OSAC PROPOSED STANDARD 2024-N-0010
Requirements and Recommendations for Competency Testing in Forensic Firearm and Toolmark Laboratories

Firearms & Toolmarks Subcommittee
Physics/Pattern Interpretation Scientific Area Committee (SAC)
Organization of Scientific Area Committees (OSAC) for Forensic Science

OSAC Proposed Standard

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Prepared by
Firearms & Toolmarks Subcommittee
Version: 2.0
December 2024

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Foreword

The following standard identifies the requirements and recommendations for forensic firearm and toolmark competency testing.

This standard was proposed by the Firearms & Toolmarks Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science.

Keywords: *competency, firearm, and toolmark*

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Requirements and Recommendations for Competency Testing in Forensic Firearm and Toolmark Laboratories

1 Scope

This document has been developed with the objective of providing a method for the Forensic Science Service Provider (FSSP) to ensure that a firearm and toolmark examiner trainee and/or examiner has the specialized knowledge, skills, and abilities (KSAs) to perform a certain task or role.

This document provides the minimum requirements and recommendations for competency testing those performing firearm and toolmark examinations. Requirements and recommendations include areas of competence, methods for assessment of competence, documentation of competence, and reassessment of competence. This standard is not intended to address proficiency testing requirements.

2 Normative References

None.

3 Terms and Definitions

3.1
competency
Demonstration that a forensic science practitioner has acquired and demonstrated specialized KSAs in the standard practices necessary to conduct examinations in a discipline or category of testing prior to performing independent casework.

3.2
competency test
A test that demonstrates that a forensic science practitioner has acquired and demonstrated specialized KSAs in the standard practices necessary to conduct examinations in a discipline or category of testing prior to performing independent casework.

3.3
exemplar
A specimen of physical evidence of known origin. A toolmark produced by a known tool. Exemplars may also include a cast of a tool working surface or test fires.

3.4
firearm and toolmark examination
A discipline of forensic science charged with conducting comparison examinations of tools and toolmarks and reporting the conclusion. When the tool is a firearm, the discipline also seeks to answer relevant questions about the firearms or ammunition components involved in an incident.

3.5
firearm examination
A specialized type of firearm and toolmark examination that includes, but is not limited to, the classification and comparison of microscopic toolmarks created by firearms on ammunition components. It may also include the examination of firearms, serial number restoration, and muzzle-to-target distance determinations.

3.6
firearm and toolmark examiner
A person who has completed training in the discipline of firearm and (non-firearm) toolmark examinations and is currently authorized to perform work in these categories of testing at a particular FSSP.

3.7
forensic science service provider (FSSP)
A forensic science agency or forensic science practitioner providing forensic science services.

3.8
ground truth
Information that is known to be real or true based on direct knowledge as opposed to information obtained by inference.

3.9
questioned toolmark
A toolmark produced by an unknown tool. Also sometimes referred to as an “unknown.” In the context of competency testing, a questioned toolmark is known to the test creator, but not the test taker.

3.10
trainee
A person who is undergoing, but has not yet completed, training in the disciplines of firearm and/or toolmark examination.

3.11
trainer
An instructor who encompasses various topics inside or outside of the discipline and should be selected based on their relevant experience in that subject area, (i.e., - firearm examiner, statisticians, armorers, and other subject matter experts).

3.12
training coordinator
A person who is responsible for delivering or monitoring training or verifying the successful completion of training elements. This person may be a currently qualified or formerly qualified examiner with appropriate expertise who has been authorized by the forensic science service provider to perform training-related duties.

Duties may include, but are not limited to, developing curriculum, delivering training materials, overseeing performance of the trainee, and giving final approval of the training program. The training coordinator may also be the trainer or be a separate individual(s).

4 Requirements

4.1 General

4.1.1 All personnel who perform casework or technical reviews shall be competency tested.

4.1.2 Competency testing shall consist of one or more tests administered covering the breadth of tasks performed.

4.1.3 Competence in a particular area shall be demonstrated prior to performing the task(s) on evidence.

4.2 Methods of Assessment of Competence

4.2.1 The FSSP shall document the test development process, including methods of assessment, ground truth, and acceptable results, prior to administering the test(s).

4.2.2 The following are examples of assessment methods. This is not an all-inclusive list but may be used as a guide for assessing competency.

4.2.2.1 Practical test - tests the practitioner's ability to perform simulated examinations where ground truth is known to the test administrator.

4.2.2.1.1 Practical competency tests should be representative of the variety of evidence typically received into the laboratory.

4.2.2.1.2 Questioned samples and known exemplars should be evaluated by the test creator prior to administering the test to ensure that the expected results can be obtained.

4.2.2.1.3 Ground truth and acceptable results shall not be disclosed to the test taker prior to completing the test.

4.2.2.1.4 A documented or reported result outside of the previously determined acceptable results shall prompt an evaluation of the test and items under examination. Further evaluation

may either determine the test taker appropriately supported their result or the result is not appropriately supported.

4.2.2.2 Written test – tests the practitioner's ability to document knowledge obtained during training.

4.2.2.3 Oral test - tests the practitioner's ability to verbalize technical knowledge.

4.2.2.4 Mock trial - tests the practitioner's ability to verbalize technical knowledge in a manner that is understandable to a lay person.

4.3 Areas of Competence

4.3.1 The FSSP shall define the areas of casework requiring competency testing.

4.3.2 Competency testing may be performed for the following areas within a forensic firearm and/or toolmark laboratory. These areas may include, but are not limited to, the following:

- Firearm mechanical function examination
- Firearm examination/comparison
    - Bullet examinations/comparisons
    - Cartridge case/shotshell examinations/comparisons
    - 3D surface topography measurements
    - Virtual Comparison Microscopy (VCM) analysis
- Toolmark examination/comparison
- Serial Number Restoration
- Gunshot residue distance determination
- Courtroom testimony

4.4 Firearm mechanical function

4.4.1 The following recommendations serve as a minimum guide for designing a firearm mechanical function competency test.

4.4.2 The mechanical function test should include the type(s) of firearms typically encountered by the FSSP.

4.4.3 The test shall include at least two firearms of different types with at least one of the firearms not operating as designed.

4.4.4 The FSSP shall define the criteria for successful completion of the competency test. At a minimum, any malfunction(s) shall be documented.

4.4.5 In addition to the above listed practical competency test, the FSSP should give a written and/or oral test(s) to evaluate the trainee's technical knowledge.

4.5 Firearm examination/comparison

4.5.1 The following recommendations serve as a minimum guide for designing a fired ammunition component competency test and may be used for light comparison microscopy (LCM) and/or VCM.

4.5.2 The test(s) shall contain questioned samples (e.g., bullets, cartridge cases) for comparison to each other and to known exemplars. Not all questioned samples shall have a matching known exemplar. Not all different source comparisons shall be based on a difference in class characteristics.

4.5.3 The firearm examination/comparison competency test(s) shall include microscopic comparison of fired bullets and fired cartridge cases. These test(s) may also include fired shotshells/shotshell components.

4.5.4 Different types of ammunition, calibers, and firearms with various quantity/quality of individual characteristics shall be utilized.

4.5.5 Fired ammunition components shall be provided to the test taker and should be representative of evidence typically encountered in casework (e.g., damaged, contaminated).

4.5.6 The FSSP shall define the criteria and acceptable results for successful completion of the competency test. At a minimum, a documented or reported false identification or false exclusion shall result in failure of the test.

4.5.7 In addition to the above listed practical competency test, the FSSP should give a written and/or oral test(s) to evaluate the trainee's technical knowledge.

4.6 Toolmark examination/comparison

4.6.1 The following recommendations serve as a minimum guide for designing a toolmark competency test.

4.6.2 The test shall contain a minimum of two different tools that have the capability of creating the same class characteristics as the questioned toolmarks when used. The tool choice should be made based on the type(s) of tool(s) that are typically encountered in casework. The same tool may be used to create both an impressed mark and a striated mark.

4.6.3 The test shall contain a minimum of four questioned samples.

4.6.3.1 The test shall contain a minimum of two questioned striated samples for comparison to each other and to known tools. Not all questioned striated samples should have a matching known tool. Not all different source conclusions shall be based on a difference in class characteristics.

4.6.3.2 The test shall contain a minimum of two questioned impressed samples for comparison to each other and to known tools. Not all questioned impressed samples should have a matching known tool. Not all different source conclusions shall be based on a difference in class characteristics.

4.6.4 The material chosen for the creation of the toolmarks shall consist of the type of material typically encountered by the chosen tool. (e.g., steel lock and bolt cutters)

4.6.5 The FSSP shall define the criteria and acceptable results for successful completion of the competency test. At a minimum, a documented or reported false identification or false exclusion shall result in failure of the test.

4.6.6 In addition to the above listed practical competency test, the FSSP should give a written and/or oral test(s) to evaluate the trainee's technical knowledge.

4.7 Serial Number Restoration

4.7.1 The following recommendations serve as a minimum guide for designing a serial number restoration competency test.

4.7.2 The serial number restoration test shall contain a minimum of one ferrous and one non-ferrous questioned sample. These samples should represent different types of serial number application methods.

4.7.3 The FSSP shall use different methods of obliteration to produce the questioned samples.

4.7.4 The FSSP shall define the criteria for successful completion of the competency test. At a minimum, no incorrect characters shall be reported.

4.7.5 In addition to the above listed practical competency test, the FSSP should give a written and/or oral test(s) to evaluate the trainee's technical knowledge.

4.8 Gunshot residue distance determination

4.8.1 The following recommendations serve as a minimum guide for designing a distance determination competency test.

4.8.2 A case scenario shall be provided by the FSSP.

4.8.3 The FSSP shall use firearm and ammunition combinations for the production of questioned patterns that are expected to produce observable patterns.

4.8.4 The FSSP shall provide the test taker with firearm(s) and ammunition for creating test patterns.

4.8.5 The test taker should have access to a range of materials that may assist in the reproduction of gunshot patterns. The material used in each of the tests should be a type of material that is available to the test taker and typically encountered in casework.

4.8.6 The FSSP shall define the criteria for successful completion of the competency test. At a minimum, the reported range shall contain the ground truth.

4.8.7 In addition to the above listed practical competency test, the FSSP should give a written and/or oral test(s) to evaluate the trainee's technical knowledge.

4.9 Courtroom testimony

4.9.1 The following recommendations serve as a minimum guide for designing a courtroom testimony competency test.

4.9.2 The FSSP shall design a mock case(s) that encompass an area or multiple areas of competency (refer to 4.3.2). The mock case(s) should be representative of what the test taker may be expected to testify to in court.

4.9.3 The moot court shall consist of qualifying and case-related questions from the prosecutor and defense. The questions shall reflect the types of questions that are relevant to the area represented in the mock case and of the Firearm and Toolmark discipline in general.

4.9.4 If there is not a separate moot court related to admissibility of the Firearm and Toolmark discipline, the moot court shall consist of admissibility-related questions.

4.9.5 The FSSP shall define the criteria for successful completion of the moot court. At a minimum, all results shall be accurate and clearly communicated without overstatement of the results.

4.10 Documentation of Competence

4.10.1 Documentation of competence shall be maintained by the FSSP and, at a minimum, include (if applicable):

- Areas of competence
- Method of assessment
- Record of test development (i.e., test materials, preparer, date of preparation and ground truth)
- Criteria for successful completion and whether that criteria was met
- Results of the competency test
- Examination documentation
- Reports
- Written assessment questions and answers
- Oral assessment questions with written content of answers
- Date of occurrence

- Person(s) responsible for providing the testing
- Person being competency tested
- Evaluator(s) and accompanying documentation

4.10.2 Competency testing documentation should be retained indefinitely.

4.11 Reassessment of Competence

4.11.1 There may be instances where reassessment of competence is warranted. The FSSP may consider the following non-exhaustive examples when considering the need for reassessment of competence.

- Extended leave from the laboratory
- Extended leave from a laboratory task
- Low frequency of a particular case type
- Unsatisfactory proficiency test
- Unsupportable results in casework
- Failure to comply with laboratory policy

4.11.2 The FSSP shall determine what situations require reassessment and the method for reassessment.

4.11.3 If reassessment is deemed necessary, refer to Methods of Assessment (4.2) and Documentation of Competence (4.10).

Bibliography

1] Guidance on the Assessment of Competence for Forensic Practitioners
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