TG 43-01

TECHNICAL GUIDELINES FOR FORENSIC BALLISTIC, IMPRESSIONS AND QUESTIONED DOCUMENT LABORATORIES

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1. Purpose and Scope

Forensic science refers to the examination of crime scenes, the recovery of evidence, laboratory examinations, interpretation of findings and presentation of the conclusions for both investigative purposes and as well as evidence in court. Forensic ballistic, questioned document and impression examinations entail mainly comparison work, which is largely subjective in nature. However, consistent findings between different examiners are produced with the necessary training (ILAC: 1999: 3).

Special approaches may be required to establish acceptable control systems for comparisons and observations. Comparisons and observations should in principle meet the same quality criteria as measurements.

This document is limited to the following areas of forensic examination:

- Ballistics related;
- Impression related; and
- Questioned document related.

The author recognises that the size of an organisation will influence the implementation of this document and all these requirements may not be implementable at, for example, a one-man laboratory. What is important is that a laboratory whishing to become accredited according to R08-01 must be able to prove that:

- The examiners are competent;
- The facility is suitable for the examinations that are performed;
- The examination methods and techniques are valid; and
- It complies with the basic quality management requirements such as internal audits and handling of customer complaints.

2. Definitions and References

2.1 R08: "Criteria for laboratory accreditation in the field of Forensics"

2.2 Administrative review:
An evaluation of the report and supporting documentation for consistency with laboratory policies and procedures and for correctness.

2.3 Ballistics-related examinations will include the following examinations:

2.3.1 Identification of ammunition fired bullets and fired cartridge cases;
2.3.2 Use of optical microscopes;
2.3.3 Microscopical individualisation of firearms, ammunition, fired bullets and cartridge cases;
2.3.4 Identification of fire arms;
2.3.5 Examination of fire arm mechanics;
2.3.6 Examination of home-made devices;
2.3.7 Techniques associated with the recovering and restoration processes of obliterated alpha-numerical figures on metals;
2.3.8 Reloading and manufacturing processes of ammunition;
2.3.9 Shot range determination; and
2.3.10 Crime scene investigation and examination techniques;
2.3.11 Physical matching; and
2.3.12 Toolmarks and impressions.

2.4. Competent / qualified:
The terms "qualified" or "competent" imply a proven combination of academic and professional qualifications, internal training, external training, experience and skill.

2.4 Examiner:
A competent individual in the field of ballistics, questioned document or impression related examinations, who examines forensic exhibits, interprets the data and reports on the

conclusions. This person may give an expert opinion based on either scientific fact or evidence.

2.5 Impression related examinations would include the following examinations:
a) Fingerprints;
b) Footprints;
c) Palm prints;
d) Glove prints;
e) Tyre prints;
f) Fabric prints;
g) Non-friction ridge body prints; and
h) Shoe prints.

2.6 Laboratory:
Any facility in which forensic ballistic, questioned document or impression related examinations is performed.

2.7 Management:
The persons that control the resources made available to the laboratory.

2.8 Objective examination / examination:
An examination which has been documented and validated and is under control, so that it can be demonstrated that all appropriately trained staff will obtain the same results within defined limits.

2.9 Objective test will be controlled by:
a) Documentation of the test;
b) Validation of the test;
c) Training and authorization of personnel; and
d) Maintenance of equipment and where appropriate by:
e) Calibration of equipment;
f) Use of appropriate reference materials;
g) Provision of guidance for interpretation;
h) Checking of results;
i) Testing of staff proficiency;
j) Recording of equipment/test performance.

2.10 Physical match:
The process of comparison of edges, ridges, surface striae and other marks between samples. Physical matches must be documented through photographs, phototransparency overlays or other appropriate imaging techniques. The examiner must ensure that the imaging technique that was employed to document the physical match is dimensionally accurate and has the necessary measuring scales.

2.11 Proficiency test:
A quality assurance measure to monitor performance and identify areas for improvement.

2.12 Quality manual:
A document stating the quality policy, quality system and quality practices of an organisation.

2.13 Quality system:
The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.

2.14 Questioned document related examinations will include the following examinations:
a) handwriting;
b) signatures;
c) typewriting and machine printed material;
d) printed and photocopied matter;
e) stamped impressions;
f) forgeries;
g) erasures; obliterations and additions;
h) incidental marks and indented writing;

i) paper and other base materials;
j) writing instruments; and
k) inks.

2.15 Questioned sample:
Any sample collected for the purpose of identification and or comparison with a known sample.

2.16 Reference collection:
A collection of stable materials and objects of which the properties and or origin are known.

2.17 Report:
A written report of the findings and interpretations of the examinations. Where the examiner is employed by the South African Government, it shall meet the relevant requirements of the Criminal Procedure Act: Act 51 of 1977.

2.18 Technical review:
An evaluation by a second examiner of the report, the physical samples and supporting documentation to verify the correctness of the findings.

2.19 Validation:
The process used to determine the conditions under which reliable results can be obtained as well as what are the limitations of these results.

2.20 Verification:
Confirmation by a second examiner who is not influenced by the findings of the first.

3. Introduction

The general requirements for competence of forensic laboratories in South Africa are contained in R08 “Criteria Document for Forensic Laboratories”. These requirements are designed to apply to all forensic science disciplines and need further interpretation for non-analytical laboratories.

This document has been compiled with the input of ballistic, questioned document and fingerprint examiners from State-funded laboratories as well as private practices. The intention of this document is to provide guidance to both assessors and laboratories on the interpretation of R08 and not to restate the provisions of R08. Laboratories must still comply with all the requirements of R08 and with any relevant statutory or legislative requirements.

4. Management and Quality System Requirements (ISO/IEC 17025 Sections 4.1, 4.2 and 4.3)

4.1 Management must be competent to take the scientific and technical responsibilities for the services that are provided.

4.2 Supervision must be undertaken by competent staff, familiar with the validity and interpretation of the findings.

4.3 The laboratory must maintain:

4.3.1 An organisational chart, indicating the positions and interrelationships of the personnel;
4.3.2 Job descriptions, defining the responsibilities and authorities of each staff member;
4.3.3 Objectives and commitments, with a means to monitor and improve the relationship between the client and the laboratory;
4.3.4 A documented policy;
4.3.5 An internal audit program;
4.3.6 Competency of personnel through continuous education and training;
4.3.7 An evidence / sample control system;
4.3.8 A proficiency testing program;
4.3.9 Facilities and environment needed to preserve evidence and to perform the examinations;
4.3.10 A standardised reporting system;
4.3.11 A maintenance program for equipment; and validated examination methods.

4.4 Documented procedures must define who may release findings, when findings may be released, to whom the findings may be released and by which means.

4.5 When generating and controlling documentation the following should be taken into consideration:

a) functionality
b) resources needed
c) policies and objectives
d) current and future requirements; and
e) interfaces used by the organisations' customers, suppliers and other interested parties.

4.6 The quality manual should at least include:

4.6.1 The scope of the quality system;
4.6.2 Documented procedures established for the quality management system;
4.6.3 A description of the interaction between the processes of the quality management system.

4.7 Documented procedures must be established to ensure that quality system documentation:

4.7.1 is approved before use;
4.7.2 is reviewed for adequacy and if necessary re-approved;
4.7.3 is readily available at the points of use;
4.7.4 is legible and identifiable;
4.7.5 changes are identifiable and communicated;
4.7.6 of an external nature is identified and controlled; and
4.7.7 is withdrawn when it becomes obsolete.

5. Personnel (ISO/IEC 17025 Sections 4.1, 4.2 and 4.3)

5.1 The laboratory must have clear statements of the competencies that are required for all jobs. Records of training and experience shall be maintained to demonstrate that examiners are qualified for the tasks they perform.

5.2 Records shall be available for authorisation of examiners to perform particular examinations.

5.3 Examiners shall successfully complete a written and oral evaluation, the relevant practical experience as well as a proficiency test before performing casework independently. It is recommended that an examiner must examine at least 10 cases under supervision of a mentor for each type of examination.

Note: Examiners who lacks practical experience shall perform casework under supervision. Examiners performing casework under supervision will be allowed to sign the reports if the mentor performed both an administrative and technical review. Records of such reviews must be maintained.

5.4 Training for ballistic related examinations will include the following:

5.4.1 Identification of ammunition, fired bullets and fired cartridge cases;
5.4.2 Use of optical microscopes;
5.4.3 Microscopical individualisation of firearms, ammunition, fired bullets and cartridge cases;
5.4.4 Identification of fire arms;
5.4.5 Examination of fire arm mechanics;
5.4.6 Examination of home-made devices;
5.4.7 Techniques associated with the recovering and restoration processes of obliterated alpha-numerical figures on metals;
5.4.8 Reloading and manufacturing processes of ammunition;
5.4.9 Shot range determination; and
5.4.10 Crime scene investigation and examination techniques;

5.4.11 Physical matching;
5.4.12 Toolmarks and impressions;
5.4.13 Manufacturing processes of firearms and its components;
5.4.14 Photography and the documentation of the results during an investigation; and
5.4.15 Giving evidence in court.

5.5 Training for questioned document related examinations will include the following:

5.5.1 Examination and individualising of handwriting;
5.5.2 Examination and individualising of signatures;
5.5.3 Procurement of handwriting specimens;
5.5.4 Examination of typewriting;
5.5.5 Examination of paper;
5.5.6 Examination of writing instruments and inks;
5.5.7 Examination of stamps and stamp impressions;
5.5.8 Examination of marks and prints on documents;
5.5.9 Examination of obliterations and alterations;
5.5.10 Specialized equipment;
5.5.11 Handling and preservation of documents; and
5.5.12 Presentation in court.

5.6 Training for impression related examinations will include the following:

5.6.1 Fingerprint theory;
5.6.2 Applicable legislation;
5.6.3 Transplanting and forgery of fingerprints;
5.6.4 The age of crime scene impressions;
5.6.5 Approaching crime scenes and how to handle exhibits;
5.6.6 Photography of fingerprint and crime scene photography;
5.6.7 Fingerprint classification and filing;
5.6.8 Palm print classification and filing;
5.6.9 Techniques to identify finger and palm prints ;
5.6.10 Preparation of court charts; and
5.6.11 Giving evidence in court.

5.7 The laboratory shall have policies and procedures in place to retain and maintain the expertise and skills of the examiners.

5.8 Supervisors of laboratories shall have at a minimum have:

5.8.1 Mastered the theory, procedures and techniques necessary to produce reliable results and completed the in-house training modules applicable to the area of responsibility;
5.8.2 At least five (5) years practical forensic experience in the field of responsibility;
5.8.3 still be active in case work in the field of responsibility.

5.9 Laboratory managers shall at a minimum have:

5.9.1 Completed at least a quality management systems course;
5.9.2 Been at least a trained internal quality systems auditor; and
5.9.3 At least ten (10) years practical forensic experience in the field of responsibility of which at least three years as a supervisor.

5.10 Laboratory assistants must complete in-house training and successfully complete a proficiency test before assisting with any casework.

5.11 Other support personnel must have the training, education and experience needed for the tasks for which they are responsible.

5.12 Continued competence of personnel affecting the outcome of the examinations must be monitored and when necessary retraining should be considered.

6. Facility (ISO/IEC 17025 Section 5.3)

6.1 Access to the laboratory must be limited and controlled. Visitors may not have unrestricted access to areas where examinations are performed. Records must be kept of all visitors to areas where examinations are performed.

6.2 Special attention must be given to the security of the laboratory after hours. Where the laboratory is not guarded by security personnel, electronic systems which are monitored should be in place.

6.3 Keys, pin codes and magnetic cards must be controlled items. Records must be maintained of all persons having access to the various areas of the laboratory.

6.4 Duplicate keys and magnetic cards must be locked away in a safe or strong room. Each duplicate key or magnetic card should be sealed separately. Records must be maintained of the date and time a duplicate was removed from storage, the reason for removing it as well the name and signature of the person taking the duplicate. When the duplicate is returned, the date and time of return, the new seal number as well as the name and signatory of the person receiving the duplicate must be recorded.

6.5 Personnel should not be allowed to make copies of any keys.

6.6 Separate locations or clearly designated areas should be available for the following:

6.6.1 Exhibit receipt;
6.6.2 Exhibit storage;
6.6.3 Where applicable sample preparation, especially if the risk for contamination exists;
6.6.4 Areas where instruments such as microscopes are used;
6.6.5 Reagent storage;
6.6.6 Standard storage; and
6.6.7 Archives.

6.7 Good housekeeping must be practised. Workspace should commensurate with the volume of work handled and the overall organisation of the laboratory.

6.8 Appropriate clothing and where applicable other personal protective equipment must be worn. In most laboratories a laboratory coat may be sufficient.

6.9 Work surfaces, floors, walls and ceilings should be non-absorbent and easy to clean and, if necessary, disinfected. Measures should be taken to avoid dust accumulation by:

6.9.1 Providing sufficient storage space;
6.9.2 Having minimal paperwork in the laboratory; and
6.9.3 Prohibiting plants and personal possessions in examination areas.

6.10 Where the environmental conditions, such as temperature and / or humidity are important to the outcome of the examination, the laboratory shall use calibrated measuring equipment to monitor these conditions. Laboratories shall monitor and maintain records of these conditions.

6.11 Access to storage areas must be restricted to authorised personnel.

6.12 Firearms, ammunition and counterfeit money must be stored in appropriate safes or strong rooms at all times when not under the direct control of the examiner. Keys to these storage areas must be controlled and adhere to the requirements of paragraphs 7.3 and 7.4.

7. **Equipment** (ISO/IEC 17025 Section 5.5)

7.1 The laboratory shall have a documented programme for the maintenance, calibration and performance verification of its equipment. All maintenance shall be performed according to the manufacturer's instructions.

7.2 Records of maintenance shall be maintained. These records shall at least include the name and signature of the person who did the work, the actions that were taken as well as verification that the instrument is properly functioning.

7.3 The equipment used within the scope of this document can generally be classified as follows:

7.3.1 General service equipment: Will typically be maintained by visual examinations for damage, safety checks and cleaning as necessary. Calibrations or performance checks will only be necessary where the equipment setting can significantly affect the examination.

7.3.2 Microscopes and attachments: Periodic cleaning and servicing is appropriate. Steps should be taken to ensure that microscopes are properly set up for use and are used only by personnel trained to do so.

7.3.3 Measuring equipment: Where appropriate, periodic performance checks shall be carried out and predetermined limits of acceptability shall be assigned. The frequency of such checks shall be determined by need, type of equipment and the performance history. Intervals between checks shall be shorter than the time the equipment has been found to drift outside the acceptable limits.

7.4 Where performance tests are built into the examination method, they shall be documented and completed before the equipment is used.

7.5 Computer systems and software shall be properly tested, controlled and authorised before use. Where well-established software is used, no particular test is necessary.

7.6 Where in-house software is used, complete documentation to validate it must be available. The laboratory must be able to show that loss or corruption of data does not occur.

7.7 Where the accuracy of a measurement has an influence on the outcome of the examination the measuring equipment shall be of appropriate quality to achieve the specification of the examination method. The equipment shall also be calibrated with standards, which are traceable to national and international standards.

8. Evidence Management (ISO/IEC 17025 Section 5.8)

8.1 Crime scenes

8.1.1 Crime scene examination does not fall within the scope of this document.
8.1.2 Where the examiner collects exhibits on a crime scene the exhibit shall where possible be packed and sealed on the scene.
8.1.3 All exhibits shall be uniquely marked or labelled at the crime scene.
8.1.4 Records of the description of the exhibit, where it was found, by whom was it collected, when was it collected (date and time), how was it packed and sealed, the seal number as how it was marked must accompany each exhibit to the laboratory.

8.2 The process that an exhibit follows through a laboratory must be documented. Documented procedures and where necessary the records must be maintained for:

a) Case reception
b) Internal transfers
c) Storage
d) Examination
e) Disposal of exhibits

Note: It must be clear where each exhibit was at a specific time, who handled it and what was done to it. Exhibits under proper seal must also be traceable.

8.3 The criteria for accepting exhibits at the laboratory must be documented. At least the following information should be available when receiving an exhibit for examination:

8.3.1 The unique number of the exhibit;
8.3.2 Date and where applicable the time of receipt;
8.3.3 Identity of the person delivering the exhibit or means of delivery, for example received by post;
8.3.4 The identity of the person receiving the exhibit;
8.3.5 The unique seal number of the packaging;
8.3.6 The contents of the packaging and any possible risks such as blood or a loaded firearm;
8.3.7 List of examinations that are required.

8.4 Exhibits shall be marked with an unique number immediately after it has been removed from its packaging.

Note: Packaging from exhibits could be highly contaminated and should be carefully handled to prevent the spread of contamination.

8.5 A documented procedure shall be implemented for the retention and disposal of exhibits or samples taken from exhibits.

8.6 Clear records of what is supposed to be in exhibit and case file storage areas must be available. At least the following records should be available in the above-mentioned storage areas:

8.6.1 The unique number of the item;
8.6.2 Date it was placed in storage;
8.6.3 Name and signature of the person who received the exhibit into the storage area; the date it was removed; and
8.6.4 The name and signature of the person receiving it from storage.

8.7 Documented procedures shall be available for the handling of exhibits, which are to be referred to other laboratories.

8.8 Detailed instructions shall be available to the users of the laboratory on how to collect, package and transport exhibits and samples, where exhibit collection and sampling falls outside the responsibility of the laboratory.

9. Methods and Procedures (ISO/IEC 17025 Section 5.4)

9.1 Methods employed by a laboratory must be fully documented and must be suitable for the laboratory's purpose and to meet the requirements of its customers.

9.2 Methods and procedures that are used may be sectoral, national or international standards or developed in-house. Laboratories should satisfy themselves that a particular method of examination is adequate for its intended purpose.

9.3 It may not be necessary to perform complete method validation studies on methods from recognised national and international organisations. A documented training program on the above-mentioned methods must be in place before such methods are used.

9.4 Data from participation in interlaboratory comparisons and proficiency testing may also be used to validate methods.

9.5 All validation data must be recorded for at least as long as there are cases, which have been examined with that method which have not been finalised in court.

10. Quality Assurance (ISO/IEC 17025 Section 5.9)

10.1 Quality control consists of procedures undertaken by the laboratory to continually evaluate its work. Quality control procedures must be based on best professional practices.

10.2 Quality control procedures must be documented. Evidence shall be retained to show that the necessary quality control measures have been taken, that all the results were acceptable

and where necessary that the corrections and corrective actions have been taken and were effective.

10.3 Examples of quality control activities will include:

10.3.1 Verification of findings;
10.3.2 Technical and administrative review;
10.3.3 Comparison with or reference to published data;
10.3.4 Comparisons against internally generated reference collections;
10.3.5 Random re-examination of exhibits; and
10.3.6 Proficiency testing and interlaboratory testing.

10.4 Procedures for review of case work will be documented and include a mechanism to address unresolved differences in opinion between the examiner and reviewer.

10.4 The number of cases to be reviewed should be determined by the experience and performance of the examiner.

11. Reference Collections / Materials (ISO/IEC 17025 Section 5.6)

11.1 Where reference materials are available, the use of such materials is essential for the demonstration of the validity of examinations and may also be used to calibrate equipment and monitor examiner or laboratory performance.

11.2 The laboratory must have documented procedures, which will ensure that reference materials are not lost, contaminated or allowed to deteriorate.

11.3 Reference collections / materials may include collections of data, items retained from case work and items which were specifically collected from industry.

11.4 Reference collections / materials must be fully documented, uniquely identified and properly controlled.

12. Reports (ISO/IEC 17025 Section 5.10)

12.1 Where a laboratory is State funded and examinations were performed for the judicial process the format of the report shall meet the relevant legal requirements.

12.2 In all other instances the reports shall meet the requirements of ISO/IEC 17025:1999

13. Procurement of Services and Supplies (ISO/IEC 17025 Section 4.5)

13.1 When a laboratory makes use of a sub contractor to perform examinations or parts thereof, the laboratory shall ensure that the sub contractor complies with the requirements of R08-01.

13.2 A documented list of approved suppliers of items and services which are critical to the outcome of the examination must be maintained. A supplier can become an approved suppliers by any of the following means:

13.2.1 If it is ISO certified or SANAS accredited;
13.2.2 On grounds of its performance history;
13.2.3 By means of an audit; and
13.2.4 On its reputation, if it is a well established organization.

ADDENDUM 1.

AMENDMENT RECORD

Proposed By:	Section	Change
CEO	Page 1	Changed to new logo & Front page
FM		Changed from R 43 to TR 43 (Technical Guidance) document.