRODUCTION

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

PROCEDURE

1. Obtain a primed empty cartridge case in the desired caliber or pull the bullet of a live cartridge using an inertial bullet puller or reloading press, 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.

2. Proper hearing and eye protection must be worn.

3. Ensure that the exhaust system is turned on and running full speed.

4. Ensure all warning systems are activated.

5. 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 bullet trap or into the tank.

6. Repeat if the firearm has more than one action.

7. Collect and retain or discard all tests as necessary.

RETENTION OF FIRED TESTS

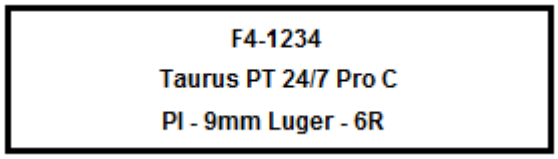
INTRODUCTION

Test bullets and cartridge cases should be retained in the Fired Standards Reference Collection (FSRC) file cabinet to be used for aid in determining type of firearm used in no-gun cases (comparison of class characteristics) or for future comparisons to fired evidence. Fired standards in the FSRC are retained for a period of no more than ten years. The tests are kept in the secure area of the firearms section, where only the firearms examiners and IBIS technician have access.

PROCEDURE

1. Create a sample/child item from the original firearm item in PLIMS ensuring that the date, firearm data and "Collecting Officer" are correct.
2. Print the label for the child item and affix to slide box as illustrated below

Side of slider box



Box End

3. Mark the end of the box with the F-number, firearm type code, GRC and make and model information as listed above.
4. Seal the box and initial properly.
5. For IBIS applicable tests, transfer the item in PLIMS to the IBIS IN BOX and place tests in the IBIS technician's "IN box"
6. After entering the tests into the IBIS, the technician will initial the test box, transfer the box to the FSRC in PLIMS and file the box in the FSRC file cabinet by F-number.
7. For non-IBIS tests, transfer the item in PLIMS to the FSRC by F-number.

EVIDENCE vs. REFERENCE DESIGNATION FOR TEST FIRES

Test bullets and cartridge cases will be considered as evidence. Thus each time the box is transferred to or from a location or person, it must be tracked in PLIMS. If a subsequent comparison becomes necessary, the analyst must sign the box out of the FSRC via PLIMS. Each time the box is opened it must be resealed with initials and date.

For fired standards that were fired prior to the use of PLIMS, if for any reason new tests cannot be produced (the firearm has been destroyed, returned or become inoperable, etc.), the FSRC may be used for comparison purposes. However, when this is the case, any statement of identification in the "Results" section of the report issued must refer to reference standards fired from a specific firearm. For example, "The evidence bullet Y was fired from the same firearm that fired the reference bullet that was fired from Firearm X". The statement, "Bullet Y was fired from Firearm X." would no longer be usable.

Miscellaneous Firearm Examination Methods

RUSTY FIREARM EXAMINATION

INTRODUCTION

Rusty firearms or those found in water, etc. may be submitted for examination. Immediate attention must be given to these firearms to prevent further damage to the firearm. The examiner should instruct the person recovering the firearm in a fluid such as water, to submit the firearm in a container of the fluid. If this is not practical, the firearm can be sprayed with a product that displaces water. It should be noted that the firearm may be too rusted to be functional.

PROCEDURE

1. Determine if the firearm is loaded and if it is, unload the firearm, if possible. If the firearm is loaded or presumed to be loaded, proceed with extreme care. Make sure the firearm is not subjected to rough handling and that the muzzle is pointed in a safe direction at all times.

2. The examiner must determine to what extent restoring the firearm is necessary (i.e., for test firing, for recovering manufacturer information, serial number, etc.).

3. Soak the firearm in penetrating oil, derusting solvents or similar material. This should be done in the chemical fume hood when possible. Check periodically until it can be opened and unloaded.

4. Periodically check the firearm until the firearm functions, or the desired information is recovered.

5. Clean the firearm with gun cleaning solvent and cleaning patches.

SILENCER EXAMINATION

INTRODUCTION

A silencer or sound suppressor is any device attached to the barrel of a firearm designed to reduce the noise of discharge. Silencers can be commercially produced or homemade. They are typically tubular metal devices, but may vary in shape or form. Even a 2-liter soda bottle can be used as a silencer. Silencers are illegal in the State of North Carolina.

PROCEDURE

1. Examine device to determine if it is, or is characteristic of, a silencer or sound suppression device.

2. Examiner will document and record his/her findings.

3. The AFTE Journal archive has some articles that are very helpful in this area. (See References at the end of this section.)

4. Because of the calibration and maintenance issues involved, this laboratory will not conduct actual sound measuring tests using a sound meter. Therefore, a device should not be reported to be a silencer, but "is characteristic of" or "exhibits the characteristics of" a silencer or sound suppression device.

MALFUNCTIONING FIREARM EXAMINATION

INTRODUCTION

A firearms examiner may be called upon to examine a firearm to determine whether the firearm will malfunction. The majority of these cases deal with the question: "Could the firearm have fired without pulling the trigger?" In these examinations, it is the goal of the examiner to answer that question by thoroughly examining and testing the firearm. This may include internal and external examinations or striking or dropping the firearm in attempts to duplicate the actions of the firearm at the time of discharge. It is very helpful if the examiner has a detailed account of the incident and the shooter's description of the alleged malfunction before beginning this examination. The examiner should attempt to keep the firearm in the same condition as received. However, there may be times that the original condition of the firearm may be altered in attempts to determine the cause of the malfunction. During these times, the examiner must specifically document these changes in his/her notes.

PROCEDURE

No one procedure can sufficiently outline the steps necessary to examine all firearms for any malfunction. However, the following list of examinations serves as a guideline for the examiner. The following list may serve to aid the examiner in his analysis. The use of the Cunningham Drop Tester is recommended for cases involving dropped firearms.

I. Physical Check (Condition of Firearm as Received):

- A. Cocked/uncocked
- B. Safety position
- C. Loaded/unloaded
- D. Cartridge position
- E. Stuck cartridges/discharged cartridge cases
- F. Presence and/or location of flares

II. Visual Abnormalities:

- A. Barrel (loose, etc.)
- B. Receiver (condition)
- C. Slide (condition)
- D. Parts broken or missing especially;
  1. the firing pin,
  2. the ejector or
  3. the extractor
- E. Screws (loose or missing)
- F. Alterations or adaptations
- G. Sights

III. Action (External):

- A. Are the relationships of the action parts correct?
- B. Is the assembly correct?
- C. Does the action lock normally upon closing?
- D. Cylinder rotation (securely locks).
- E. Hand relationship to the ratchet (worn).
- F. Trigger (not returning, sticks, broken spring, etc.)
- G. Check the trigger pull (single action, double action) and striking of hammer.

IV. Safeties:

A. 1/4,1/2, full cock, seating check (any false seating positions, pull off/push off, etc.)
B. Grip, magazine, disconnector: function
C. Thumb/finger - note positions when firearm will fire
D. Rebound hammer or inertia firing pin - Will firing pin ride on primers? Is firing pin frozen or bent? (Drop hammer several times to check above safeties.)
E. Does the slide or bolt have to be completely closed to fire?
F. Can the safeties be bypassed? Will dropping hammer bypass safeties? (This may require primed cartridge tests.)
G. Will a light blow on the rear of the hammer, when it is in battery, discharge the primer?
H. Is the firing pin impression off center (both single action and double action operation)?

USE CAUTION WHEN FIRING LIVE CARTRIDGES OR PRIMED CARTRIDGE CASES

V. Action Check:

A. Check feeding (magazine, carrier or lifter, feed ramp, magazine lips, etc.).
B. Will a cartridge fire on closing of the bolt or slide?
C. Extractor and/or ejector markings on evidence cartridges/discharged cartridge cases consistent and/or normal?
D. Unusual marks exhibited on the cartridges/discharged cartridge cases.

VI. Check for any inherent "quirks" known about the particular firearm based on literature or case data.

VII. Test Fire Firearm (note operation, misfires, etc.):

A. Note any operational problems.
B. Ammunition involved (proper cartridge, type, reloads, etc.).
C. Check consistency of the impression on test and evidence.

VIII. Special Situational Tests:
Discretion should be considered in situational testing if the force needed could disturb the internal action and/or cause changes which might prevent determining the exact cause of the malfunction.

IX. Action (Internal) (remove side plate or partially disassemble):

A. Hammer notch(s) (worn, burrs, dirt, etc.).
B. Sear (worn, broken, burrs, etc.).
C. Safeties (relationships and general parts relationship).
D. Springs (weak, broken, altered, etc.).
E. Signs of any tampering or faulty assembly.

FIREARM REFERENCE COLLECTION

INTRODUCTION

The Firearm Reference Collection is maintained by the laboratory for various scientific reasons, including:

1. To assist in identifying the make, model and source of an evidence firearm.
2. To provide exemplar firearms for various scientific testing purposes that might otherwise compromise an evidence firearm.
3. To provide an exemplar resource for the training of new forensic scientists or crime scene search technicians.
4. To provide a source of firearms parts for the temporary repair of evidence firearms for test firing purposes.
5. To provide a resource for the identification of firearm parts recovered at a crime scene.

6. To provide a resource for the location and style of firearm serial numbers.

PROCEDURE

The Laboratory firearms reference collections will be maintained under strict regulations and controls. The Laboratory assumes all responsibility for security and control of these firearms.

1. Immediately upon receipt of a firearm for the reference collection, the firearm will be logged into the Reference Collection Database which is located on the departmental R: drive. This entry should include all fields in the database for which the information is known, including:

    a. The exhibit number assigned.
    b. The complaint number.
    c. A description of the firearm (make, model, caliber, type).
    d. The serial number of the firearm.
    e. The date received.
    f. The receiving examiner's initials.
    g. Any relevant remarks.

2. For firearms received prior to PLIMS, a property sheet will be signed for every firearm received for the reference collection. The respective exhibit number assigned to each firearm will be recorded on the property sheet copy. These forms will be maintained in exhibit number order.

3. The firearms reference collection will be displayed and maintained in such a manner as to prevent the firearms' deterioration and to facilitate their inventory, safety and control. All firearms not stored in the display at the entrance to the section will be stored in the firearms vault.

4. All firearms received for the reference collection will have their assigned exhibit number inscribed on the frame or receiver. Furthermore, all long guns placed in the reference collection will be tagged in such a manner so as to display their location within the collection.

5. Persons wishing to check a firearm out of the reference collection must fill out the Firearms Reference Collection Release Form.

Note: Information from older submissions can be found in the Reference Collection Log Book, which was discontinued in 2009.

AMMUNITION REFERENCE COLLECTION

INTRODUCTION

The Ammunition Reference Collection is defined as a collection of cartridge components utilized for various scientific reasons, including:

1. To identify the manufacturers' cartridge designation and source of evidence ammunition or component parts thereof.
2. To provide an exemplar resource for the training of new forensic scientists or crime scene search technicians.
3. To provide a resource for the identification of ammunition components recovered at a crime scene.

PROCEDURE

The nature of the ammunition reference collection will be dictated or limited by the space and or storage containers available. However the following should be considered;

1. Use a clear plastic (or glass if no plastic tubes in that size exist) tubes or boxes for storage of each ammunition entry.
2. The ammunition sample will be logged into the appropriate database table (Sectioned Cartridges or Sectioned Shotshells) in the Firearms Data database on the department's R: drive recording cartridge data for each field in the table such as:
   A. Manufacturer
   B. Bullet weight
   C. Bullet type or configuration
   D. The origin (purchased, donated, evidence, etc.)
   E. For cartridges/shotshells entered after January 1, 2011, the complaint number of the case from which any evidence ammunition will be entered as the origin.
3. Sectioned cartridges will be stored in the appropriate storage cabinet utilizing caliber and exhibit number as appropriate to organize.
4. Sectioned shotshells will be stored in the appropriate plastic bin located on top of the live ammunition storage cabinets in the main room of the Firearms Section
5. Elements of the Ammunition Reference Collection will not normally be transported outside of the section.

PHOTOGRAPHY

INTRODUCTION

Photography may be used to document bullet and/or cartridge case comparisons that result in identifications, document the physical condition of an exhibit (a "Record Shot"), for training purposes or for scientific publications. Photography may also be used to document a microscopic comparison **for evidentiary or court purposes**. In those cases where photomicrographs are used in court, the examiner should fully explain the limitations (including those listed below) to the jury. Note that ASCLD-LAB requires that if photographs of identifications are not taken, sufficient notes and/or drawings must be made such that another competent examiner can determine what was used as the basis for identification.

PROCEDURE

1. Situations where photographs are normally used:

   A. To graphically document the basis of a conclusion (as required by ASCLD-LAB); showing some of the characteristics used to make a microscopic identification and/or for an examiner's future recollection of an identification.
   B. Anytime an item of evidence has to be cut down, cut apart or otherwise dismantled for examination and cannot be reassembled.
   C. Before and after shots of the obliterated and restored areas related to serial number restorations
   D. In the training process.
   E. To document the physical condition of an item of evidence.
   F. To include as an illustration in a scientific article or paper.

2. Limitations of Photomicrographs:

   Photomicrographs of a comparison seldom completely and accurately depict what is seen through the microscope for many reasons, these include:

   A. An actual comparison is three-dimensional, whereas photographs are two-dimensional.
   B. Photographic film does not have as great a tolerance to light variations as does the human eye.
   C. Digital cameras and their display devices lack the resolution to portray what is seen by the eye.
   D. A photograph limits the field of view.
   E. Many comparisons deal with multiple areas over a large portion of the surface of the evidence and a photomicrograph is unable to pick up these related areas.

F. Normally available bubble jet, inkjet, laser and color-dye sublimation printers (of 1200 dpi or less) are not capable of providing sufficient resolution to capture the detail necessary to accurately interpret the stria present on a bullet when printing digital images.

3. Photograph Requirements
   A. Photographs will depict the image as the examiner sees it to the degree that is possible with the limitations of the camera, software and computer hardware available.
   B. All photographs will be stored in PLIMS as an attachment to the assignment. Copies may also be stored on the Department's resource (R:) drive in the examiner's directory. (R:\resources\Department\Crimelab\Sensitive\Case Notes and Photos\Firearms Section)
   C. Photographs stored on the R: drive will be stored in sub-folders named by the case's F-number.
   D. Photographs will either be named or labeled to describe the item depicted and/or what the photographer intends to illustrate.
   E. Comparison photomicrographs will list the specific items depicted and the magnification or objective used. All documentation will be stored in PLIMS as an attachment to the assignment.

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22. ASCLD/LAB-International, ASCLD/LAB Policy on Measurement Uncertainty, 2011 by ASCLD/LAB.

23. ATF Broadcast2_Nov 2013 as sent to Gene Rivera by ATF IBIS Section Chief, Washington DC laboratory. Received 12/19/2013.

Fired Evidence Examination Methods

The examination of any fired evidence will include the completion of a bullet worksheet, cartridge case worksheet or a general laboratory worksheet. These worksheets will include the physical description of the fired evidence and will serve as a source to document the condition of the evidence as it is received and any tests or comparisons performed.

LISTED PROCEDURES

- Physical Examination & Classification of Fired Evidence
- Trace Material Examination
- Caliber Examination
- Land & Groove Measurement – Air Gap
- Land & Groove Measurement – Stereo Scope w/ Measuring Reticle
- GRC Utilization
- Wadding Determination
- Shot Determination
- Microscopic Comparison
- Open File (IBIS)

SAFETY CONSIDERATIONS

These procedures involve hazardous materials, operations and equipment. These procedures do not purport to address all of the safety problems associated with their use. It is the responsibility of the user of these procedures to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered.

These procedures may also involve hazardous materials to include evidence that may be contaminated with a biohazard. These procedures do not purport to address all of the safety problems associated with their use. It is the responsibility of the user of these procedures to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use. Proper caution to include strict adherence to Universal Precautions and Blood-borne pathogen safety must be exercised and the use of personal protective equipment must be considered to avoid exposure to any potential hazards.

Appropriate hearing and eye protection must be worn when applicable.

PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED EVIDENCE

PROCEDURE

BULLET - A bullet worksheet will be filled out. This may include noting the following:

1. The diameter /caliber.
2. The number of lands and grooves on fired bullet.
3. The direction of twist.
4. The bullet weight - recording weight of bullets in grains.
   recording weight of slugs in ounces
5. The number of cannelures
6. The composition of bullet (finish).
7. The bullet type.
8. How the bullet was marked by the examiner.
9. The measured width of the land impressions.
10. The measured width of the groove impressions.
11. The condition of the fired evidence as received.
12. If any trace material is present.
13. The suitability of the fired evidence for comparison purposes.

CARTRIDGE CASE – A cartridge case worksheet will be filled out (unless information is included on firearm worksheet with revolver). This may include noting the following:

1. The cartridge case caliber.
2. The headstamp (manufacturer).
3. The case finish.
4. The primer finish.
5. Rimfire vs. center fire.
6. The firing pin impression description (FPI).
7. The extractor position (EXT).
8. The ejector position (EJ).
9. The breech mark description (BREECH)
10. How the case is marked.
11. The condition of the fired evidence as received.
12. If any trace material is present.
13. The suitability of the fired evidence for comparison purposes.

OTHER FIRED EVIDENCE - A general worksheet will be filled out. This may include noting the following:

1. The caliber and/or measured size.
2. The composition.
3. The slug weight (in ounces) or pellet weight (in grains).
4. Possible manufacturer information.
5. Number of pellets, if applicable.
6. The condition of the fired evidence as received.
7. If any trace material is present.
8. The suitability of the fired evidence for comparison purposes.

TRACE MATERIAL EXAMINATION

INTRODUCTION

Fired Evidence recovered during an investigation may contain trace material transferred from the crime scene. This trace material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The examiner needs to evaluate the importance of this evidence and, if further examination of the trace material is necessary, remove and preserve a sample of the trace material present. Removal of trace material may also be necessary to allow the proper examination of the fired evidence. Removal of the trace evidence may be done by the examiner for later analysis or the item may be sent for analysis by another laboratory.

PREPARATIONS

NOTE: ALWAYS ADD ACID TO WATER. NEVER ADD WATER TO ACID.

15% Acetic Acid Solution:
Prepare a 15% Acetic Acid Solution utilizing Concentrated Glacial Acetic Acid and distilled water.

10% Bleach Solution:
Prepare a 10% Bleach Solution utilizing Bleach and distilled water.

NFPA LISTING				
CHEMICAL	HEALTH HAZARD	FLAMMABILITY HAZARD	REACTIVITY HAZARD	CONTACT HAZARD
15% Acetic Acid	2	2	3	
10% Bleach	2	0	1	
Methanol	1	3	0	
Acetone	1	3	0	
MC-404C Enzymatic Detergent Solution	1	0	0	

WARNING! Acetic acid is capable of detonation and can pose a **SEVERE REACTIVITY HAZARD**.

WARNING! Methanol is flammable and can pose a **SEVERE FLAMMABILITY HAZARD.**

WARNING! Acetone is flammable and can pose a **SEVERE FLAMMABILITY HAZARD**.

The examiner should use eye protection and work within a fume hood when preparing the solutions. The examiner may wish to consider wearing a respirator and gloves.

PROCEDURE

1. Examine the fired evidence visually and microscopically for any trace material and record in notes.

2. Determine if further examination of trace material is necessary. If so, remove material being careful not to damage the fired evidence. Place the removed trace material in a suitable container/packaging for submission to the appropriate section/laboratory for further examination. If necessary, consult the appropriate section/laboratory prior to the removal of any trace evidence. If the trace material is not going to be retained for further examination, proceed with the following steps that are applicable.

3. For evidence containing blood, tissue or other biohazards, soak the evidence for at least one (1) minute in a 10% bleach solution or other appropriate solution. The ultrasonic cleaner may also be used; (see instructions below) however the item should be soaked in bleach solution even if the ultrasonic cleaner is used.

4. Remove loose material by rinsing the fired evidence with methanol or water.

5. Remove plaster by soaking the fired evidence in soapy water or a 15% acetic acid solution.

6. Remove paint by soaking the fired evidence in alcohol or acetone.

7. Remove corrosion from copper or brass by soaking in a vinegar and salt based hot sauce, i.e. Texas Pete®.

USE OF THE BRANSON 3510 ULTRASONIC CLEANER

The ultrasonic cleaner should be used per the instruction manual provided with the unit. However the following items should be noted.

- Be sure to fill the tank with water up to the "Operating Level" line prior to each use
- Place the item to be cleaned in a beaker with enough of the MC-404C enzymatic detergent to cover the item completely
- Turn the timer dial to the desired time

- Heat may also be used, but note that **the heater must be turned off manually** – it does not turn off when the timer stops!
- Never put objects directly on the bottom of the tank
- See cautions in the users' manual

Preparation of the MC-404C Enzymatic Detergent Solution

Add 30ml of concentrated solution to 1 gallon of water. Slightly more of the MC-404C solution may be used if necessary. For the plastic containers currently in use mix 15 ml of the detergent into 1,892.5 ml of water. The solution will appear slightly green.

Dispose of the enzymatic solution down the drain.

CALIBER EXAMINATION

INTRODUCTION

Caliber, or the base diameter, is one of the class characteristics of a fired bullet. The determination of caliber will aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, the bullet's caliber will be used in determining the General Rifling Characteristics of the firearm involved.

INSTRUMENTATION

Comparison Microscope
Stereo Microscope
Calipers
Micrometer

PROCEDURE

The following may be utilized to determine the caliber of any fired bullet. The condition of the bullet will determine which steps can be used.

1. Compare the base diameter of the evidence bullet directly with known fired test standards.

2. Measure the base diameter of the evidence bullet using a measuring device and compare this measurement with known measurements published in reference literature.

3. Determine the number and widths of the lands and grooves and compare to Table 8 in the Appendix of the AFTE Glossary (6th Edition). The FBI's or J. Scott Doyle's GRC programs also have a utility that may also be utilized.

4. Physical characteristics of the evidence bullet, such as weight, bullet shape (morphology), composition, nose configuration, and number and placement of cannelures, may aid in caliber determination.

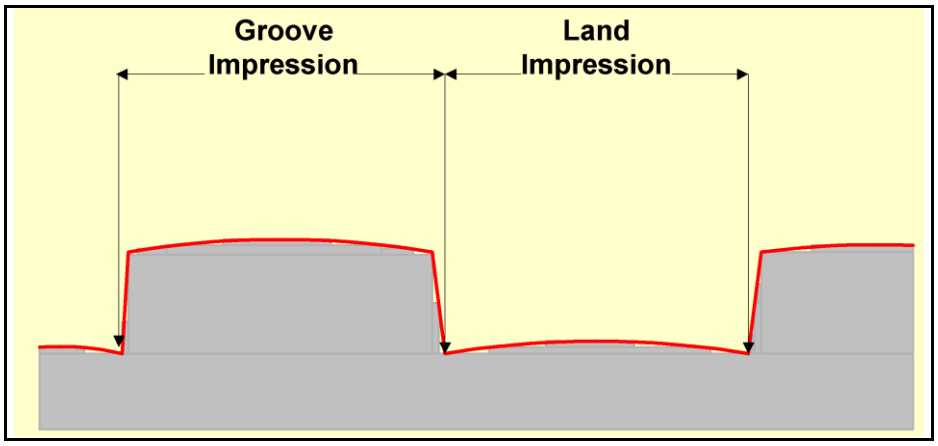
INTERPRETATION OF RESULTS:

Caliber is written as a numerical term without the decimal point. If the base is mutilated, the examiner may only be able to determine that the evidence is consistent with a range of calibers or that the caliber cannot be determined.

LAND & GROOVE MEASUREMENT - AIR GAP METHOD

INTRODUCTION

One of the class characteristics used in the discipline of firearms identification is the width of the land impressions and groove impressions. These measurements aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, these measurements will be used in determining the General Rifling Characteristics of the firearm involved. Several instruments and methods can be used to obtain these measurements. The air gap method is one such method.



INSTRUMENTATION

Comparison Microscope
Micrometer

PROCEDURE

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.

1. The fired bullet in question is mounted on one stage of the comparison microscope. The micrometer is mounted on the other stage.

2. Both stages must be using the same magnification level (objective setting) and be in focus.

3. Align the image of the measurement gap (opening) of the micrometer with the image of the appropriate land impression being measured and record the measurement to the nearest hundredth or thousandth of an inch.

4. Repeat the above utilizing the groove impression.

INTERPRETATION OF RESULTS:

It may be necessary to measure several of each land and groove impression in order to record a reliable measurement.

GRC UTILIZATION

INTRODUCTION

The FBI's General Rifling Characteristics File (or the MS Access version created by former AFTE Web Master J. Scott Doyle) can be utilized when attempting to determine a list of possible firearms that could have fired an evidence bullet and/or cartridge case when the correct firearm was not submitted.

PROCEDURE

1. The General Rifling Characteristics File can be accessed using one of the GRC PC software versions or the current printout of the file.

2. Follow the operating instructions listed specifically within each of the above systems utilizing the caliber and rifling characteristics of the evidence bullet.

INTERPRETATION OF RESULTS:

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.

WADDING DETERMINATION

INTRODUCTION

By examining wadding, the examiner may be able to determine the gauge size, manufacturer, and if the wad contains markings suitable for comparison, the firearm that discharged it.

PROCEDURE

1. Trace material present should be recorded and retained, if necessary.

2. If contaminated with blood or tissue, the wad should be disinfected.

3. Determine gauge size by directly comparing evidence to known laboratory standards of similar manufacture or composition by comparing the base of evidence to the bases of the standards until a similar size is found. Gauge size can also be determined by measuring the base diameter of the wad and comparing these measurements to known measurements. Measurements may be obtained by utilizing a caliper, the air gap procedure, the stereo microscope with measuring reticle, or a hand held ruler.

4. Manufacturer data can be determined by locating information stamped into the wad or by comparing the wad to known laboratory standards.

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

6. If evidence shotshells are submitted, it may be necessary to disassemble one for the determination of gauge size or manufacturer.

7. Record all information on the appropriate worksheet.

INTERPRETATION OF RESULTS:

If the wad is mutilated or soaked with blood or other body fluids, the examiner may not be able to specifically determine gauge size. The examiner should also recognize that some manufacturers duplicate the design of another manufacturer or use the parts from another manufacturer in their products.

SHOT DETERMINATION

INTRODUCTION

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 live shotshells or to the size that the submitted discharged shotshell was marked to have contained.

INSTRUMENTATION

Stereo Microscope
Calipers / Micrometer
Scale / Balance

PROCEDURE

The examiner may use one or more of the techniques below to determine shot size.

I. Visual/Microscopic Comparison

A. Determine the total number of pellets received.

B. Determine the composition of the pellets.

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

D. Compare the evidence pellets side by side with laboratory standards of known shot sizes until a 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; however, if more than one size is used at a time, care should be taken not to mix up the shot.

E. Record findings on appropriate worksheet.

II. Comparison by Weight

A. Record the total number of pellets received.

B. Determine the composition of the pellets.

C. Determine the number of pellets suitable for weighing. Make note if pellet sizes all appear similar. If several sizes present, determine each specific size separately.

D. Weigh the pellets in grams or grains.

E. Divide weight of pellets by total number weighed. Consult known pellet weights in Table 7 of the Appendix in the AFTE Glossary (6th Edition) and determine shot size which corresponds to evidence shot.

F. Record findings on appropriate worksheet.

G. The weight of the evidence pellets can also be directly compared to weight of standards using the same number of pellets.

III. Measuring Pellet Size

A. Determine the total number of pellets received.

B. Determine the composition of the pellets.

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

D. Choose the best specimen(s) and measure diameter using a caliper and record in hundredths or thousandths of an inch.

E. Consult known pellet sizes in Table 5 of the Appendix of the AFTE Glossary (6th Edition) and determine shot size which corresponds to evidence shot.

MICROSCOPIC COMPARISON

INTRODUCTION

In order for a firearms examiner to identify fired evidence back to the firearm that fired it, a microscopic comparison utilizing a comparison microscope must be performed. The comparison microscope allows the examiner to place the evidence on one side of the microscope and the test shot on the other side. This procedure can also be utilized in cases where no gun is recovered such as determining whether fired bullets or discharged cartridge cases were fired from/discharged in the same firearm.

INSTRUMENTATION

Comparison Microscope

PROCEDURE

The procedure steps below do not have to be performed in the order listed; however, all steps must be considered and/or addressed.

I. Select the correct objective (magnification) setting and ensure that the objectives are locked in place.

II. Select the correct set of oculars (eyepieces).

III. The illumination (lights) used must be properly adjusted.

IV. Intercompare test fired components first to establish reproducibility of class and individual characteristics.

V. Compare unknown piece of fired evidence to either another unknown piece of fired evidence or known test shots by placing the unknown evidence on one stage and the other unknown evidence or known standard on the other stage.

VI. The entire evidence surface must be considered.

VII. If an identification is not initially made, the examiner should consider the following factors:

A. Lighting angle.
B. Type of light being used.
C. The need for additional known standards (possibly using different ammunition for test shots).
D. The position of the evidence, the tests or both the evidence and the tests.
E. The possibility of using magnesium smoke.
F. The possibility of cleaning the firearm and firing additional tests.

INTERPRETATION OF RESULTS

IDENTIFICATION
When compared items exhibit agreement of a combination of individual characteristics and all discernable class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool, the examiner will report an identification or that both items originated from the same source. In accordance with ASCLD-LAB requirements, sufficient notes or photomicrographs are required to document conclusions of a positive identification. A photomicrograph showing the correspondence of individual characteristics between exhibits will suffice to meet this requirement.

INCONCLUSIVE
When the examiner concludes that no identification or elimination is possible because the compared items exhibit (1) some agreement of individual characteristics and all discernable class characteristics, but insufficient for an identification; or (2) agreement of all discernable class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility; or (3) agreement of all discernable class characteristics and disagreement of individual characteristics, but insufficient for an elimination. Within the category of no identification – no elimination there may be degrees of certainty expressed. No professional standard exists which limits an expression of likelihood. In accordance with ASCLD-LAB requirements, where no definitive conclusion can be reached, the report will clearly communicate the reason(s); e.g. insufficient agreement of individual characteristics, damage, etc. Photographs will not be required in the case of inconclusive findings, however notes will be sufficient to fully support the conclusion.

ELIMINATION
When compared items exhibit significant disagreement of discernable class characteristics and/or individual characteristics the examiner will report an elimination or that the items (evidence and tests) did not originate from the same source. Photographs will not be required in the case of an elimination, however notes will be sufficient to fully support the conclusion; however, it is strongly suggested that photographs be taken where eliminations are based on the disagreement of individual characteristics.

UNSUITABLE
A lack of suitable microscopic characteristics will lead the examiner to the conclusion that the items are not suitable for comparison. When evidence bears no marks suitable for microscopic comparison, the documentation of the determination will be recorded on worksheet.

VERIFICATION
It is the policy of this laboratory that (unless one is unavailable for an extended period) another qualified examiner will verify microscopic comparisons that result in a conclusion of a positive identification. This verification will be documented in the examiner's notes (verifying examiner's initials and date). Where multiple exhibits are all identified, a representative sample will be verified. It is not necessary to verify each exhibit.

It is suggested that any identification be indexed.

INSTRUMENTATION – ISO 17025 – 5.5.4

For purposes of ISO 17025 5.5.4 as of January 1, 2011, all examinations were performed with the equipment listed in Appendix D unless listed otherwise in the case notes.

OPEN CASE FILE (IBIS)

INTRODUCTION

The open case file is a collection of discharged cartridge cases from unsolved crimes where a firearm has not been located or connected to the evidence collected at the crime scene.

Discharged cartridge cases received where no firearm is submitted for comparison will be included in the open case file (entered into the IBIS) when all other necessary examinations are completed. (Subject to current acceptance parameters. The current parameters are listed earlier in the manual under Test Firing Methods.) These cartridge cases are entered into the IBIS computer system and compared to test fired cartridge cases, as well as evidence cartridge cases from previous and subsequent cases.

PROCEDURE

The following procedure will be utilized when placing fired evidence into the open case file:

I. Utilize current regulations and restrictions (as dictated by Section policy) for the firearm calibers that may be placed into the open case file.

II. Entry Procedures

1. Test Samples:

See the section Open File (IBIS) Parameters and Retention of Fired Tests in the Test Firing Methods portion of this SOP for determining which tests are to be entered into the IBIS and for the storage of the tests.

2. Evidence Cartridge Cases:

a. The firearms examiner will seal the cartridge case(s) in their original packaging when all other examinations are complete.
b. The firearms examiner will note the item numbers that are to be entered in the IBIS on the evidence packaging (near his/her initials)
c. The firearms examiner will transfer the evidence to the IBIS INBOX; noting the transaction in PLIMS
d. The IBIS technician will accept the items in PLIMS
e. The IBIS technician will enter the evidence via the IBIS SOPs
f. Upon completion of entering the evidence in the IBIS, the technician will release the evidence to the Property Bureau in the normal manner (or return it to the firearm examiner in the case of an IBIS hit.)

III. IBIS Hits

1. The IBIS printout will serve as the lab request.
2. A new assignment will be opened in PLIMS for any case where the assignment has been closed.
3. The examiner that worked the original (fired evidence) case will work the IBIS hit in cases where the firearms technician has submitted a test.
4. The firearm will be retrieved and worked as a new case.
5. The appropriate Firearm Worksheet should be chosen considering both types of cases involved in the hit.
6. In the case of two (or more) fired evidence cases, the examiner who worked the most recent case will work the IBIS hit.
7. The IBIS hit will be reported out under the complaint numbers both cases.
8. Appropriate notes will be scanned and attached to the assignments for all affected cases in PLIMS and placed in the affected hard copy case files, as with any IBIS hit.

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Integrated Ballistics Identification System (IBIS)

INTRODUCTON

IBIS is a computerized system for acquiring and storing the images of questioned (evidence) cartridge cases and known cartridge cases (test fired in known firearms). IBIS photographs portions of the primer/firing pin/ejector mark areas of discharged cartridge cases using state of the art optical and electronic technology. These images are then stored in databases and sophisticated algorithms are used to correlate the images against each other using filters such as the caliber, date of crime and date of entry. These correlations produce lists of possible matches with the highest scoring correlations at the top of the list. The IBIS technician can then call up the images and compare them side by side on a monitor. If a possible match is found during this screening process, then an examiner makes the actual evidence-to-test or evidence-to-evidence comparison on his comparison microscope for a final determination.

IBIS RESPONSIBILITIES

THE IBIS TECHNICIAN

1. The IBIS technician has the responsibility for entering, storing and correlating all IBIS entries.

2. The IBIS technician is also responsible for entering information into the IBIS Data Entry Logbook.

3. The IBIS technician will be responsible for screening the correlations of all test fired and evidence cartridge cases entered into IBIS.

4. The IBIS technician will review the correlation results via the method listed in the Procedures section below. The technician will notify the submitting firearms examiner if a possible hit is found.

5. The IBIS technician will be responsible for backing up IBIS data at the prescribed intervals.

6. The IBIS technician will be responsible for IBIS maintenance, doing what he can and coordinating with FTI for major maintenance problems.

7. The IBIS technician will be responsible for entering the proper information in the CMPD Firearm Tracking Database.

8. The IBIS technician will be the primary liaison to FTI. Case related information may be released to FTI or related agencies only with the consent of the firearms examiner who worked the case and only after any comparison has been verified.

FIREARMS EXAMINERS

Firearms Examiners have the following responsibilities with respect to IBIS:

1. Know which calibers are acceptable for IBIS entry. The current list of calibers is found in the "*Open File (IBIS) Parameters*" section of this SOP.

2. Know the preferred ammunition for test firing known firearms for entry of test cartridge cases into IBIS.

    - Federal American Eagle (preferred)
    - Other manufacturers (especially those with softer primers) are acceptable if Federal American Eagle is not available.

3. The examiner must screen all unidentified evidence cartridge cases to determine if they are suitable for entry into the IBIS.

- Any evidence cartridge case selected for entry into IBIS must have sufficient individual characteristics within the firing pin impression and/or the breech face marks on which to base a positive identification.
- If there are more than one matching evidence cartridge cases suitable for entry into IBIS, the examiner should select the best one for entry or, if necessary, more than one if the different individual characteristics reproduce better on different specimens.
- The examiner will notify the IBIS technician which item(s) should be entered via a note on the fired evidence packaging.
- The item number of evidence cartridge cases which are to be entered into the IBIS should be noted on the examiner's worksheet(s).

4. The Firearms Section supervisor will be responsible for following up on possible cross jurisdictional IBIS hits.

PROCEDURES

ACQUIRING CARTRIDGE CASES

The procedure for acquiring cartridge cases can be found in the IBIS BRASSTRAX Training Guide (Version 2.3).

CARTRIDGE CASE CORRELATIONS

The procedure for correlating cartridge cases can be found in the IBIS MatchPoint+ Training Guide (Version 2.3).

IMAGE COMPARISONS

The procedure for comparing cartridge case images can be found in the IBIS MatchPoint+ Training Guide (Version 2.3).

REVIEWING CORRELATION RESULTS

1. The IBIS technician will do an onscreen comparison of each of the evidence and test fired cartridge cases entered into IBIS that have been correlated against the databases. These comparisons will be documented via the IBIS's internal software feature that notes comparisons made.

2. For Cartridge cases-

    a. In the BRASSTRAX database the IBIS technician will enter the evidence cartridge case correlated against the database into the computer as the reference cartridge case.
    b. The IBIS technician will compare at least the top fifty (50) candidates on the correlation screen.
    c. If a possible match is found, the IBIS technician will advise the examiner whose case is involved and coordinate the examination of the reference cartridge case against the possible match cartridge case.

BACKING UP THE SYSTEM

The IBIS system will be backed up automatically by the NC State Crime Laboratory at the server in Raleigh.

IBIS QUALITY CONTROL/CALIBRATION AND PROFICIENCY TEST

PURPOSE

The purpose of acquiring a Quality Control (QC) Cartridge Case, minimally on a quarterly basis (calendar year), is to address two issues: (1) to ensure that the IBIS hardware and software are calibrated and performing properly, and (2) to assure that the IBIS technician is acquiring data according to established training and protocols (i.e., a proficiency test). Over a period of time, the correlation scores of the QC Cartridge Case can be evaluated for trends in performance of the technician and the IBIS.

PROCEDURE

This cartridge case should be entered into the IBIS on a quarterly basis, the correlation results of which will be recorded in the IBIS unit.

1. The source of the Cartridge Case set will be from a firearm from the NC State Crime Laboratory Firearms Section.
2. The QC Cartridge Case should be carefully marked and packaged. **At least one time per year** the entry of the QC Cartridge Case or another cartridge case that has already been entered into the system will also serve as a proficiency test.

    a. The proficiency test will be administered to each individual who will be making entries into the IBIS, at least once per calendar year.
    b. During each quarter (calendar year), the QC Cartridge Case will be acquired and correlated to previous entries of the QC cartridge case and those from other IBIS sites in the state that are stored in the database.
    c. The score for that correlation will be recorded in the IBIS Quality Control Logbook and compared to previous scores. Any apparent gross deviation from the previous scores will be discussed with Section Administrator of the Firearms Section and the IBIS Coordinator at the NC State Crime Laboratory. Possible solutions to the deviation will be agreed upon prior to any further data acquisition.
    d. The correlation score sheet will be maintained with the IBIS Quality Control Logbook.
    e. Periodically, the correlation scores will be charted to serve as a graphical record.

3. For purposes of proficiency testing the Section Administrator (or his designee) will do the following:

    a. Review the entry of the chosen test cartridge case. Ensure that the proper laboratory and IBIS procedures are followed.
    b. Evaluate the image quality and correlations results of each item entered.
    c. Review documentation and results with the IBIS technician. The guidelines of the CMPD Crime Laboratory Quality Manual will be followed with respect to any unsatisfactory findings.
    d. Results of the proficiency test will be documented using the Proficiency Test Review Form and retained in the front office proficiency test file cabinet. The results will be forwarded to the Laboratory Director and the Quality Assurance Manager.

Possible Results – Firearm Examination

There are countless possible results relating to the examination of firearms. This section is included as a guide for the most frequently reported results. It should not be construed to be all-inclusive or limiting to the examiner in reporting examination results. ISO 17025 and ASCLD-LAB Supplemental standards require the *"…unambiguous identification of the substance, material or product sampled"*, and that "*the significance of terms that convey the strength of an association (e.g. "consistent with", or "common source") must be communicated in the report"*. For these reasons the use of terms such as "consistent with" will be avoided when possible. Additionally, the method(s) used to analyze the evidence will be identified or described in the laboratory report.

FIREARMS OPERABILITY

- The firearm is in XXXX operating condition.
  Good - Functions as designed by the manufacturer
  Fair - Functions every time the trigger is pulled, but not to design standards. (e.g., safeties may not function).
  Poor - Will fire, but not reliably
  Very Poor - Will fire intermittently, but very unreliably
  Inoperable - Will not fire

- Examination revealed that the firearm was not safe to test fire.
- The firearm was found to be missing (several) parts and is, therefore, inoperable.
- The force required to activate the trigger of XXX was found to be within/above/below the normal range for this type of firearm.
- The firearm was found to exhibit a barrel length of XXX inches +/- 3/32 inch at K=2 (95.45%) and an overall length of XXX inches +/- 3/32 inch at K=2 (95.45%).
- The firearm was found to exhibit a barrel length of XXX inches +/- 3/32 inch at K=2 (95.45%).
- The firearm was found to exhibit an overall length of XXX inches +/- 3/32 inch at K=2 (95.45%).
- XXX of the live cartridges submitted with the firearm were used in analysis of the firearm.
- The (e.g. grips) of XXX were swabbed for DNA. The swabs were submitted to the Property & Evidence Division as (a child item of the original item #) Item XXX.

FIRED EVIDENCE

BULLETS

- The bullet is a XXX caliber bullet exhibiting XXX lands and grooves with a XXX twist.
- The bullet is a XXX caliber bullet that was fired from a firearm exhibiting XXX lands and grooves with a XXX twist.

  With Gun-
- The bullet was fired from the firearm.
- The bullet was not fired from the firearm.
- The bullet could neither be identified nor eliminated as having been fired form the firearm.*
- The bullet is not suitable for comparison.

  No Gun-
- The bullets were fired from the same firearm.
- The bullets were not fired from the same firearm.
- The bullets could neither be identified nor eliminated as having been fired from the same firearm.*
- At least one of the bullets is not suitable for comparison.
- A list of possible firearms that could have fired the bullet includes, but is not (necessarily) limited to the following: XXX, XXX, XXX, …
- A list of possible firearms that could have fired Item # XXX includes, but is not (necessarily) limited to those manufactured/marketed by: XXX, XXX, XXX, …

- A list of possible firearms that could have fired the bullet is too long to be included in the lab report.
- The bullet exhibits characteristics associated with having been fired by a firearm manufactured by XXX.

CARTRIDGE CASES

With Gun-

- The cartridge case was discharged in the firearm.
- The cartridge case was not discharged in the firearm.
- The cartridge case could neither be identified nor eliminated as having been discharged in the firearm.*
- The cartridge case was not suitable for comparison.

No Gun-

- The cartridge cases were discharged in the same firearm.
- The cartridge cases were not discharged in the same firearm.
- The cartridge case could neither be identified nor eliminated as having been discharged in the firearm.*
- At least one of the cartridge cases is not suitable for comparison.
- A list of possible firearms that could have discharged the cartridge case includes, but is not (necessarily) limited to the following: XXX, XXX, XXX, …
- A list of possible firearms that could have discharged the cartridge case is too long to be included in the lab report.
- The cartridge case exhibits characteristics associated with having been discharged in a firearm manufactured by XXX.

SHOT & WADDING

- The wadding is a (or exhibits the characteristics of a) XXX gauge XXX (material) wad.
- The wadding exhibits the characteristics of those manufactured by XXX.
- The wadding exhibits the characteristics of those loaded in the shotshells submitted.
- The pellets are consistent in size and weight with XXX (size) XXX (metal) pellets.
- The pellets exhibit the characteristics of those loaded in the shotshells submitted.

IBIS

- The cartridge case will be submitted for inclusion in the open file (IBIS).
- There are no cartridge cases currently in the open file for comparison. (The cartridge case has cleared the open file.)

* Note: Within the category of no identification – no elimination there may be degrees of certainty expressed. No professional standard exists which limits an expression of likelihood. By ASCLD-LAB requirement, where no definitive conclusion can be reached, the report will clearly communicate the reason(s); e.g. insufficient agreement of individual characteristics, damage, etc.

Release of Case Related Information

Analysts/examiners will generate written reports for all analytical work performed on evidence. The reports will contain the conclusions and opinions that address the purpose for which the analytical work was undertaken. At times due to the immediacy of an ongoing investigation it may be necessary to release information prior to writing a report. It is required that an appropriate review (e.g., comparison verification, etc.) take place before any such information is released. The release of information will be noted in the case file.

For purposes of the Firearms Section, comparison information will not be released until a verification has taken place and documented in the case notes (unless the absence of a second analyst makes this impossible). Only an examiner may release IBIS hit information subject to the above requirement. Information i.e., firearm operability, barrel or overall length, GRC lists, etc. may be released before a case file is reviewed, however it should be made clear to the person receiving the list that the information is preliminary and subject to change upon case review/ID verification.

Issue Date	History
03/31/00	Original Issue
11/1/00	Changed open file/IBIS procedures with addition of IBIS & IBIS technician to section.
3/19/01	Added IBIS procedures section, changed photography section, edited and added references, added 223 Rem cartridge cases to IBIS parameters.
9/10/01	Allowed IBIS technician to work drug cases and write limited reports.
1/31/02	Clarified evidence vs. standard reference collection and what could be used for comparison purposes. Defined "normal" as used on trigger pull on worksheet.
1/30/04	Eliminated use of the “routine case memo”, upgraded Gene’s title, added unloading procedure, added white slider box illustrations, fixed typos, updated process map.
1/11/07	Clarified pre-firing safety examination requirements. Required the use of a NIST traceable yard stick for barrel and overall length measurements.
3/28/08	Added section regarding efficient use of resources, modified the silencer examination SOP, modified the IBIS responsibilities of the section supervisor, added the release of case related information, updated serial number restoration map, fixed typo on FA analysis process map, updated abbreviations page.
5/7/09	Added Swabbing Firearms for DNA, changed IBIS applicable calibers, modified policy regarding test firing certain types of pistols.
9/13/10	Added reporting requirement for DNA swabbing, revised barrel and overall length measuring SOPs, changed reporting terminology for trigger pull testing, added information regarding the ultrasonic cleaner, updated abbreviations page.
3/8/11	Updated measuring of BBL and OAL, Reference Collections, Photography, Interpretation of Comparison Results and Reporting of Inconclusive Results to meet ISO 17025 requirements. Added a note on instrumentation used by examiners and added Appendix D.
6/17/11	Updated footer for ISO 17025
9/8/11	Revised estimated uncertainty values and updated related reporting policy to follow ASCLD/LAB-International requirements
2/7/12	Updated IBIS section for training manual versions.
12/5/12	Revised reporting statements for barrel and overall lengths and fired evidence.
5/15/13	Updated for new BRASSTRAX IBIS unit (no more bullets)
12/11/13	Updated measurement uncertainty and its reporting due to new personnel and updated ASCLD-LAB guidance documents.
12/26/13	Updated IBIS caliber and process guidelines.
4/4/14	Made extensive revisions for use with new PLIMS and new CMPD firearms process.
12/18/14	Updated IBIS process items and minor edits/updates.

Approval

Director _____ Date:
Matthew C. Mathis

Issuance

Chief Criminalist _____ Date:
Todd J. Nordhoff

Criminalist _____ Date:
Gene C. Rivera

Criminalist _____ Date:
Jennifer A. Pohlheber

IBIS Technician _____ Date:
Robert E. Moore

Jeffrey S. Taylor
Digitally signed by Jeffrey S. Taylor
DN: cn=Jeffrey S. Taylor, o=CMPD, ou=Crime Lab, email=JTaylor1@cmpd.org, c=US
Date: 2014.12.18 07:26:33 -05'00'