Issued: 09/15/2014 Version: FTM2014 R0
Effective: 09/15/2014 Archive: Archived

Document Structure

Issued: 09/15/2014 Version: FTM2014 R0
Effective: 09/15/2014 Archive: Active

Introduction

This document supplements the Alaska State Crime Laboratory Quality Assurance Manual. The guidelines and procedures in this manual are additional Firearm and Tool Mark Discipline specific information.

The numbering scheme in this document follows that of the Alaska State Crime Laboratory Quality Assurance Manual. Supplemental requirements are found in Sections 4 and 5 of this document. Additional requirements in Sections 4 and 5 are listed by the Quality Assurance Manual criteria point they address. In Sections 4 and 5, the phrase "*Nothing Additional*" means there is Nothing Additional to the requirements listed in the Laboratory Quality Assurance Manual.

Abbreviations

5 R L = G	5 lands and grooves, Right hand twist
L=G	lands equals grooves
LL>G	lands larger
AP	Armor piercing
Bb	Barrel
Bfm	Breach face marks
BP	Black Powder
BT	Boattail
Chem	Chemical examination or test
CMS	Case mouth seal, color identification. Also see MOUTH ANNULUS
CN	Cupro Nickel, bullet jacket
CNCS	Cupro Nickel Clad Steel, bullet jacket
Cu	Copper
CWS	Copper washed steel, case finish
DC	Dual core
DCC	Discharged cartridge case
Ejt	Ejector
Ext	Extractor
F	Function
FA	Firearms
FMC	Full metal case
FMJ	Full metal jacket, also known as FULL PATCH
FP	Firing pin
FPI	Firing pin impression
FSLC	Fired since last cleaned
G or GIMP	Groove impression
GM	Gliding metal, bullet jacket
GMCS	Gliding metal clad steel, bullet jacket
GRC	General rifling characteristics
Griess	Griess test for nitrates
GSR	Gunshot residue
HB	Heavy ball, round-nose bullet
HE	High explosive
HP	Hollow point
HPB	Heavy pointed ball, boattail bullet
HPT	High pressure test
I	Incendiary
I.D. or IDENT	Identification
IP	Inside primed

JHP	Jacketed hollow point.
JSP	Jacketed soft point
L or LIMP	Land impression
LPB	Light pointed ball – flat based bullet
LRN	Lead round nose bullet type
LS	Lacquered steel, case finish
MA	Mouth annulus, color identification. Also see CASE MOUTH SEAL
MC	Metal cased
Mfg	Manufacture
Mic or Micro	Microscopic
Na Rho	Sodium Rhodizonate test
NC	No conclusion
NCIC Code	Uniform offense codes published by the **National Crime Information Center**
NI or Nonident	Nonidentification (could not have fired the specimen)
P	Pointed
PA	Primer annulus, color identification
Pb	Lead
Prod. Code	Product code
RD	Range determination
Report	A sharp explosive sound (especially the sound of a gun firing)
RF	Rimfire
RN	Round nose
SHOTSHELL	Shotgun shell ammunition
SIMILAR	Similar or approximately equal to
SN	Soft nose
SP	Soft point
SWC	Semi-wad cutter
T	Tracer
TC	Truncated cone
Tests = Item	Means that the evidence, item X, can be identified as having been fired in the firearm being examined
Tests = Tests	Means test cases and/or bullets can be identified as having been fired in the same firearm
TM	Toolmarks
w/	With
WC	Wad cutter
Wt	weight

4 Management requirements

4.1 Organization

Nothing Additional

4.2 Management System

Nothing Additional

4.3 Document Control

Nothing Additional

4.4 Review of requests, tenders and contracts

Nothing Additional

4.5 Subcontracting of tests and calibrations

Nothing Additional

4.6 Purchasing services and supplies

4.6.1 *Nothing Additional*

4.6.2 GRIESS, RHODIZONATE and DITHIOOXAMIDE are prepared fresh when needed for casework by the examining scientist and are tested with positive and negative controls. The results are recorded on the case worksheet.

4.6.3 *Purchasing* documents will be saved online.

4.6.4 The Firearms and Toolmark Discipline does not have any critical consumables.

4.7 Service to the Customer

Nothing Additional

4.8 Complaints

Nothing Additional

4.9 Control of nonconforming testing and/or calibration work

Nothing Additional

4.10 Improvement

Nothing Additional

4.11 Corrective Action

Nothing Additional

4.12 Preventive Action

Nothing Additional

4.13 Control of Records

4.13.1.1 *Nothing Additional*

4.13.1.2 *Nothing Additional*

4.13.1.3 *Nothing Additional*

4.13.1.4 *Nothing Additional*

4.13.2.1

FIREARM WORKSHEETS:

A firearm worksheet may take on many forms but should minimally contain the following information:

- Laboratory Case Number
- Caliber/Gauge
- Make
- Model
- Serial number
- Firing mechanics
- Type of action
- Safeties
- Operating condition
- Trigger pull
- Rifling characteristics
- Barrel length
- Overall length
- Documentation of test fires produced using the firearm
- Other information the examiner might find useful

FIRED BULLET WORKSHEET:

A fired bullet worksheet may take on many forms but the examiner should minimally consider containing the following information:

- Laboratory Case Number
- Bullet Caliber
- Bullet Weight
- Bullet Morphology
- Bullet Rifling Characteristics
- Physical condition of the bullet
- Other information the examiner might find useful

DISCHARGED CARTRIDGE CASE WORKSHEET:

A discharged cartridge case worksheet may take on many forms.The examiner should minimally consider containing the following information:

- Laboratory Case Number
- Cartridge Case Caliber/Designation
- Head Stamp Information
- Morphology of the cartridge case
- Type of firing pin impression
- Type of breach face marking
- Detailing any extraneous marking
- Other information the examiner might find useful

4.13.2.1 (continued)

FIREARMS RANGE OF CONCLUSIONS

Identification

The fired evidence in question was fired with the suspect firearm.

The fired evidence in question was fired from the same firearm, firearm not received.

Elimination

The fired evidence in question was not fired with the suspect firearm.

The fired evidence in question was not fired from the same firearm, firearm not received.

The discipline recognizes that an elimination of a firearm by other than class characteristics is possible but that such elimination is an exceptional situation.

The discipline does not consider the routine comparison of test shots to the open case file to normally constitute an exceptional situation.

If an examiner arrives at an opinion where he/she eliminates a firearm, for any reason, the examiner must substantiate the reasons supporting his/her opinion and incorporate them into his/her work notes.

Inconclusive

The fired evidence in question cannot be identified or eliminated as having been fired with the suspect firearm.

The fired evidence in question cannot be identified or eliminated as having been fired with the same firearm, firearm not submitted.

Inconclusive categories

Inconclusive **A**: Some agreement of individual characteristics and all discernible class characteristics, but insufficient for an identification.

Inconclusive **B**: Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.

Inconclusive **C**: Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

Unsuitable

The fired evidence in question is not suitable for comparison purposes.

Unidentifiable

The evidence in question cannot be identified as being fired evidence.

4.13.2.1 (continued)

TOOLMARKS RANGE OF CONCLUSIONS

Identification

The toolmark evidence in question was made with the suspect tool.

The toolmark evidence in question was made with the same tool, tool not received.

Elimination

The toolmark evidence in question was not made with the suspect tool.

The toolmark evidence in question was not made with the same tool, tool received.

The discipline recognizes that an elimination of a toolmark by other than class characteristics is possible but that such an elimination is an exceptional situation.

Inconclusive

The toolmark evidence in question cannot be identified or eliminated as having been made with the suspect tool.

The toolmark evidence in question cannot be identified or eliminated as having been made with the same tool, tool not submitted.

Inconclusive categories

Inconclusive **A**: Some agreement of individual characteristics and all discernible class characteristics, but insufficient for an identification.

Inconclusive **B**: Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.

Inconclusive **C**: Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

Unsuitable

The toolmark evidence in question is not suitable for comparison purposes.

Unidentifiable

The evidence in question cannot be identified as being a toolmark.

4.13.2.1 (continued)

REPORTS and CASE FILES

The final report will clearly convey to the officer and/or prosecutor exactly what was analyzed.

Reasons for inconclusive results will be conveyed on the worksheet and in the report.

Reports should be thoroughly checked by the forensic scientist after they are generated and before sending for review. All reports issued by examiners at the Scientific Crime Detection Laboratory must be subjected to a technical and an administrative review by another forensic scientist prior to issuing the report. The technical review portion must be performed by a scientist that has been competency tested in the Firearm and Toolmark discipline.

A technical review focuses on the analyst's bench notes and the chain-of-custody records. The main purpose of a technical review is to ensure that the conclusions of the examiner are fair and reasonable and based on sound scientific examinations and procedures. The technical reviewer should agree with the conclusions as based on the testing performed and should be comfortable testifying to the results if the analyst happens to be unavailable for court.

The main purpose of the administrative review is to check for proper transcription of identification numbers, adherence to laboratory policies, proper spelling and grammar, clarity of the report, appropriateness to the agency's request, and distribution of the report to the proper agency or agencies. This last responsibility may be delegated to administrative personnel.

Note: The signature of the reviewer on the final report indicates that the reviewer has performed both an administrative and technical review.

(End of 4.13.2.1)

4.13.2.2 *Nothing Additional*

4.13.2.2.1 Start and end dates for work are noted in the analyst case notes.

4.13.2.3 *Nothing Additional*

4.13.2.3.1 *Nothing Additional*

4.13.2.3.2 *Nothing Additional*

4.13.2.4 *Nothing Additional*

4.13.2.5 *Nothing Additional*

4.13.2.5.1 Does not apply to Firearms/Toolmark

4.13.2.5.2 There are no instrumental analyses in the Firearms/Toolmark Discipline.

4.13.2.6 *Nothing Additional*

4.13.2.7 *Nothing Additional*

4.13.2.8 *Nothing Additional*

4.13.2.9 *Nothing Additional*

4.13.2.10 *Nothing Additional*

4.13.2.11 *Nothing Additional*

4.13.2.12 A verification in the Firearm/Toolmark Section indicates that a second court qualified examiner agrees with the summary report RESULTS and the bench notes CRITERIA FOR THE CONCLUSIONS for fired bullets, discharged cartridge cases, items with toolmarks, and any other comparative analysis opinion reported by the first examiner. Verifications are performed when an examiner puts forth a comparison indicating an IDENTIFICATION, an ELIMINATION, or an INCONCLUSIVE where another examiner's comparison is deemed useful. Verifications may or may not include a re-examination of the evidence. While there is no requirement for verification of comparison results, the Firearm Examiners should routinely subject their comparative conclusions to a second opinion. The frequency of these verifications may range from only a few per year to many per year.

When a verification is to be performed, the case examiner will electronically request a verification examination in the Laboratory Information Management System (LIMS). The verifying examiner will then perform the verification and enter the results into the LIMS system, indicating the date performed.

4.13.2.13 Discipline abbreviations are listed in the Abbreviations Section of this manual.

4.14 Internal Audits

Nothing Additional

4.15 Management Reviews

Nothing Additional

5 Technical requirements

5.1 General

5.1.1 *Nothing Additional*

5.1.2 **MEASUREMENT OF UNCERTAINTY IN GUN BARREL LENGTH**

The measuring technique for gun barrel length and overall firearm length is described in the Firearms/Toolmark Work Instructions.

The U.S. government as well as the State of Alaska has restricted or prohibited certain firearms on the basis of barrel length.

1.1 **Federal** guidelines: Shotguns have barrels as short as 18 inches (46 cm), the minimum shotgun barrel length allowed by law in the United States without special permits; most manufactures use a minimum length of 18.5 inches, to give leeway in the case of a measuring dispute). Barrel lengths of less than 18 inches (46 cm) as measured from the breechface to the muzzle when the weapon is in battery with its action closed and ready to fire, or have an overall length of less than 26 inches (66 cm) are classified as short barreled shotguns under the 1934 National Firearms Act and are heavily regulated.

1.2 **Alaska** statute 11.61.200, Prohibited Weapon: rifle with a barrel length of less than 16 inches, shotgun with a barrel length of less than 18 inches, or firearm made from a rifle or shotgun which, as modified, has an overall length of less than 26 inches.

For the State of Alaska Scientific Crime Detection Laboratory; the barrel length and the overall length of a rifle or shotgun can be important measurements because legal rulings can be based on these measurements. These measurements will be classified as “Descriptive” or “Reported” in the following manner.

Descriptive measurements are routine firearm dimension measurements for general documentation. Descriptive measurements are only recorded in case notes.

Reported measurements are measurements which are relevant to determinations of possession of “Short Barrel” rifles or “Short Barrel” Shotguns.

For barrel length of a shotgun or rifle, if the descriptive measurement is less than 16 inches for a rifle or less than 18 inches for a shotgun, a reported measurement shall be taken.

For overall length of a shotgun or rifle, if the descriptive measurement is less than 26 inches for a rifle or less than 18 inches for a shotgun, a reported measurement shall be taken.

Reported measurements are recorded in the case notes and in the case report.

5.1.2 (continued)

All overall and barrel length measurements will be recorded to the nearest .1 inch.

When a measurement is reported, the measurement uncertainty and a statement regarding the 99.73% coverage probability shall be on the report. The coverage probability represents an expanded uncertainty where k=3.000. Reported measurements will include the measurement (Y) and an expanded uncertainty (U) expressed as Y +/-U. For example, a 23.0 overall length with an coverage probability of .3 inches would be reported as "23.0 inches +/-.3 inches at a coverage probability of 99.73%". The current expanded uncertainty document is maintained as a protected document on the laboratory shared network drive and is available to all Firearms discipline analysts.

Descriptive measurements will not include an expanded uncertainty.

At a minimum the uncertainty estimate shall be reviewed annually, upon replacement of a reference standard, significant changes to the analytical method or personnel change within the discipline.

(End of 5.1.2)

5.1.3 GRIESS, RHODIZONATE and DITHIOOXAMIDE are prepared fresh when needed for casework by the examining scientist and are tested with positive and negative controls.

5.1.3.1 GRIESS, RHODIZONATE and DITHIOOXAMIDE results are recorded on the case worksheet.

5.2 Personnel

Nothing Additional

5.3 Accommodation and environmental conditions

5.3.1 *Nothing Additional*

5.3.2 *Nothing Additional*

5.3.3 *Nothing Additional*

5.3.4.1 Each analyst is assigned the evidence locker in their work area. Any unassigned work areas' evidence locker can be used as needed. When not in use the key is stored in the lock indicating it is available for use. The duplicate key from each locker within the firearms laboratory is locked in a key box in the Firearm discipline gun storage room. Access to the gun storage room is limited to discipline analysts, the discipline supervisor and top management. The key box can only be opened by the discipline supervisor or designee.

If an evidence locker key is lost, the discipline supervisor must be notified immediately.

5.3.5 *Nothing Additional*

5.3.6 *Nothing Additional*

5.4 Test and calibration methods and method validation

5.4.1 Processing used for a case evidence is left to analyst discretion. Processing guidelines are listed in the Firearm/Toolmark Work Instructions Manual.

5.4.2 *Nothing Additional*

5.4.3 *Nothing Additional*

5.4.4 *Nothing Additional*

5.4.5 Validation of Methods

5.4.5.1 *Nothing Additional*

5.4.5.2 Validation records are stored in the Validations folder in the Discipline Share folder.

5.4.5.3 *Nothing Additional*

5.4.5.4 Performance Check records are stored in the Performance Checks folder in the Discipline Share folder.

5.4.6 Estimation of uncertainty of measurement

5.4.6.1 *Nothing Additional*

5.4.6.2 Measurement of uncertainty - See section 5.1.2 of this manual.

5.4.6.3 Measurement of uncertainty - See section 5.1.2 of this manual.

5.4.7 Control of data

5.4.7.1 *Nothing Additional*

5.4.7.2 *Nothing Additional*

5.4.7.2.1 *Nothing Additional*

5.5 Equipment

5.5.1 Equipment used in the Firearm/Toolmark Discipline consists of:

- Comparison Microscopes
- Stereo Microscopes
- Balances
- Trigger pull Devices (Arsenal or Postal Weights)
- Micrometer/Caliper
- Rulers
- Fume Hoods
- Infrared Cameras

5.5.2 CALIBRATION STANDARDS and INSTRUMENTATION MAINTENANCE

COMPARISON MICROSCOPES

The State of Alaska Scientific Crime Detection Laboratory utilizes two Leeds LCF Firearms Comparison Microscopes, installed March 1, 2010 and May 30, 2012. These microscopes replaced a Reichert Comparison Scope, serial #2. The Operations Manual and validation certification for the Leeds microscopes are maintained on the laboratory's computer network and in the laboratory's LIMS.

The comparison microscope will be cleaned and serviced by a factory certified technician as needed.

USAGE: The comparison microscope will be checked prior to use to insure that it is functioning properly.

This check will be performed by placing two similar items on each stage (test to test) and observing the agreement between these items.

This performance check of the comparison microscope will be documented in the case file.

Use of the stage micrometer for critical measurements of evidence will be preceded by verification with a NIST Micrometer Calibrator. This verification will be documented on the firearm worksheet.

5.5.2 (continued)

STEREOMICROSCOPE

The Firearm & Toolmark unit of the laboratory utilizes Leica™ stereomicroscopes, models MZ6 and Wild M3Z.

The comparison microscope will be cleaned and serviced by a factory certified technician as needed.

USAGE: Each stereomicroscope will be checked prior to use to insure that it is functioning properly.

This check will be performed by observing an item under the microscope and utilizing past experience in determining if the instrument appears to be giving a true and accurate representation of the evidence.

BALANCES

The balances will be cleaned, calibrated, and certified annually by an accredited external vendor. Documentation of this action is kept with the laboratory's quality assurance records.

Verification of balances with NIST traceable standard weights will be performed monthly and the verification documented in the Firearm Balance Logbook. Reference weights must not be touched with bare hands (tweezers or gloves are used).

TRIGGER PULL DEVICES (ARSENAL or POSTAL WEIGHTS)

Performance checks of the three trigger pull weights (0.5 lb, 1 lb, and 2 lbs) will be conducted when purchased and annually thereafter. Each weight must not exceed ±2.0 grams when performance checked, or the weight will not be used. The performance checks will be conducted utilizing an externally calibrated in-house balance.

Documentation of yearly performance checks of the trigger pull weights and trigger pull (hook) device will be made and the records maintained in the Firearm **Balances & Weights** Logbook and in the Quality Assurance files maintained by the Quality Assurance Manager.

Conversions: 0.5 lb. = 226.80 grams
1.0 lb. = 453.59 grams
1.5 lbs. = 680.39 grams
2.0 lbs. = 907.18 grams

USAGE: The arsenal weights and "hook device" will be inspected before each use to insure that the weights are not damaged. This inspection does not need to be documented unless something is noted.

5.5.2 (continued)

MICROMETER/CALIPER

USAGE: The micrometer/caliper will be checked prior to use to insure that it is functioning properly using a NIST-certified gauge block. The Certificate of Accuracy will be maintained on the laboratory's network and in the LIMS. Any checks will be documented on the appropriate laboratory worksheet for the item being measured. The gauge block will be replaced every two years.

RULERS

USAGE: Because the overall and barrel lengths of rifles or shotguns are factors in the legal ownership of a firearm, an accurate measurement of both is necessary, particularly when either measurement appears to be very close to the legal minimums.

NIST-traceable rulers will be utilized. The Certificates of Calibration for the NIST-traceable rulers will be maintained in the LIMS and on the laboratory's computer network. The rulers will be replaced every two years.

The overall and barrel lengths, when it is necessary to record them, will be documented to the nearest tenth of an inch on the appropriate Firearm Worksheet.

FUME HOOD

The fume hood will be serviced and certified annually by a reputable outside agency. These preventative maintenance actions will be documented and that documentation kept with the laboratory Quality Assurance records.

INFRARED CAMERAS

The State of Alaska Scientific Crime Detection Laboratory utilizes a Sony NightShot digital camera. This camera is utilized primarily for documentation photography and for visualizing gunshot residue. One additional IR camera, a Canon EOS 5D Mark II digital SLR, has been validated for use in the Firearm unit of the laboratory.

The Operation Manuals for these cameras are kept in the Firearm/Toolmark laboratory. Information on the cameras is also kept on the laboratory computer network:

I:\Discipline Shares\Firearm and Toolmark\Instrumentation & Equipment\Infrared Cameras

(End of 5.5.2)

5.5.3 Equipment manuals are stored in the Discipline Share folder.

5.5.4 *Nothing Additional*

5.5.5 Equipment records are stored in Discipline Share folder.

5.5.6 Performance checks - See Section 5.5.2 of this manual.

5.5.7 *Nothing Additional*

5.5.8 Equipment Calibration documentation - See Section 5.5.2 of this manual.

5.5.9 *Nothing Additional*

5.5.10 *Nothing Additional*

5.5.11 *Nothing Additional*

5.5.12 *Nothing Additional*

5.6 Measurement traceability

5.6.1 General

5.6.1.1 Calibration Checks - See Section 5.5.2 of this manual.

5.6.2 Specific Requirements

5.6.2.2.1 NIST traceability- See Section 5.5.2 of this manual.

5.6.2.2.2 SI units - See Section 5.5.2 of this manual.

5.6.3 Reference Standards and Reference Materials

5.6.3.1 *Nothing Additional*

5.6.3.2 *Nothing Additional*

5.6.3.2.1 Firearms Reference and Ammunition Reference Collections are addressed in the Firearms Toolmark Work Instruction Manual.

5.6.3.3 Firearms reference collection is inventoried at least once per calendar year.

5.6.3.4 *Nothing Additional*

5.7 Sampling

Nothing Additional

5.8 Handling of test and calibration items

Nothing Additional

5.9 Assuring the quality of test and calibration results

5.9.1 *Nothing Additional*

5.9.1.1 Control testing is covered under criteria point 5.1.3 in this manual and in the Firearms/Toolmarks Work Instruction Manual.

5.9.2 If a control test is negative, the Discipline supervisor will be notified. The Discipline supervisor or a designee will take any necessary corrective action.

5.9.3 *Nothing Additional*

5.9.3.1 *Nothing Additional*

5.9.3.2 *Nothing Additional*

5.9.3.3 Each Firearms/Toolmark analyst takes a CTS General Firearms proficiency test yearly.

5.9.3.3.1 *Nothing Additional*

5.9.3.3.2 *Nothing Additional*

5.9.3.4 Each Firearms/Toolmark analyst takes a CTS General Firearms proficiency test yearly.

5.9.3.5 *Nothing Additional*

5.9.3.6 *Nothing Additional*

5.9.4 *Nothing Additional*

5.9.4.1 See 4.13.2.1 in this manual

5.9.4.2 *Nothing Additional*

5.9.4.3 *Nothing Additional*

5.9.5 *Nothing Additional*

5.9.5.1 *Nothing Additional*

5.9.6 *Nothing Additional*

5.9.7 *Nothing Additional*

5.10 Reporting the results

5.10.1 *Nothing Additional*

5.10.2 *Nothing Additional*

5.10.3 Test Results

5.10.3.1 *Nothing Additional*

5.10.3.2 *Nothing Additional*

5.10.3.3 *Nothing Additional*

5.10.3.4 *Nothing Additional*

5.10.3.5 Results and report wordings are covered under criteria point 4.13.2.1 in this manual.

5.10.3.6 Exclusions and report wordings are covered under criteria point 4.13.2.1 in this manual.

5.10.3.7 Inconclusive results and report wordings are covered under criteria point 4.13.2.1 in this manual.

5.10.4 *Nothing Additional*

5.10.5 *Nothing Additional*

5.10.6 *Nothing Additional*

5.10.7 *Nothing Additional*

5.10.8 *Nothing Additional*

5.10.9 *Nothing Additional*

REVISION HISTORY

Changes from FTM2013 R2 to FTM2014 R0
No changes for this issue.