



Modules in a Forensic Science Process

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TABLE OF CONTENTS

PREAMBLE	4
PURPOSE	4
AUTHORSHIP	4
1. Scope	5
2. Terms and definitions	6
3. General guidance common to all activity modules in the forensic science process	9
4. Activity modules in the forensic science process	18
4.1 Initial discussion regarding scene of crime attendance	18
4.2 Undertaking initial actions at the scene of crime	20
4.3 Developing a scene of crime investigation strategy	21
4.4 Undertake scene of crime investigation	23
4.5 Assess scene of crime findings and consider further examination	26
4.6 Interpret and report findings from the scene of crime	27
4.7 Examination and testing	27
4.8 Interpretation of the results of examinations and tests	30
4.9 Report from examinations and tests including interpretation of results	32
Annex A: Examples of disciplines undertaken by forensic units	34
Annex B: Bibliography	36
Annex C: Correlation chart	36

PREAMBLE

ILAC G-19, Guidelines for Forensic Science Laboratories, was published in 2002, with the purpose of: "... provide guidance for laboratories involved in forensic analysis and examination by providing application of ISO/IEC 17025." In October 2007, the IAF and ILAC Joint General Assembly resolved that a single top level document that approaches the forensic science process as a whole and provides common guidance for both ISO/IEC 17020 and ISO/IEC 17025 in areas where the activities overlap be drafted, and that the guidance be based on the guidance document to ISO/IEC 17020 for Crime Scene Investigation, already prepared by the European co-operation for Accreditation (EA) and the European Network of Forensic Science Institutes (ENFSI) (EA-5/03), and on ILAC G19 for forensic laboratories. The task of preparing the document was given to Working Group 10 of the ILAC Accreditation Committee (ILAC AIC WG10).

The requirements that there is a single document, that deals with the forensic science process as a whole, and that it provides common guidance for both ISO/IEC 17020 and ISO/IEC 17025 in areas where the activities overlap, mean that the normal format of clause-by-clause guidance is not the most appropriate approach in this instance. Providing guidance is further complicated because there is no clear and consistent distinction in forensic practice between the activities conducted at a scene of crime and those conducted in a forensic laboratory, nor is there always a clear and consistent distinction in the administrative location of personnel involved in the activities. Thus, testing may be conducted at a scene and general examination of materials recovered from a scene may be conducted in a forensic laboratory. Equally staff conducting scene of crime examinations may be part of the forensic laboratory or may be located within a separate administrative entity.

Finally, accreditation bodies can choose, as appropriate, to have accreditation programs which are based on ISO/IEC 17025 and/or ISO/IEC 17020 for different parts of the forensic science process. However, the accreditation body should clearly describe which standard they intend to use for which parts of the forensic science process and ensure that this is made clear to any organizations applying for accreditation. Appropriate applications of ISO/IEC 17020 and ISO/IEC 17025 should be made by accrediting bodies based upon the presence or absence of testing in the segment of the forensic science process in question.

The word 'shall' has been used in this document where there is a corresponding requirement in ISO/IEC 17020 and ISO/IEC 17025; the word 'should' has been used to indicate a recommendation that is generally accepted practice in the forensic science process.

PURPOSE

This document is intended to provide guidance for laboratories, scene of crime investigation units and other entities, hereafter called forensic units, involved in examination and testing in the forensic science process by providing guidance for the application of ISO/IEC 17020 and ISO/IEC 17025.

AUTHORSHIP

This document has been produced in consultation with the Working Group 10 of the ILAC Accreditation Committee and approved for publication by the ILAC General Assembly in 2014

1. Scope

The guidance defines the purpose of the forensic science process and the series of steps from the time a forensic unit is notified of an incident until the presentation of findings together with a description of the activities that take place at each step.

The guidance does not specify which International Standard should apply to the work being conducted by the forensic unit. This is a matter for the conformity assessment body, in this circumstance this is the forensic unit, and the accreditation body concerned.

Any testing conducted as part of scene of crime investigation shall be carried out according to documented procedures and ISO/IEC 17020 may cover these procedures provided that the relevant clauses of ISO/IEC 17025 are considered.

The forensic unit may undertake a combination of activities to which this document contains guidance. The accreditation to be granted shall be based on the activities for which the forensic unit applies for accreditation and the accreditation body shall apply the guidance which is related to those activities only.

The activities may include the examination of a wide range of items and substances and require technical expertise in multiple disciplines. A table is provided in Annex A listing some of the forensic disciplines being undertaken by forensic units.

The techniques adopted in the examination and testing of forensic material cover a broad range; from visual examination to sophisticated instrumental procedures.

The forensic science process

The forensic science process includes, but is not limited to:

- ◆ Initial discussion regarding scene of crime attendance
- ◆ Undertaking initial actions at the scene of crime
- ◆ Developing a scene of crime investigation strategy
- ◆ Undertake scene of crime investigation
- ◆ Assess scene of crime findings and consider further examination
- ◆ Interpret and report findings from the scene of crime
- ◆ Examination, testing and presumptive testing (including appropriate case assessment)
- ◆ Interpretation of the result of examinations and tests
- ◆ Report from examinations and tests including interpretation of results

The document is formatted based on the activities which may occur during the stages above and does not define time lines for the completion of an activity. It was developed to provide additional guidance for specific sections within ISO/IEC 17020 and ISO/IEC 17025 and does not repeat the requirements of these standards, where the given explanations are sufficient. It endeavours to provide interpretation or clarification and should be read in parallel with ISO/IEC 17020 and ISO/IEC 17025 as appropriate.

A forensic unit can have one single management system to cover all of its activities and all the competence standards to which it works, i.e. ISO/IEC 17020 and ISO/IEC 17025.

2. Terms and Definitions

Many concepts of significance in the forensic science process are described by terms or are defined in ways that are not consistent across jurisdictions. The guidance therefore defines these for the purpose of providing a common understanding of the meaning of terms used in this document.

2.1 Competence

Competence is the demonstrated ability to apply knowledge and skills and, where relevant, demonstrated personal attributes.

2.2 Contamination

Contamination is the undesirable introduction of substances or trace materials to exhibits at any point within the forensic science process.

2.3 Contract

A contract may be any written or oral agreement to provide forensic services.

Note: a contract does not necessarily involve payment for the services and may be mandated by law and may need to be in accordance with local, regional or national legal requirements.

2.4 Court Statement

A court statement is a written report of the results and interpretations of forensic tests/examinations submitted to the court. Such reports may be in a format prescribed in legislation and may also be in electronic format. In addition, statements may be submitted to law enforcement investigators, members of the judiciary and other interested parties.

2.5 Critical findings

Observations and results that have a significant impact on the conclusion reached and the interpretation and opinion provided. In addition, these observations and results cannot be repeated or checked in the absence of the exhibit or sample, and/or could be interpreted differently.

2.6 Customer

The customer is normally the organization and/or a person asking the forensic unit to perform all or a specific part of the forensic science process. This also includes the term 'client'. This may be an internal customer. If work is requested via legal mandate (e.g. court order) or if the results of examination/testing are to be provided to a member of the judicial system, then the judicial system may be considered to be the customer.

2.7 Equipment

Equipment refers to all tools, instruments, software, reagents and chemicals that are used as part of the forensic science process which need to be monitored and controlled.

2.8 Examination/Test

Examination/test has been used in this document to refer to sampling, analysis, visual inspections, comparisons, interpretations and opinions.

2.9 Exhibit

An exhibit is an item or sample recovered as part of an investigation. This includes everything recovered in the forensic science process including swabs, whole objects, and debris and may include derived items like casts of footprints, finger mark lifts. Exhibits may sometimes be referred to as 'evidence'.

2.10 Facility

Facility is any physical environment used to protect the integrity of exhibits, conduct testing, or support any other aspect of the forensic science process, for example, permanent premises, offices, tents, storage area, mobile office, mobile laboratory, vehicles of the forensic unit.

2.11 Forensic unit

A forensic unit is a legal entity or a defined part of a legal entity that performs any part of the forensic science process.

2.12 Impartiality

Actual and perceived presence of objectivity.

Note 1: Objectivity means that conflicts of interest do not exist or are resolved so as not to adversely influence subsequent activities of the forensic unit.

Note 2: Other terms that are useful in conveying the element of impartiality are: objectivity, independence, freedom from conflicts of interest, freedom from bias, lack of prejudice, neutrality, fairness, open-mindedness, even-handedness, detachment, and balance.

2.13 Investigator

A person, however named, trained to perform scene of crime examinations and/or investigations. Other names used for this function are, for example, Scene of Crime Officer, Crime Scene Investigator, Scene of Crime investigator and Scene of Crime Examiner.

2.14 Non-conforming examination and testing

Non-conforming examination and testing refers to any aspect of the forensic unit's work, including, scene examination, laboratory examination, sampling, testing, results or expert witness testimony that do not conform to the forensic unit's policies, procedures or the agreed requirements of the customer. Examples are using equipment that is out of specification, misidentifying a drug or incorrectly interpreting a blood pattern.

2.15 Objective Examination / Test

An objective examination/test is an examination/test which, having been documented and validated, is under control so that it can be demonstrated that all appropriately trained staff will obtain the same results within defined limits. These defined limits relate to expressions of degrees of probability as well as numerical values.

Objective examinations/tests will be controlled by:

- ◆ documentation of the examination/test
- ◆ validation of the examination/test
- ◆ training and authorisation of staff
- ◆ maintenance of equipment

and where appropriate by:

- ◆ calibration of equipment
- ◆ use of appropriate reference materials
- ◆ provision of guidance for interpretation
- ◆ checking of results
- ◆ testing of staff proficiency
- ◆ recording of equipment/test performance

Visual inspection, qualitative examinations, comparative examinations and computer simulations are included in the definition of objective examination/test. In this document the word examination or test refers to an objective examination or test.

2.16 Reference Collection

Reference collection is a collection of stable materials, substances, objects or artefacts of known properties or origin that may be used in the determination of the properties or origins of unknown items.

2.17 Reference Material

A reference material is a material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.

2.18 Sampling

Sampling is a defined process whereby a part of a substance, material or product is taken to provide for testing of a representative sample of the whole. The process should be based on statistically valid techniques, where possible. A sample is a portion drawn from a population for the purpose of examination/testing to determine the attributes of the whole. In forensic science, 'sample' is also used to describe physical objects collected as exhibits, or sub-sets of these. These exhibits may be collected using criteria other than conventional statistical criteria, for example, samples collected at a scene of crime. In this document the term sampling will be used for both purposes.

In order to identify the samples that need to be taken, and the sequence of performing different sampling, a sampling strategy, sampling plan and sampling procedures are required.

The sampling strategy is the overall approach to sampling.

The sampling plan is the method of implementing the sampling strategy.

The sampling procedure is the method used to retrieve the sample.

2.19 Scene of crime

The term ‘scene of crime’ is used to identify a scene of incident prior to establishing whether a criminal or illegal action has taken place or not. The scene of crime is not solely restricted to the location of the incident (primary scene of crime), but also includes areas where relevant acts were carried out before or after the incident (secondary scene of crime). In addition to the obvious scenes of crime this may also include accident investigations, suspicious fires, vehicle accidents, terrorist attacks, and disaster victim identification.

Note: The forensic science process is not restricted to situations in which the incident and purpose refer to the investigation of a crime. Other examples include civil litigation, parentage determination, environmental protection and control of gaming and other gambling-related activities. Where applicable, a victim could also be considered as a scene of crime.

2.20 Subcontractor

A subcontractor is a legal entity that is not part of the forensic unit and that is contracted to do work for the forensic unit within the subcontractor’s own legal entity and under the subcontractor’s own management system.

2.21 Testing

Testing is used in the document when there is an activity including measurements and analytical techniques.

2.22 Validation

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

3. General guidance common to all activity modules in the forensic science process

3.1 Document control

The requirements for the accessibility and control of documents apply to permanent facilities and also to all sites or locations where work is performed, e.g. scene of crime.

3.2 Complaints and Appeals

Responses to any complaints, appeals or opportunities for improvement shall include examination of the potential impact on any work that has been undertaken by the forensic unit. In the event that it is shown that there could have been an impact on any work this shall be dealt with through the non-conforming work process.

Note: The term “appeal” in this document should not be confused with the use of “appeal” in a legal sense. Appeals and the appeals process in the context of this document is an internal process of the forensic unit whose result is being appealed against. The decision on the appeal remains that of the forensic unit that is being appealed against, and does not require a hearing or decision on the appeal by some external agency or court.

Complaints may be received from many sources including customers, victims of crime, police forces, other departments within the same organization e.g. laboratory, scene of crime unit, law enforcement investigation unit and the judiciary.

In addition, when a court decision is successfully challenged and this reflects on any work performed by the forensic unit this shall be handled through the corrective action process or other improvement processes.

3.3 Competence

The forensic unit shall have a policy that ensures all staff working in the forensic unit are competent to perform the work required.

The management system shall define each role in the forensic unit and its limitations and specify requirements for qualifications, training, experience and knowledge for the tasks assigned to each role. Having qualifications, training and experience neither guarantees practical competence nor sound judgement. Therefore, management or responsible persons shall be able to demonstrate with objective evidence that all personnel are competent, by carrying out assessments of their knowledge and skills against defined criteria.

The forensic unit shall ensure that temporary staff are competent and work in accordance with the unit’s management system (also see 2.20 Subcontractors).

In assessing the competence of an individual the forensic unit shall ensure that where appropriate staff have relevant understanding of the technology behind the crime e.g. firearms, and the technology used to investigate the crime e.g. fingerprints, DNA profiling, blood pattern analysis. They shall also have sufficient competence and experience to recognize the significance of anything unusual, for example, a staged burglary or altered exhibits.

Training shall follow an up-to-date, defined training program and the assessment of competence shall take place at every level of professional development for the person involved. Where test or technique specific training is given, acceptance criteria shall be assigned to demonstrate the effectiveness of the training e.g. observation of the relevant examinations/tests or analyses by an experienced officer, satisfactory performance in the analysis of quality control/quality assurance samples, correlation of results with those obtained by other trained staff. Where necessary, training programs should also include training in the presentation of evidence in court.

The assessment of competence may take a variety of forms, dependent on the task(s) performed e.g. written and / or oral examinations; practical exercises; or direct observation by a qualified person. In many cases, some combination of competency assessment will be the most appropriate approach.

Each forensic unit shall maintain an up-to-date record of the training that each member of staff has received. These records shall include academic and professional qualifications, external or internal courses attended and relevant training (and retraining, where necessary) received whilst working in the forensic unit. Records shall be sufficiently detailed to provide evidence that each member of staff has been properly trained and that their competence to perform a task or test has been formally assessed. These records should be retained for an appropriate defined period according to the expectations of the customer and / or the legal system.

A procedure shall be in place for introducing employees into the forensic unit, and should define the training and the supervision required. This procedure or process may vary depending on the ability, qualifications and experience of those being trained. An individual's training programme shall be based around their expertise, specialist knowledge and their experience.

The forensic unit shall also have procedures for the on-going training and maintenance of competence, skills and expertise.

When employing staff from another organization (including a forensic unit) their competence shall be verified by the forensic unit.

3.4 Additional considerations relating to personnel

A Code of Conduct (however named) for the forensic unit should be in place that addresses ethical behaviour, confidentiality, impartiality, personal safety, relationship with other members of the forensic unit and any other issues needed to ensure appropriate conduct of all staff. The Code of Conduct should also be applicable to all personnel, permanent, temporary and contract personnel.

3.5 Records

The forensic unit shall have documented procedures to create and maintain records relating to each case under investigation. The information that is to be included in case records shall be documented appropriately and may include, but not be limited to, records of any communication with the customers (verbal or written), contract review, examination and testing requested and agreements with customer, exhibit receipts, descriptions of exhibits including packaging and seals, subpoenas, records of observations and test/examination results, reference to procedures used, diagrams, print-outs, photographs, videos.

The records required to support conclusions shall be such that in the absence of the original member of staff, another competent member of staff could evaluate what had been performed, interpret the data and if necessary repeat the activity.

The records shall be sufficient to provide an auditable trail.

The recording method chosen will depend on the aspect of the forensic science process being carried out at the time. Records can be obtained by e.g. drawing or writing, photocopies, computer, sound recording, voice recording, photographs, video, 3D laser scanning.

It is not always possible to preserve potential evidence, for example, if it is necessary to remove part of a blood pattern for DNA analysis. In such a situation, the potential evidence shall be documented and/or measured using suitable recording techniques prior to its removal.

Records of observations shall be made at the time of the examination or as soon as practicable thereafter, and these shall include, where relevant, who carried out the scene of crime investigation, date, location, sampling, examination/testing results, quality checks and conditions of examination/testing. Where instrumental analysis is conducted, operating parameters should be recorded. It shall be clear from the case record who has performed each stage of the process, when e.g. relevant date(s) and what was examined.

Any changes made to records should be retained so the original information can be reviewed whether this is in hard copy form or electronic. When a test or examination result is rejected, the reason(s) shall be recorded, along with the date and an identification of who has rejected the result.

The forensic unit's retention policy shall consider the legal requirements and customer expectations of the applicable economy or region.

Manual calculations and data transfers that do not form part of a validated electronic process should be checked by a second person. The case record should include an indication that such checks have been carried out, by whom and when.

Each page of every document in the case record should be traceable to the case. There should be a mechanism by which the integrity of the documentation is maintained. This means, for example, that it should be easy to detect if a document is added to the file at a later date or goes missing from the file.

Hard copy records generated by the forensic unit, used as part of the case file, should be paginated using a page numbering system that indicates the total number of pages.

'Chain of custody' records that detail each person or organization that takes possession of an item/exhibit shall be maintained from the receipt of the items/exhibits through processing to storage and where applicable to return to submitting client, or disposal. The acceptable definition and procedure for 'chain of custody' needs to be adapted to the legal provisions of each country. Any transfer of material shall be recorded. Records relating to the chain of custody shall be retained in accordance with the requirements for other case records.

Electronic equivalents of handwritten initials or signatures are acceptable provided the forensic unit can demonstrate that the electronic initials or signature can only be applied by the individual represented by the electronic initials or signature.

If records are stored electronically a mechanism should be in place to prevent files/data being removed and in addition there should be a way of knowing which records are to be stored in which locations.

In general, records should be made in a permanent manner; for example, handwritten notes should be in permanent ink. Exceptions can be made when environmental conditions prevent the use of ink. In addition it may be appropriate to make diagrams and tracings in pencil, including coloured pencils.

Where technical abbreviations are made in records, these abbreviations should be clearly defined and readily understood.

3.6 Health and safety

The forensic unit should provide all personnel with a safe environment, including the adoption and use of a documented health and safety program. The health and safety program should consider and cover work carried out in the forensic unit's permanent facilities, at sites away from its permanent facilities, or in associated temporary or mobile facilities.

3.7 Internal audits

The internal audit program shall, where relevant, include scene of crime investigation activities, examination/testing activities, interpretation process, and reporting.

The evaluation of the implementation of the forensic unit's procedures shall include direct observation of the examinations and testing undertaken on-site or in the laboratory.

3.8 Witnessing scene of crime activities

The forensic unit should have a witnessing program to ensure that the persons working in the organization have the competence required of them.

Factors to be considered when deciding on the approach to be taken to witnessing include, but are not limited to:

- ◆ The degree of complexity of a particular scene in order to confirm competence
- ◆ Frequency of attendance at different scenes
- ◆ Scope of accreditation
- ◆ Experience of the personnel
- ◆ Frequency at which a suitable scene appears, for example terrorist incidents. Scenes which are infrequently encountered may require other means by which to confirm competence, e.g. mock incident or other types of simulations.
- ◆ Other activities which take place for the purpose of confirming competence

The person who performs the witnessing shall have the appropriate competence.

Witnessing should not only cover the procedural part of the work but also go into the depth of the technical competence of the staff and their ability to take relevant decisions at the scene of crime.

3.9 Non-conforming examination and testing

The forensic unit shall have policies and procedures to identify non-conforming work and, in addition, policies and procedures that are implemented when non-conforming work is identified. Ongoing monitoring can be carried out in a number of ways, e.g. by

peer review, proficiency tests and collaborative exercises, auditing and customer complaints.

Initially the significance of a non-conformity in relation to the validity of examination or test results shall be evaluated and its root cause identified. This shall include thoroughly investigating the review of casework already reported. The policies and procedures shall ensure that there are designated defined responsibilities for the management of non-conforming work and actions that shall be taken. This may include withdrawing or withholding test reports, informing the customer, halting examination and testing, re-testing or re-examination, modifying the procedures or methods or re-training.

The corrective action once identified and approved shall be implemented promptly. The designated authority shall then decide when work can resume. It is important to ensure that non-conforming work is effectively identified and associated corrective actions are implemented in all relevant areas of the forensic unit.

Where it is found that the forensic unit has issued a report containing non-conforming work that is deemed to significantly affect the result, the customer shall be notified immediately, the work or report recalled (where possible) and additional work or report issued by the forensic unit.

Where it has been identified that the non-conforming work could recur, appropriate corrective action shall be implemented. This shall include the potential review of casework already reported prior to the non-conforming work being identified and implications for other cases and other sections in the forensic unit as well as implications for the forensic unit's own internal policies and procedures.

The non-conforming work and all actions taken shall be recorded.

3.10 Methods and method validation

All methods shall be fully documented including procedures for quality control, and, where appropriate, the use of reference materials.

Irrespective of whether the forensic unit implements ISO/IEC 17025 or ISO/IEC 17020, methods of examination/testing shall be fit for purpose. In demonstrating this, the forensic unit will need to refer to appropriate validation / verification data.

Validation studies are required for all methods including comparative methods. Validation studies can be conducted by the scientific community (as in the case of standard or published methods) or by the forensic unit itself (as in the case of methods developed in-house or where significant modifications are made to previously validated methods).

When developing their processes, forensic units shall show with objective evidence that they have assessed the factors that can influence the results and have recorded these. Examples of such processes are the strategy building process when arriving at the scene of crime, protection and preservation of exhibits, identification of relevant exhibits, and the interpretation process. The purpose of this is to ensure reproducibility and repeatability of the process thus ensuring that different persons arrive at compatible results.

When a method has been validated in another organization the forensic unit shall review validation records to ensure that the validation performed was fit for purpose. It is then possible for the forensic unit to only undertake verification for the method to demonstrate that the unit is competent to perform the test/examination. Any validation/verification procedure conducted in-house shall be documented and validation/verification records shall be kept.

Where practicable, technical procedures used by a forensic unit shall be validated or verified before being used on casework or applied at a scene of crime. An instance of when this would not be practicable would be when a new substance is found, for example, a new drug. In any circumstance the technical procedures used shall be validated or verified before any results are reported. Methods may be validated by comparison with other established methods using certified reference materials (where available) or materials of known characteristics. In validating test methods, the following issues (among others) may need to be determined, as appropriate, for example, if the method is quantitative or qualitative:

Scope of the method

- ◆ Intended purpose and limitations

Sampling

- ◆ sampling strategy

Sample preparation

- ◆ sample homogeneity

Testing

- ◆ accuracy
- ◆ precision
- ◆ measurement uncertainty
- ◆ matrix effects
- ◆ interference
- ◆ limit of detection
- ◆ limit of quantification
- ◆ linearity range
- ◆ stability of measured compounds
- ◆ specificity and selectivity
- ◆ repeatability
- ◆ reproducibility
- ◆ robustness

Interpretation

- ◆ Reproducibility
- ◆ Robustness
- ◆ Performance characteristics
- ◆ Hypothesis and/or scenarios
- ◆ Databases
- ◆ Statistical Evaluation
- ◆ Limitations of conclusions
- ◆ Scientific Literature

Interpretations of results and findings shall be based on robust studies and documented procedures. In cases where no robust studies are available, the interpretation shall at least be supported by a documented body of evidence (records).

Forensic units should have a procedure to identify infrequently performed examinations/tests. For these examinations/tests, there are two methods of demonstrating competence, either of which would be equally valid. These are:

- ♦ regular use of control samples and control charts even when casework samples are not being analysed; or
- ♦ re-verification before the examination/test in question is performed on a casework sample involving at least the use of an appropriate reference material, followed by replicate examination/testing of the real sample.

3.11 Environmental conditions

The environmental conditions within laboratory premises, or any location where examinations and testing are performed, shall be defined if the conditions are critical for the outcome of the results. The specified conditions shall be monitored and recorded.

Special care is needed in forensic units involved in the determination of trace levels of materials, for example DNA and gunshot residue analysis. Physical separation of high-level and low-level work, for example, bulk and trace drugs, is required as is a high awareness of contamination issues by all the personnel in the forensic unit. Appropriate personal protective equipment shall be worn to ensure exhibits and personnel are protected. Access to laboratory facilities with special requirements concerning contamination issues shall be restricted and controlled. Environmental monitoring could be necessary for equipment, work areas, clothing and consumables.

Where possible the forensic unit should be able to identify potential contamination and its sources. This may require collecting background information which can be searched against if unusual results are obtained (e.g. DNA/Fingerprint/Footwear database of staff/visitors).

The access to the scene of crime should be controlled. The effects of the environmental conditions shall be considered to avoid loss or deterioration of exhibits. When significant environmental conditions are not possible to control, e.g. weather conditions at a scene of crime, the actual conditions shall be recorded.

Exhibit integrity shall be a key consideration throughout the forensic science process. The storage conditions shall be such as to prevent loss, deterioration and contamination and to maintain the integrity and identity of the exhibit. Where perishable items are stored any degradation of the samples shall be minimised.

3.12 Equipment, equipment records, reference collections and consumables

Equipment

The forensic unit shall operate a program for the maintenance and calibration of critical equipment used; this shall allow for the demonstration of measurement traceability, where appropriate.

Equipment which influences the quality of the examination and testing shall be labelled or in other ways identified. Equipment may be owned by the laboratory, borrowed,

rented, hired, leased or provided by another source. The responsibility for the calibration status and overall suitability of the equipment used lies solely with the forensic unit.

Where software is used it shall be demonstrated as being fit for purpose. This may be a verification check of the software functionality, for example, the use of a spreadsheet to calculate values, or could be as part of the more wide reaching validation of the forensic science process in which the software is used, for example, the use of databases for matching specific characteristics.

The forensic unit shall have written policies and procedures defining the conditions under which equipment can be used. Policies and procedures shall also be in place for the use of disposable equipment to ensure that such equipment does not contribute to contamination through misuse or re-use.

The facilities and equipment shall only be used by authorised personnel. Where equipment not under the direct control of the forensic unit is used, the unit shall verify that the equipment meets all relevant requirements before each use. Typical measures would include visual inspection, functional checks and/or re-calibration. The verification procedure shall be documented and verification records shall be kept.

Some pieces of equipment used at the scene of crime have self-checks, some are not subject to effects of transportation and require only verification and others may require use of a reference material that validates the calibration and function status as shown to be satisfactory. Verification of equipment performance shall be conducted by staff with the recognized competence to operate and verify the equipment.

Equipment records

Records shall be maintained of each item of equipment and its software significant to the examinations / tests performed.

It is expected that the records held by all forensic units would be in accordance with the requirements specified in ISO/IEC 17025 5.5.5

Reference Collections

Reference collections of data or items/materials representative of those encountered in casework which are maintained for identification, comparison or interpretation purposes e.g. mass spectra, motor vehicle paints or headlamp lenses, drug samples, typewriter print styles, wood fragments, bullets, cartridges, DNA profiles, frequency databases shall be fully documented, uniquely identified and properly controlled.

Consumables

The quality of reference materials and reagents shall be fit for purpose for the procedure used. Lot/batch numbers of reference materials and critical reagents shall be recorded. All critical reagents shall be tested for their reliability.

Reference materials and reagents should be labelled with:

- ◆ name;
- ◆ concentration, where appropriate;
- ◆ preparation date and/or expiry date;
- ◆ identity of preparer;
- ◆ storage conditions, if relevant;
- ◆ hazard warning, where necessary.

The forensic unit shall define and document its policies and procedures for the selection and use of purchased external services, equipment and consumable supplies that affect the quality of its service. There shall be procedures and criteria for inspection, acceptance/rejection and storage of consumable materials, for example, consumables used at the scene, during analysis and personal protective equipment.

Appropriate quality records of external services, supplies and purchased products shall be established and maintained for a period of time, as defined in the management system. This system shall include the recording of lot numbers of all relevant reagents, control materials and calibrators, the date of receipt and the date the material is placed in service.

4. Activity modules in the forensic science process

This section identifies the different activities in the forensic science process as separate modules and gives guidance which can be applied independent of whether ISO/IEC 17025 or ISO/IEC 17020 is being implemented. See Annex C for a correlation chart.

It is acknowledged that the modules described here may seem to describe a time line. However, this is not necessarily the case and the order in which activities are performed will vary depending on the circumstances, and some may be repeated.

4.1 Initial discussion regarding scene of crime attendance

This is the stage when the forensic investigator receives an assignment. At this stage the forensic investigator will need to receive specific information from the 'customers' and may also need to give instructions to the 'customers'. This is also the stage when the forensic unit assigns clearly defined authority and responsibility for scene of crime investigation and each individual scene. Aspects of the standards, which may be involved here, are contract review, subcontracting and appointing responsible persons.

4.1.1 Contract review

Due to the nature of the scene of crime investigation the scope of an assignment is not always clear before the investigation has been started.

It is the responsibility of the forensic unit to make sure that any work it undertakes is within its scope of competence.

The forensic unit should have a system that ensures that upcoming assignments are reviewed promptly and either managed appropriately or, where necessary, rejected according to defined policies and procedures.

When deciding on the scene of crime investigation process the following issues shall be considered:

- ◆ The required expertise and technical knowledge of investigators.
- ◆ The extent and particular conditions of the assignment in question, insofar as these are available and understood, to enable clear instructions to be issued.

- ◆ The use of suitable resources, facilities and equipment.
- ◆ Ongoing monitoring by the forensic unit of its assignments and tasks.
- ◆ Monitoring of completed assignments or tasks to ensure they fulfil the requirements and have been carried out correctly.

For routine or repeat work requests, review may be limited to considerations of time and human resources and an acceptable record in such cases would be a signed acceptance by an appropriately authorised person.

For any specific scene the following aspects shall be considered:

- ◆ jurisdiction
- ◆ integrity of the scene of crime
- ◆ environmental conditions
- ◆ need for any special equipment or special competencies
- ◆ health and safety issues
- ◆ size and complexity of the scene(s) of crime and need for additional resources
- ◆ assignment of responsibility for one scene of crime and coordination responsibility for several

In situations where verbal agreements are acceptable, the organization shall keep a record of all requests and instructions received verbally, dates and the identity of the customers' representative.

The return or disposal of exhibits and retained materials shall be agreed with the customer and recorded in writing. Any variation from what has been agreed during the initial contract review shall be recorded.

4.1.2 Instruction to the customer

In some circumstances, it may be appropriate for the forensic unit to give some instruction to the customer on how best to preserve the scene of crime. However, the amount of knowledge concerning the scene of crime at hand may be very limited and therefore it may be difficult to give exact instructions.

4.1.3 Subcontracting and other technical support

Forensic units encounter situations where additional resources are needed. The needs may be met by the use of contracted or other technical support personnel or subcontracting the work.

In all cases where contracted or other technical support personnel are engaged the forensic unit shall provide evidence of their competence for their assigned tasks.

In all cases of subcontracting, the forensic unit shall provide appropriate evidence of the subcontracted body's competence, such as accreditation certificate or records of evaluation performed by qualified personnel according to appropriate procedures.

4.1.4 Assignment of responsibility

The forensic unit shall have a clear policy and procedure for appointing and assigning personnel with the responsibility for the scene of crime investigation. An appropriate competent person, however named, shall be assigned as responsible for the case depending on:

- ◆ legislation/policy,
- ◆ type of crime: volume crime versus major crime,
- ◆ the character of the case, the complexity or other conditions at the scene.

The principal responsibility for each scene of crime investigation rests with the investigator assigned to be in charge of the case, which shall be documented in the case file. At all stages responsibilities shall be clearly identified, in particular if personnel from different organizational units are involved.

4.2 Undertaking initial actions at the scene of crime

This is the stage when the forensic unit arrives at the scene of crime and takes action to protect the integrity of the scene of crime and to assess it.

4.2.1 Initial discussions at the scene of crime

The discussions at the scene of crime will be held with the appropriate people depending on the legal system in the country, for example police, medical examiner, judge, magistrates, prosecutors.

If the initial visit at the scene shows that the assumptions of the contract review were not fully in line with the situation at the scene then the relevant steps of the contract review may need to be repeated.

4.2.2 Coordination with other forensic units or subcontractors

The forensic unit may not always have the specific competence or the capacity to perform all of the necessary examinations / tests. In that case it may need to use other resources than its own. These may, for example, be other forensic units or experts from other forensic units. In these cases there may be need for coordination of all resources involved in the scene of crime investigation.

In that case the following should be considered:

- ◆ coordination of sequence of activities to maximise exhibit protection
- ◆ prevention of contamination or cross-contamination of exhibits
- ◆ clarification of roles and responsibilities.

4.2.3 Control and preservation of the scene of crime

Maintaining the integrity of the scene and evidential items within it is essential. Personal protective equipment, such as wearing gloves and face masks, and limiting access to personnel with examination and testing duties, are examples of steps taken to prevent contamination, and the use of tents to protect from rain is an example of preventing degradation.

However, the procedures that are implemented to maintain scene integrity depend on the nature of the crime and its scene. Volume crime scenes, such as burglaries, can be processed by an investigator with only basic protective equipment and without the need for access control, but large outdoor scenes may require more demanding perimeter control and procedures for recovery and preservation of evidence than is the case with indoor scenes.

The scenes of what are generally referred to as ‘major crime’ such as rape or murder require stringent attention to control and preservation. Access to the scene of crime should be controllable and limited, achieved by creation of at least one access cordon; in some cases a second inner cordon may be used. A record should be retained of all persons entering and leaving the scene of crime. All personnel entering the scene shall wear personal protective equipment that ensures that they do not contaminate the scene. The forensic unit shall dispose of relevant items used or worn at the scene of crime in a timely manner, to ensure that exhibits recovered from other scenes of crime are not compromised.

If the crime scene is not controlled by the customer, and it is not possible to be controlled by the forensic unit, any issues with security and uncontrolled access should be recorded in the examination notes.

4.3 *Developing a scene of crime investigation strategy*

This is the stage where the strategic plan will be determined and this may encompass the following questions:

- ◆ what has happened?
- ◆ where did it happen?
- ◆ when did it happen?
- ◆ how did it happen?
- ◆ who was involved?
- ◆ why did it happen?

The forensic unit shall determine what constitutes the scene of crime it is assigned to investigate and aim at determining the requirements of the investigation. It will also have to decide on the techniques/equipment required, determine the samples that need to be taken and then decide on the sequence of sampling and/or examination. All these aspects shall be recorded.

4.3.1 *Determine the crime type*

The determination of the type of the crime has normally been decided by the customer before the forensic unit is assigned to conduct the investigation.

The forensic unit should have a policy that will indicate different levels of scene of crime investigation in relation to the type of crime, such as to distinguish between ‘volume crime’ and ‘major crime’ or using other kinds of designation. This policy should include a written indication of the required competencies, methods, equipment, techniques and resources depending on the type of crime.

4.3.2 *Assessment of the scene and determining the requirements of the investigation*

Once assessment of the scene of crime has been performed, which includes any discussions with the law enforcement investigator or first responder, it is acceptable that the forensic unit may determine a different scope of investigation than what was initially defined (see 4.4.1 in this document). In that case, this shall be clearly recorded, clarified and, where appropriate, authorised by the customer. At this stage a search pattern may need to be decided.

4.3.3 *Sampling*

Sampling in this context includes the selection, recovery, and prioritization of materials for examination / analysis from scenes of crime. Typically sampling is carried out for a number of reasons including the following: selection to target potential evidence; units too large to be submitted to the laboratory as a whole item; to answer relevant questions by examination of a portion of the population; to minimise the total number of required analytical determinations while assuring that all relevant legal and scientific requirements are met.

In order to identify the samples that need to be taken, and the sequence of performing different sampling and/or examinations/tests, a sampling strategy, sampling plan and sampling procedures are required.

In determining the sampling strategy, sampling plans and sampling procedures to be used the following factors should be considered:

- ◆ The background information available
- ◆ Prioritising the question(s) that need to be answered
- ◆ The generation of relevant hypotheses and their refinement throughout the scene of crime investigation
- ◆ The type of forensic examination/testing that is relevant
- ◆ The need to employ statistical sampling
- ◆ Any special considerations to be taken into account such as weather, health and safety considerations, location of exhibit, possibility of contamination, possibility of exhibit being tampered with, interference with other exhibits, lack of homogeneity of the sample etc.
- ◆ The necessity to sequence the sampling that is to take place, for example, if you have a fingerprint in blood is it necessary for the fingerprint examiner to examine the print first prior to removing the blood for DNA profiling
- ◆ The necessity to consult all relevant experts/ personnel
- ◆ The necessity to establish an interagency strategy to ensure appropriate samples are taken
- ◆ Legal requirements
- ◆ Policies of the organization

When sampling at scenes of crime, emphasis is placed on the competence of the staff. Therefore the training and competence of staff in these activities is of prime importance. All aspects of sampling at scenes of crime shall be covered during training, and competence assessed initially and on an on-going basis.

When a forensic unit is working under the direction of another organization, which has already undertaken the sample strategy and plan then the forensic unit needs only to follow its own sampling procedure.

4.3.4 *Determine the facilities and techniques/equipment required*

The forensic unit shall have policies and procedures to ensure that they have the appropriate equipment, facilities and techniques available. In determining this, the following should be considered:

- ◆ The scene of crime location: interior or exterior
- ◆ The condition of the exhibit: either fragile or stable
- ◆ Weather conditions that might affect the scene of crime or exhibits within
- ◆ Scene of crime management considerations which may alter or contaminate the exhibit
- ◆ Additional processing techniques that may need to be conducted at the scene of crime with specialized personnel.

The policy and procedure should also include the actions needed when it is determined that the forensic unit could not perform the requested scene of crime service.

4.3.5 *Coordination with other forensic units or subcontractors*

A forensic unit with primary responsibility for a scene of crime may find it necessary, in some circumstances, to solicit the support of other forensic units or subcontractors to adequately process a scene of crime. Coordination among forensic units and/or subcontractors is absolutely essential to ensure the integrity of the scene and the value of all exhibits from the scene. A clearly designated representative of the primary forensic unit responsible for the scene of crime should be assigned overall responsibility for the scene of crime and for coordinating the work completed by any other forensic units or subcontractors.

Any forensic unit or subcontractor responding to a scene of crime should first inquire about the involvement of any other forensic units or subcontractors. If any are identified, communications should occur with the other forensic units or subcontractors before any scene of crime activity commences.

The integrity of the scene of crime, the chain of custody of exhibits gathered from the scene of crime, and the unintentional destruction of available exhibits are all important considerations in coordinating the efforts of multiple forensic units or subcontractors.

4.4 *Undertake scene of crime investigation*

This is the stage where:

- ◆ the scene of crime is documented,
- ◆ the scene of crime is searched/examined,
- ◆ on-going interpretation of the scene of crime takes place,
- ◆ exhibits are recovered, labeled, documented and collected,

- ♦ samples are taken, sampling is recorded,
- ♦ strategies and plans may be reviewed.

4.4.1 *Scene of crime investigation procedures*

The forensic unit shall conduct scene of crime investigations in accordance with the processes and procedures stipulated in their management system.

In certain circumstances, the customers provide additional or background information, which should be considered or explicitly examined at the time of the scene of crime investigation. If such additional or background information is used, the information shall be recorded.

Before exhibits are recovered, the forensic unit should consider the conditions encountered on-site to ensure that the exhibits can be recovered and documented with as little disruption as possible. Where necessary and depending on the technical options, the exhibits are prepared for the sample taking process. Consideration should be given as to the sequence in which samples are taken.

4.4.2 *Documentation of the scene of crime*

Documentation of the scene of crime shall be made before the examination starts and throughout the investigation. Documentation can be made, for example:

- ♦ in writing or drawing,
- ♦ by voice recording,
- ♦ by photographs,
- ♦ in video or
- ♦ 3D laser scanning.

4.4.3 *The scene of crime examination*

This includes the following steps:

- ♦ Search
- ♦ Locate
- ♦ Assess relevance
- ♦ Document
- ♦ Collect
- ♦ Identify (label)
- ♦ Preserve and protect
- ♦ Package
- ♦ Transport

All conducted activities, observations, findings and conclusions reached during the scene examination shall be recorded. The records shall be sufficient so that another competent person could understand and evaluate the scene of crime examination.

The forensic unit should perform a search pattern according to a structured procedure, at least in the area of major crime. Records of this should be maintained.

The collection of exhibits shall be conducted in accordance with the processes and procedures in the management system.

The collected exhibits shall be clearly and uniquely identified to enable systematic evaluation. Exhibits collected and the locations at which they were found shall be documented or characterised using suitable procedures e.g. measurements, plans, diagrams, photography, photogrammetry, so that the exhibits can be identified at all times and the locations at which they were found can be determined. The identity for exhibits shall correlate with the report.

Appropriate precautions and procedures are required and shall be observed when dealing with potentially dangerous substances and items. For legal purposes, the forensic unit shall maintain a 'chain of custody record' for exhibits whilst under its control. This record shall detail each person or organization who takes possession of an exhibit or alternatively the location of that exhibit (e.g. if in storage).

The acceptable definition and procedure for 'chain of custody' should be adapted to the legal provisions of each country. The forensic unit shall take appropriate precautions to ensure that the identified exhibits taken for further examination are recovered, stored and transported without loss or contamination (from the environment, weather, people etc.).

Normally, it would be expected that forensic personnel will continually review the plan and strategy for the scene of crime investigation. Any revisions shall be recorded.

4.4.4 Testing

See also guidance in 3.12 of this document, generic guidance to equipment.

The forensic unit may be undertaking testing, including but not limited to quantitative measurements and presumptive or screening tests, as part of a scene of crime investigation. If the unit is accredited to ISO/IEC 17025 then relevant requirements are covered in that particular standard. However, if a body is accredited to ISO/IEC 17020 and its inspection activity contains testing then it should meet the relevant requirements of ISO/IEC 17025.

4.4.5 Equipment used at a scene

Some examples of portable equipment used at the scene that needs calibration or checking according to a prescribed maintenance program before taken to the scene are the following:

- ◆ Digital cameras (white balance calibration),
- ◆ Electrostatic lifters (dust print lifters),
- ◆ Forensic light sources, for example for detecting biological evidence etc. (UV and IR light sources),
- ◆ Detectors for gas, explosives, fluids/accelerators,
- ◆ Laser telemeter, rulers, micrometers and measurement devices for recording distances and dimensions,
- ◆ Thermometers,
- ◆ Soundmeter,

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- ◆ GPS for site identification/logging,
 - ◆ Calliper,
 - ◆ Photo ionization detector,
 - ◆ Data-loggers used for recording weather information (for palynology and entomology).

Some examples of critical consumables that shall be tested for their reliability at the scene before use are the following:

- ◆ Test kits for: blood e.g. peroxidase tests, semen e.g. acid phosphatase, drugs e.g. Marquis,
- ◆ Detecting and enhancement chemicals e.g. Luminol, Leuco Crystal Violet.

The result of the test shall be recorded.

Equipment in mobile laboratories used at the scene shall meet the same requirements as equipment in stationary laboratories.

4.5 *Assess scene of crime findings and consider further examination*

This is the stage where the forensic unit determines if the purpose of the examination has been fulfilled, if further examination is necessary and is possible or whether the scene of crime examination has been completed. At this stage the forensic unit will also decide whether samples need to be sent away for further examination and testing.

4.5.1 *Review scene of crime finding in the context of the request and the strategy*

Abnormalities and irregularities are findings and observations at the scene of crime that do not fit into the general expectation of the scene of crime, for example, attendance at a theft of a motor vehicle and the discovery of a body in the back of the car. Irregularity of an exhibit could be that an exhibit is missing, that there is an unsealed exhibit or that there is doubt as to the suitability or integrity of the exhibit.

Abnormalities or irregularities at the scene of crime which are shown to or identified by the investigation team, shall be recorded and should be clarified before the scene of crime investigation itself commences. These could influence the subsequent direction of the investigation or require an on-site procedure which differs from the standard management system procedures. If doubts arise as to whether the exhibit can be properly recovered in the conditions encountered, before the investigation activities commence, the superior body (e.g. court, judge, prosecutor) or the customer should be consulted about whether and how the available resources should be used.

4.5.2 *Determine what should be examined further*

Includes coordination with:

- ◆ Subcontractors,
- ◆ different law enforcement agencies,
- ◆ other organizations e.g. the medical examiner giving and receiving information.

It may also cover collecting information through other sources like the mobile phone companies, CCTV, collecting samples from potential suspects or from victims, and tests for the purposes of elimination.

4.5.3 *Subsequent laboratory examination/tests*

This is the stage when the forensic unit determines where the exhibit will be sent depending on the type of examination/test to be performed.

The forensic unit shall ensure that the identified exhibits taken for further examination/test are recovered, stored and transported without contamination (from the environment, weather, people etc.), deterioration and with due regard to the integrity and the chain of custody of the exhibits. Where perishable items are handled any deterioration of the items shall be minimised.

4.6 *Interpret and report findings from the scene of crime*

This section refers to any interpretation and reporting of results, which may take place directly after the scene of crime investigation.

The report should contain all the results of examinations/tests and observations as well as the findings and, where appropriate and admissible, conclusions arrived at from these outputs. The report should contain any information on which an interpretation might be made.

The forensic unit will need to develop its own format and list of contents for its reports. For general principles of interpretation and reporting please see sections 4.8 and 4.9.

4.7 *Examination and testing*

This is the stage where the forensic unit personnel determine an examination strategy, choose methods and procedures and decide on the sequence of sampling, examination and testing. This will be done in agreement with the customer as part of the contract review.

4.7.1 *Contract review and exchange of information*

The person who is going to undertake the examination and testing may not necessarily have prior knowledge of the case. It is therefore important to have a documented contract review defining the purpose of the examinations and tests to be performed. It is also necessary to provide the person doing the examinations and tests with background information on the case to support the examination and testing work.

However, the provision of this information should not compromise the impartiality of any subsequent examination/testing.

4.7.2 *Examination and testing strategy*

In defining the examination and testing strategy the forensic unit should consider, where appropriate, the following:

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- ◆ Customer requirements
 - ◆ The ability of the forensic science examinations to help address the identified issues
 - ◆ Urgency and priority of customer requirements
 - ◆ Appropriate background information
 - ◆ Alternatives to the propositions which have already been provided by the customer
 - ◆ Resources available to the forensic unit
 - ◆ Experts that may need to be consulted prior to examination or testing
 - ◆ The examinations or testing that has the potential to provide the most information in response to the various propositions and alternatives
 - ◆ Issues that could affect the integrity of the items under examination or testing
 - ◆ Constraints that may exist e.g. the need to preserve material for other purposes, cost
 - ◆ Examination/tests or other activities that may have a destructive effect on subsequent examination/testing
 - ◆ Co-ordination of multiple disciplinary examination/testing to determine the sample(s) that need to be taken and the sequence of performing sampling or examination/testing
 - ◆ Examination/testing services that are currently available in laboratories
 - ◆ Consideration of anti-contamination precautions appropriate for the examinations/ testing under discussion and all evidence types that potentially may be available
 - ◆ On-going review of examination strategy and testing in light of new and significant information
 - ◆ What is technically possible and worthwhile to meet the customer's requirement, including the defence.

Other elements may also be considered in the examination and testing strategy.

4.7.3 *Facilities, techniques and equipment required*

Access to the operational area of the laboratory shall be controllable and limited. Visitors shall not have unrestricted access to the operational areas of the laboratory. A record shall be retained of all visitors to the operational areas of the laboratory.

Storage areas for exhibits shall be secure to prevent theft or interference and have their access limited and controlled. The storage conditions shall be such as to prevent loss, deterioration and contamination and to maintain the integrity and identity of the exhibit. This applies both before and after examinations have been performed. Where perishable items are handled any deterioration of the items shall be minimised.

4.7.4 *Coordination of multidiscipline examination and testing*

Determining an examination and testing strategy, choosing appropriate methods, and deciding on the appropriate sequence requires an overall working knowledge of current forensic science capabilities. To ensure an appropriate level of service to customers and to protect against the unintentional loss of

evidence, all personnel in a forensic unit responsible for making such decisions shall have at least general training in the examination/testing capabilities of available forensic science disciplines. Updated training should be provided to forensic unit personnel periodically to maintain a current awareness of available forensic science capabilities – including the concept of non-destructive vs. destructive examination/testing.

Appropriate consideration of potential further examinations / tests shall be given when determining the most appropriate packaging and storage of exhibits; which samples need to be taken for examination and testing; and the appropriate sequence for examination and testing. When exhibits in a case require multidiscipline examination/testing, an arrangement should be in place to ensure that each item requiring examination or testing is subjected to the appropriate examination or test, and that the sequence of examination/testing does not, unintentionally, preclude additional examination/testing.

In all cases, each person performing sampling, examinations or testing shall be held accountable for handling, processing, sampling, and examination/testing each item or exhibit in the most appropriate manner and sequence.

4.7.5 *Critical Findings Check*

The records of the checks on critical findings shall indicate that each critical finding has been checked and by whom the checks were performed and when. This may be indicated in a number of ways, including entries against each finding, entry on a summary of findings or a statement to this effect in the records. The records shall indicate if the critical finding has been agreed, or the action taken if this was not the case.

Where a critical findings check is the only quality control procedure, such as blood pattern analysis, footwear comparison, scene of crime interpretation or damage identification and interpretation, then this check shall be performed without knowledge of the original result and this independence shall be identifiable from the records.

4.7.6 *Sampling*

Selection, recovery, prioritization and sampling of materials from submitted test items are important parts of the forensic science process. Laboratories shall ensure that there are documented procedures and training programs to cover this aspect of their work and that detailed competency/training records are kept for all staff involved. See also 4.3.3 of this document.

4.7.7 *Perform examination or tests*

4.7.7.1 *Handling of test items*

For legal purposes, forensic units shall be able to demonstrate that the items/samples examined and reported on were those submitted. A 'chain of custody' record shall be maintained from the receipt of items/samples which details each person who takes possession of an item or alternatively the location of that item (e.g. if in storage).

Where exhibits are generated in the forensic unit e.g. fibre tape lifts, microscope slides, a chain of custody record will be started and included in the case records.

There shall be documented procedures which describe the measures taken to secure exhibits in the process of being examined which are left unattended.

4.7.7.2 Assuring the quality of examination and test results

Analytical performance shall be monitored by operating quality control schemes that are appropriate to the type and frequency of examination/testing undertaken by a forensic unit.

The range of quality control activities available include the use of:

- ◆ reference collections;
- ◆ certified reference materials and internally generated reference materials;
- ◆ statistical tables;
- ◆ positive and negative controls;
- ◆ control charts;
- ◆ replicate examination/testing;
- ◆ alternative methods;
- ◆ repeat examination/testing;
- ◆ spiked samples, standard additions and internal standards;
- ◆ independent checks (verification) by other authorised personnel.

Depending on the particular test being performed, the forensic unit may make use of one or several of these examples to demonstrate that the test or examination is 'under control'. The quality control procedures necessary in any particular area of work shall be determined by the forensic unit responsible for the work, based on best professional practice. The procedures shall be documented and records shall be retained to show that all appropriate quality control (QC) measures have been taken, that all QC results are acceptable or, if not, that corrective action has been taken.

An effective means for a forensic unit to monitor its performance, both against its own requirements and against the performance of peers, is to take part in proficiency testing programs. When participating in proficiency testing programs, the forensic unit's own documented test procedures should be used. Performance in the programs shall be reviewed regularly and where necessary, corrective action shall be taken. Proficiency testing records should include:

- ◆ full details of the examinations/tests undertaken;
- ◆ results and conclusions obtained;
- ◆ an indication that performance has been reviewed;
- ◆ details of the corrective action undertaken, where necessary.

4.8 Interpretation of the results of examinations and tests

This is the stage where the unit performing the examinations and tests evaluates and interprets the results of the examinations and tests based on the request and the information supplied during the process.

4.8.1 Making an interpretation

Interpretation is when the conclusions drawn are based on more than just the result of the test at hand, for example conclusions drawn from observations at a scene of crime. Both in laboratory work and in scene of crime investigation there will be conclusions drawn based on observations and visual tests without objective examinations/tests necessarily being made.

Interpretations shall be based on robust studies. In cases where this is not possible, the interpretation shall at least be supported by a documented body of evidence (records).

When interpretations are made the limitations of the examination/testing used shall be fully considered. For example, definitive conclusions shall not be drawn from presumptive testing.

Staff at the forensic unit should have access to complete, comprehensive and accurate test results and findings and consult relevant reliable sources of information to support the interpretation. Interpretation of results and findings in the context of the case is possible when enough information about the case is available. A hypothesis based on the results/findings and available information should be defined. Alternative hypotheses should also be considered.

The consideration of one or more alternative hypotheses allows an organization to demonstrate its impartiality.

When necessary, the customer should be asked to provide sufficient information about the items and the circumstances at the scene of crime. Lacking this information may limit the possibility for an appropriate interpretation.

4.8.2 Peer review

Peer review should be practised in cases of interpretation of results or findings and observations, as this should be treated as a critical finding.

4.8.3 Competence

Personnel interpreting results shall have been assessed and deemed competent before reporting statements including interpretation and opinions of results and findings.

There needs to be a clear definition of the competence requirements/criteria for interpretations.

4.9 *Report from examinations and tests including interpretation of results*

This is the stage where the organization reports the results of its examinations and tests. Upon request from the customer, the forensic unit may submit preliminary reports verbally or through e-mail. In cases where the work is stopped on request of the customer a report need not necessarily be issued.

All reports, on all types of media, shall meet the reporting requirements of ISO/IEC 17020 or ISO/IEC 17025 as appropriate.

It is accepted that forensic units may not be able to include all of the items in 'Court Statements' that are detailed in sub-clause 5.10 of ISO/IEC 17025 or sub-clause 7.4.2 of ISO/IEC 17020 as the format of these documents is prescribed in legislation. Forensic units may therefore choose to adopt one or more of the following means of meeting these requirements.

- ◆ the preparation of a report which includes all of the information required by ISO/IEC 17025 or ISO/IEC 17020 as appropriate;
- ◆ the preparation of an annex to the Court Statement which includes any additional information required by ISO/IEC 17025 or ISO/IEC 17020 as appropriate;
- ◆ ensuring that the case record relating to a specific case contains all the relevant information required by ISO/IEC 17025 or ISO/IEC 17020 as relevant.

The type and amount of information required in the report may depend on the legal system. However, in all cases, there shall be a clear indication of which parts are background information, which are facts and which are interpretations or opinions.

The output given to the customer shall not in any way be misleading.

The report should contain all the results of examinations/test and observations as well as the findings and, where appropriate and admissible, conclusions drawn from these results.

The reports issued by the forensic unit shall be complete and shall contain the information on which an interpretation might be made.

The forensic unit shall have a procedure and criteria to decide when and to what extent a technical review of a report needs to be performed. Technical review should be performed by a qualified person with the appropriate competence to confirm the validity of the results. Conclusions shall be properly qualified.

It shall be clear in the report to the customer on what an interpretation and/or conclusion is based, including the results and findings, also the available information at the time of the evaluation presented in the report.

The forensic unit may give an oral report, if required by the customer and permitted by laboratory policy and, where applicable, by legislation. An oral report should only be given by suitably competent staff and should always be recorded and followed by a written report.

Where at all possible, any critical findings conveyed in the oral report should be checked. Where the information being reported has not been peer reviewed, or the examination/testing is incomplete prior to orally informing the customer, the oral report

shall be qualified with a caveat that the results are provisional. It shall be clear to the customer that provisional results will have to be confirmed by further tests, if required by forensic unit procedures and that the examination/testing and report shall be peer reviewed before a written report can be issued.

For oral results, the identity and appropriateness of the recipient shall be established.

All oral reports shall be recorded in a traceable manner, including:

- ◆ The customer's name, the date and time the oral report is conveyed, and identification check (if relevant) shall be recorded.
- ◆ The information conveyed in the oral report relevant to the case, shall be recorded.

Annex A: Examples of disciplines undertaken by forensic units

The table below lists **only some** of the forensic disciplines but **does not preclude additional activities** being undertaken by a forensic unit. Even if some forensic disciplines may not be mentioned here, they may still be included in the scope of this guidance document.

Audio, Video and Computer Analysis

- Speech, audio and video analysis
- Biometrics
- Computers (hardware and software)
- Image enhancement
- Recovery of information from electronic devices and media
- Automated skull reconstruction and aging simulation
- CCTV
- Facial mapping
- Mobile computerized devices (including phone, GPS, PDA)

Controlled/non-controlled Substances

- Botanical material
- Related chemicals and paraphernalia
- Controlled pharmaceutical and drugs

Entomology, Botany, Archaeology, Anthropology
Fingerprints

- Fingerprints and finger marks (development and comparison)
- Palm prints (development and comparison)
- Footprints (development and comparison)

Firearms and ballistics

- Bullets and cartridges
- Gun shot residue
- Firearms
- Stun Guns

Hairs, Blood, Body Fluids and Tissues

- Animal DNA profiling
- DNA profiling
- Parentage testing
- Body fluid identification
- Mitochondrial DNA profiling

Handwriting and Document Examination

- Copiers and copied material
- Handwriting
- Inks and printing materials
- Printers and other printed objects
- Security marks
- Embossing and embossed materials
- Indentations
- Paper
- Rubber stamps
- Typewriters and typewritten material

Marks and Impressions

- Damage examination
- Glove marks
- Shoe marks
- Tyre marks
- Fabric impression
- Non-friction ridge body marks
- Tool marks and impressions

Forensic Medicine

- Cause of death determination
- Pathology
- Examination of injuries
- Odontology

Scene Investigation

- Blood pattern analysis
- Fire investigation
- Scene of crime investigation
- Bullet trajectory
- Photography
- Chemical, Biological, Radioactive, Nuclear

Toxicology

- Alcohol
- Pharmaceutical products
- Drugs
- Poisons

Trace Evidence

- Acids
- Alkalis
- Botanical material (excluding controlled substances)
- Components of technical or household appliances
- Dyes and pigments
- Feeding stuffs and ancillary items
- Fibres and hairs
- Food
- Glass
- Lachrymatory chemicals
- Manufacturers marks (including serial number restoration)
- Oils and greases
- Soils
- Adhesives
- Arson & fire evidence e.g. Fire debris
- Clothing/garments
- Corrosives
- Cosmetics
- Electrical devices and components
- Explosives and explosion debris
- Fertilisers
- Firearm discharge residues
- Hydrocarbon fuels
- Light filaments
- Lubricants and spermicidal agents
- Metals and alloys
- Paints
- Plastics
- Pyrotechnic devices

Vehicles and Vehicle Accident Investigation

- Component failures including light bulbs
- Electrical failures
- Speed calculations
- Trajectory determination
- Car immobiliser systems
- Erased markings
- Tachograph charts
- Tyre examination

Annex B: Bibliography

EA-5/03:2008 Guidance for the Implementation of ISO/IEC 17020 in the field of crime scene investigation

ISO/IEC 17020:2012 Conformity assessment – Requirements for the operation of various types of bodies performing inspection

ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories

ILACG19:2002 Guidelines for Forensic Science Laboratories

ISO Guide 30:1992 (amended in 2008) Terms and definitions in connection to reference materials

ILAC-P9:11/2010 ILAC Policy for Participation in Proficiency Testing Activities

Annex C: Correlation chart

ILAC G19:08/2014	ISO/IEC 17025:2005	ISO/IEC 17020:2012
3.1	4.3	8.3
3.2	4.8, 4.9	7.5, 7.6
3.3	5.2	6.1
3.4		
3.5	4.13, 5.7, 5.8	7.1, 7.2, 7.3, 8.4
3.6		7.1
3.7	4.14	6.1, 8.6
3.8	4.14	6.1
3.9	4.9, 4.11, 4.13	8.7, 5.2
3.10	4.3, 5.4	7.1
3.11	5.3, 5.8	6.2, 7.2, 7.3
3.12	4.6, 4.13, 5.2, 5.4, 5.5, 5.6	6.1, 6.2, 7.1
4.1		
4.1.1	4.4, 5.8	5.1, 7.1, 7.3
4.1.2	4.13, 4.7, 5.2, 5.8	7.1.5 b
4.1.3	4.5, 5.2.3	6.3
4.1.4	4.1.5 f, 5.2, 4.13	6.1, 7.3
4.2.1	4.4	5.1
4.2.2	4.5, 4.6	6.3
4.2.3	4.13, 5.3	6.2
4.3.1	5.4, 5.7, 5.8	7.1
4.3.2	4.4	5.1, 7.3
4.3.3	5.2, 5.7	6.1, 7.1.2, 7.2
4.3.4	5.3, 5.5	6.2
4.3.5	4.5, 4.6,	6.3
4.4.1	4.4, 5.4	5.1, 7.1
4.4.2	4.13	7.1, 7.3

4.4.3	4.4, 4.13, 5.4, 5.7, 5.8, 5.10	7.1,7.2, 7.3, 7.4
4.4.4	5.4	7.1.3
4.4.5	4.6, 5.3	6.2
4.5.1	4.4, 5.4	7.2
4.5.2	4.4, 5.4	5.1, 7.1
4.5.3	4.4, 4.5, 4.6, 5.4, 5.8	7.2.4, 7.1.5
4.6	5.2, 5.4, 5.8	7.1
4.7.1	4.4, 5.4	5.1, 7.1
4.7.2	4.4, 5.7, 5.8	7.1.5, 7.1.2
4.7.3	5.3, 5.8	6.2, 7.2
4.7.4	4.2.1, 5.2, 5.4, 5.8	6.1, 7.1
4.7.5	5.4, 5.9	4.1, 7.3
4.7.6	5.2, 5.7	6.1, 7.2
4.7.7		
4.7.7.1	5.8	7.2, 7.3
4.7.7.2	5.8,5.9	7.1, 7.2
4.8.1	4.1.5 d, 5.4	4.1.1, 7.1
4.8.2	5.9	7.3
4.8.3	5.2	6.1
4.9	5.10, 4.4, 4.1, 4.4, 4.13	4.2, 6.1,7.3, 7.4