OSAC 2022-S-0012 Standard for Proficiency Testing in Friction Ridge Examination

Friction Ridge Subcommittee
Physics/Pattern Scientific Area Committee
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Draft OSAC Proposed Standard

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Prepared by
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For more information about this important process, please visit our website at: https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/scientific-technical-review-panels.

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1. Introduction

1.1. This document has been developed with the objective of improving the quality and consistency of friction ridge examination practices.

1.2. The purpose of this document is to provide a standard for assessing the performance of individual FSP personnel and the overall FSP quality system through proficiency testing in friction ridge examination. This document is intended to be supplemental to the International Organization for Standardization / International Electrotechnical Commission (ISO/IEC) 17043 *Conformity Assessment – General Requirements for Proficiency Testing* standards with discipline specific information for friction ridge examination.

1.3. Proficiency testing is an integral component of a Forensic Service Provider's (FSP's) quality assurance program. Proficiency testing provides a means of:

1.3.1. evaluating the skills and abilities of individual FSP personnel to perform specific tests or measurements.

1.3.2. evaluating the effectiveness of a FSP's quality system (e.g. facility, equipment, procedures, training, and quality controls).

1.3.3. identification of vulnerabilities or problems in the quality system necessitating corrective action.

1.3.4. identification of interlaboratory differences.

1.4. Tests can vary in design, quality, and difficulty. The reliability of results produced by a FSP depend on:

1.4.1. The performance of the FSP when tested, and

1.4.2. The robustness of the test taken by the FSP upon which performance was assessed.

1.5. The robustness of the test taken by the FSP depends on factors related to the development, validation, and administration of the test as well as the evaluation of the results.

1.6. Conformance to this standard ensures that tests are selected by the FSP for which the necessary documentation is available to enable a third party to evaluate the robustness of the test used for assessing the performance of the FSP. Conformance to this standard alone, without consideration of the robustness of the test upon which performance was assessed, does not imply the performance of the FSP is reliable or satisfactory.

1.7. In this document, the following verbal forms are used: "*shall*" indicates a requirement, "*should*" indicates a recommendation; "*may*" indicates permission; and "*can*" indicates a possibility or capability.

2. Scope

2.1. This document prescribes the minimum requirements for the selection, development, validation, administration, evaluation, and documentation of proficiency tests used by Forensic Service Providers (FSPs) for purposes of assessing the performance of the FSP personnel and overall FSP quality system related to friction ridge examination. These requirements are applicable to tests generated internally by FSPs and tests obtained from external sources.

2.2. This document does not address requirements related to:

2.2.1. the specific method(s) for conducting friction ridge examinations.

2.2.2. validation of novel or existing methods prior to implementation.

3. Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1. Acceptable Result: A result that conforms to the assigned value or is otherwise permissible under casework conditions by FSP policy.

3.2. Assigned Value: Value attributed to a particular property of a test specimen. NOTE: The assigned value provides the basis for which participant results are expected to conform and performance is evaluated.

3.3. Complexity (of a Comparison): A characteristic of a comparison in which the attributes of one or both impressions may require additional consideration and quality control measures as it relates to the evaluation of a source conclusion. Comparisons can be designated as high complexity, low complexity, or non-complex.

3.4. Complexity (of an Impression): A characteristic of an impression whose attributes may require additional consideration and quality control measures. Impressions can be designated as high complexity, low complexity, or non-complex.

3.5. Consultation: A significant interaction, prior to the initiation of verification or technical review process, between FSP personnel regarding one or more impressions in question. NOTE: An interaction is considered "significant" when it involves a partial or complete examination of the impression(s) in question.

3.6. Corrective Action: An action to eliminate the cause of a non-conformity and to prevent recurrence.

3.7. Examination: The act or process of observing, searching, detecting, recording, prioritizing, collecting, analyzing, measuring, comparing, and/or interpreting.

3.8. Forensic Service Provider (FSP): A forensic science entity or forensic science practitioner providing forensic science services.

3.9. Friction Ridge Detail/Features: The combination of ridge flow, ridge characteristics, and ridge structure of friction ridge skin, as observed and reproduced in an impression. A large subset of the observed data used to compare and interpret similarity or dissimilarity between two impressions.

3.10. Ground Truth: The actual or true state of affairs concerning the source or type of items submitted for evaluation.

3.11. Interlaboratory Comparison: Organization, performance and evaluation of measurements or tests on the same or similar items by two or more FSPs in accordance with predetermined conditions.

3.12. Intralaboratory Comparison: Organization, performance and evaluation of measurements or tests on the same or similar items within the same FSP in accordance with predetermined conditions.

3.13. Observed Data: Any demonstrable information observed within an impression that an examiner relies upon to reach a decision, conclusion or opinion. This has historically been expressed as “features” or “minutiae,” but the use of the broader term “observed data” is inclusive of other types of data that may be considered beyond minutiae, such as quality, scars, creases, edge shapes, pore structure, and other friction ridge features.

3.14. Participant: Laboratory, organization or individual that receives proficiency test items and submits results for review by the proficiency test provider.

3.15. Proficiency Testing: Evaluation of participant performance against pre-established criteria by means of interlaboratory comparisons.

3.16. Technical Review: A qualified second party’s evaluation of reports, notes, data, and other documentation to ensure there is appropriate and sufficient support for the actions, results, conclusions, opinions and interpretations.

3.17. Test sample: A subset of items included as part of a test which are subject to examination by FSP personnel.

3.18. Test Specimen: A single item of the test sample.

3.19. Verification: Confirmation, through either re-examination or review of documented data by another examiner, that a conclusion or opinion conforms to specified

requirements and is reproducible. NOTE: "Specified requirements" are the FSP's policies and procedures relating to Analysis, Comparison and Evaluation of friction ridge impressions.

4. General Requirements

4.1. Selection

4.1.1. Tests shall be selected which have been developed and validated in accordance with the requirements set forth in this standard (sections 4.2 and 4.3).

4.1.2. Where available and appropriate for the job function(s) being tested, tests shall be obtained by an external source through participation in a proficiency testing program from a provider accredited to the ISO/IEC 17043 international standard.

4.1.3. Where not available or not appropriate for the specific job function(s) being tested, tests may be obtained by an external source through participation in an interlaboratory comparison or developed internally by the FSP through participation in an interlaboratory comparison or intralaboratory comparison.

4.2. Development

4.2.1. Tests shall be developed to assess the performance of the FSP as it relates to all major job functions performed by the FSP. These areas may include but are not limited to the following:

4.2.1.1. Detection of friction ridge impressions through optical, physical, and chemical processing / development techniques.

4.2.1.2. Preservation of friction ridge impressions through photography and/or digital capture.

4.2.1.3. Enhancement of friction ridge impression through digital processing.

4.2.1.4. Recording exemplar impressions.

4.2.1.5. Examination (Analysis, Comparison, and Evaluation) of friction ridge impressions, including scenarios involving:

4.2.1.5.1. Potential donor sources paired arbitrarily

4.2.1.5.2. Potential donor sources paired as a result of their similarity to one another, such as being derived from the result of an Automated

Biometric Identification System search of the unknown impression.

4.2.1.6. Encoding, searching, and retrieving friction ridge impressions using ABIS.

4.2.2. The extent to which the test sample is representative of casework shall be documented as it relates to the types, qualities, and conditions of the test specimens for the job functions being tested. Methods used to measure and assess the representativeness of the test sample to casework shall be documented and can range from subjective assessment by expert(s) to more objective approaches such as expert consensus panels or automated software. Statistical analyses appropriate for the type of data generated from the measurements should be used to demonstrate the extent to which the test sample compares to casework.

NOTE 1: The OSAC Friction Ridge Subcommittee Proposed Best Practice Recommendations for Analysis and Comparison & Evaluation provide recommendations related to categorizing the quality of friction ridge detail/features, complexity (of an Impression), and complexity (of a Comparison) through observation.

NOTE 2: Objective methods, such as automated software (where appropriate) or expert consensus panels, are more robust than subjective methods for assessing representativeness of test samples to casework.

4.2.3. Test samples should include a variety of different substrate types (e.g., porous, non-porous, semi-porous), friction ridge development techniques (e.g., optical, chemical, and physical processes), and deposition matrices (e.g. sweat, oils, blood, livescan, ink, etc.).

4.2.4. Test samples should include specimens which assess the full range of association and non-association source conclusions that can be encountered in casework. At a minimum, tests shall include specimens which assess source conclusions representing the strongest support for same sources (e.g., source identification), the strongest support for different sources (e.g., source exclusion), and insufficient support for a stronger source conclusion (e.g., inconclusive).

NOTE: The OSAC Friction Ridge Subcommittee Proposed Standard for Friction Ridge Examination Conclusions provides qualitative expressions for the range of conclusions that may be reached following friction ridge comparisons.

4.2.5. Test samples should only include impressions for which the ground truth state is known.

NOTE: Knowledge of ground truth is more robust and enables performance to be measured in terms of both accuracy and consistency. Ground truth is essential for measuring accuracy; however, ground truth is not necessary for measuring

consistency between participants through participation in proficiency testing programs or other interlaboratory comparisons or intralaboratory comparisons. In circumstances where it is impractical to create suitable test specimens for which ground truth is known, casework samples can be used to assess performance in terms of consistency and agreement with assigned values.

4.2.6. Test specimens shall each have an assigned value for which participant results are expected to conform and performance is evaluated. Criteria for determining the assigned values shall be documented, appropriate for the performance characteristic being measured (e.g., accuracy and/or consistency), and based on observable or measurable attributes of the test specimens (e.g., quality and quantity of friction ridge detail/features). Where applicable to the job function being tested (e.g., examination of friction ridge impressions), the observable or measurable attributes of the test specimen to support a source conclusion should conform to those criteria established by a national standard or consensus body recognized by the OSAC Friction Ridge Subcommittee.

NOTE: Knowledge of ground truth for test specimen is not always sufficient for determining the assigned value. For tests designed to assess performance related to examination of friction ridge impressions, test specimens might be known to have come from same (or different) sources but lack sufficient observable or measurable attributes to support a strong source conclusion (e.g., source identification or source exclusion). In these circumstances, a response choice indicating insufficient support for a stronger source conclusion (e.g., inconclusive) can be the assigned value.

4.2.7. Neither the ground truth nor assigned values for test specimens shall be disclosed to the participants to which the test is administered until after the test is completed.

4.3. Validation

4.3.1. Tests shall be validated prior to administration to participants.

4.3.1.1. Tests obtained from external sources should include a description of how the tests were developed and validated in accordance with the requirements specified in sections 4.2 and 4.3 of this standard, to allow the FSP to verify conformance to this standard and serve as evidence of conformity. Documentation of the validation completed by the external provider can serve as evidence of conformity.

4.3.1.2. Tests developed by the FSP or tests obtained from external sources that do not include a description of how the tests were developed and validated in accordance with the requirements specified in sections 4.2 and 4.3 of this standard shall be validated by the FSP to verify conformance to this

standard. Documentation of the validation completed by the FSP can serve as evidence of conformity.

4.3.2. Test validation shall include the following:

4.3.2.1. Verification that test samples are representative of those encountered in casework as it relates to the types, qualities, and conditions of the test specimens for the job functions being tested.

4.3.2.2. Verification that the test can be completed using the materials included in the test by pre-distribution administration of the test to participants independent of the test development and in the same conditions as the proposed test.

NOTE: For tests developed or validated by the FSP, the personnel participating in the pre-distribution administration of the test can be internal or external to the FSP.

4.3.2.3. Verification that the pre-distribution test results correspond to the assigned values.

4.3.3. The results of the validation demonstrating that the test conforms to the requirements set forth by this standard shall be documented and maintained by the FSP.

4.4. Administration

4.4.1. The FSP shall be responsible for ensuring the test has been validated prior to distribution. Documentation verifying the test has been developed and validated in accordance with the requirements specified in sections 4.2 and 4.3 of this standard shall be obtained or produced by the FSP prior to test administration. This applies to tests developed internally or obtained from external sources.

4.4.2. All FSP personnel shall complete at least one proficiency test, interlaboratory comparison, or intralaboratory comparison annually.

4.4.3. Tests shall only be administered to FSP personnel approved to perform independent casework.

4.4.4. Tests shall be administered in conditions reflecting casework (e.g., environmental conditions, equipment, time constraints, etc.) and in accordance with applicable FSP policies and procedures. Supporting task relevant contextual information may be provided to participants, provided that the contextual information does not exceed that to which the participants are exposed to in normal casework.

4.4.5. Tests shall be administered such that the results produced by individual FSP personnel are their own and not influenced by other participants, such as through Consultation, prior to Verification or Technical Review.

NOTE: This does not preclude participants from using tools or equipment (including automated comparison software or statistical models) that are otherwise available and permissible for use in normal casework.

4.4.6. Tests should be administered such that participants are not exposed to subtle cues that may hint at or guide them to the expected results without direct examination of the test specimen.

NOTE: Subtle cues can be unintentionally introduced or inferred by the design or administration of a single test or patterns that emerge from a sequence of tests (e.g., see OSAC Technical Series 004: Human Factors in Validation and Performance Testing of Forensic Science -- https://doi.org/10.29325/OSAC.TS.0004).

4.4.7. Tests can be administered in one of two formats:

4.4.7.1. Non-blind testing: Participants are aware they are being tested

4.4.7.2. Blind testing: Participants are not aware they are being tested

NOTE: Blind testing is more robust than non-blind testing.

4.5. Evaluation

4.5.1. The FSP shall have established criteria for evaluating acceptable performance as it relates to both the individual FSP personnel *and* overall FSP quality system. Methods used to evaluate performance shall be documented and include statistical analyses appropriate for the evaluation. These criteria and methods shall be documented prior to test administration and address:

4.5.1.1. Agreement of participant results to the assigned values.

4.5.1.2. Sufficient documentation of observed data to support the participant's results.

4.5.1.3. Completion of the test in accordance with applicable FSP policies and procedures.

NOTE 1: Acceptable performance can allow for deviations from the assigned values provided the extent of allowable deviations are documented prior to test administration and bounded within the range of

acceptable results that are normally permissible under casework conditions.

NOTE 2: Performance of individual FSP personnel is evaluated based on the results produced *prior* to the application of quality controls involving influence by other participants, such as Verification or Technical Review. Performance of the overall FSP quality system is evaluated based on the results produced *after* the application of quality controls involving influence by other participants, such as Verification or Technical Review.

4.5.2. Cause analysis shall be performed when a result is generated during the test that does not correspond to the assigned value or exceeds the range of acceptable results. Corrective actions shall be taken where appropriate.

NOTE: Cause analysis can include consideration of factors related to the environment, facilities, equipment, examination method, policies and procedures, training, and skills or abilities of the FSP personnel.

4.6. Documentation

4.6.1. The FSP shall have a procedure to maintain records documenting the following as it relates to the selection, development, validation, and administration of the test, as well as evaluation of the results in accordance with the requirements and recommendations set forth in sections 4.2 through 4.5 of this standard:

4.6.1.1. The identity of the Proficiency Testing Program Manager responsible for the selection, administration, and evaluation of tests within the FSP

NOTE: The proficiency testing program manager can be a Quality Assurance Manager, Supervisor, or otherwise designated FSP personnel.

4.6.1.2. The source of the test (for tests obtained from external sources) or identity of the personnel responsible for developing the test along with their qualifications (for tests developed internally).

4.6.1.3. The job function(s) tested.

4.6.1.4. Verification that the test has been developed and validated in accordance with the requirements set forth in sections 4.2 and 4.3 of this standard.

4.6.1.5. A description of the types of substrates included in the development of the test.

4.6.1.6. A description of the development techniques included in the development of the test.

4.6.1.7. A description of the deposition matrices of the test samples included in the development of the test.

4.6.1.8. A description of the scenario(s) presented in the test, including any supplemental background or contextual information.

4.6.1.9. Criteria for determining the assigned values for test specimen.

4.6.1.10. A list of the qualifications of the personnel participating in the pre-distribution administration of the test.

4.6.1.11. A list of the FSP personnel to which the test was administered.

4.6.1.12. The date the test was administered to participant(s) and the date the test was completed by the participant(s).

4.6.1.13. Conditions under which the test was administered to the participants.

4.6.1.14. Format of the test administered to the participants (non-blind or blind).

4.6.1.15. Participant responses.

4.6.1.16. Criteria for acceptable performance as it relates to:

4.6.1.16.1. Individual FSP personnel

4.6.1.16.2. Overall FSP quality system

4.6.1.17. Results of participant performance as it relates to:

4.6.1.17.1. Individual FSP personnel

4.6.1.17.2. Overall FSP quality system

4.6.1.18. Cause analysis and applicable corrective action(s).

4.6.2. Documentation shall be sufficient to enable a third party to interpret and evaluate the robustness of the development, validation, administration, and evaluation of the test used to assess the performance of the FSP personnel and quality system overall.

5. Appendix A: Change Log

Version	Date	Change
1.0	DD/MM/YYYY	Original Issue