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# Codes Of Practice And Conduct

Friction Ridge Detail (Fingerprint) Comparison

FSR-C-128

Issue 3

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## 1. Introduction

- 1.1.1 The purpose of this appendix to the Forensic Science Regulator's 'Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System' (Codes) is to establish the specific requirements for friction ridge (fingerprint) detail examination within the context of accreditation to ISO/IEC 17025 'General Requirements for the Competence of Testing and Calibration Laboratories' and the Codes.
- 1.1.2 Adherence to these requirements will enable the fingerprint profession to continue to provide a robust and reliable service to the criminal justice system and provide confidence and assurance to the public.
- 1.1.3 The Council Framework Decision 2009/905/JHA on 'Accreditation of forensic service providers carrying out laboratory activities' applies to the areas of DNA analysis and fingerprint examination.
- 1.1.4 Transposition of the requirements of the Decision into domestic legislation was achieved through The Accreditation of Forensic Science Provider Regulations 2018 and came into effect on 25 March 2019, with further amendment to the Regulations in 2019.
- 1.1.5 The Regulations require those commissioning fingerprint examination for the criminal justice system to instruct only organisations that hold the required accreditation.

## 2. Scope

- 2.1.1 This appendix covers: identity confirmation; evidence processing; comparison of friction ridge detail; case documentation; report writing and communication. All comparison procedures herein referred to as palm and fingerprints apply equally to friction ridge detail from the **plantar areas**.

## 3. Implementation

- 3.1.1 This appendix is available for incorporation into a forensic provider's quality management system from the date of publication. The Regulator **required** that the Codes and the requirements for identity confirmation and manual

comparison set out in this appendix were included in a provider's schedule of accreditation by October 2018. These are ongoing requirements and changes should be implemented three months from publication of any revised document.

3.1.2 When available the use of the new automated fingerprint search algorithm shall be validated and the FUs shall have plans to incorporate it as an accredited activity within two years of release.

## 4. Modification

4.1.1 This is the third issue of this document. Parts of this document which have been significantly altered from the previous issue are highlighted in grey and are listed at 4.1.2. The nature of these changes is not detailed, but changes such as those required to correct spelling and grammar and to update references which are altered by the passage of time are not included.

4.1.2 The following paragraphs contain substantive changes from the previous issue of this document: Title; Copyright; Table of Contents; 1.1.1,4,5; 2.1.1; 3.1.1,2, 4 (whole section); 5.1.1,5; 6.1.2,3; 6.2.1; 6.4.1,2,3,4; 8.1.4; 9.1.1,3,4,5; 10.1.1; 11 (New Section); 12.1.1,3,4; 12.2.3; 12.3.1; 13.1.1; 13.1.2,3,4; 15.1.1; 16.1.2; 17.1.2,3; 18.1.1,2,4,5; 19.1.1,2,4,5; 25.2.2; 25.3.3,5; 25.4.1; 25.5.2; 2,3,4; 25.6.1,2; 25.7.1; 25.8.1; 25.10.1; 25.11.1; 25.12 (Heading); References; Abbreviations; Glossary and Annex A has been removed.

4.1.3 The Regulator uses an identification system for all documents. In the normal sequence of documents this identifier is of the form 'FSR-#-###' where (a) the '#' indicates a letter to describe the type or document and (b) '###' indicates a numerical, or alphanumerical, code to identify the document. For example, this document is FSR-C-128. Combined with the issue number this ensures each document is uniquely identified.

4.1.4 If it is necessary to publish a modified version of a document (e.g. a version in a different language), then the modified version will have an additional letter at the end of the unique identifier. The identifier thus becoming FSR-#-####.

- 4.1.5 In all cases the normal document bearing the identifier FSR-#-###, is to be taken as the definitive version. In the event of any discrepancy between the normal version and a modified version then the text of the definitive version. In the event of any discrepancy between the normal version and a modified version then the text of the normal version shall prevail.

## 5. Terms And Definitions

- 5.1.1 The terms and definitions set out in the Codes apply to this appendix. Terms and definition employed in this appendix are listed in the Glossary at section 23 where terms are linked (underlined) and additional terminology can be found in FSR-C-126 'Friction Ridge Detail (Fingerprint) Examination – Terminology, Definitions and Acronyms'.
- 5.1.2 The word 'shall' has been used in this document where there is a corresponding requirement in ISO/IEC 17025 or the Forensic Science Regulator's Codes of Practice and Conduct; the word 'should' has been used to indicate generally accepted practice in fingerprint examinations.
- 5.1.3 The term 'forensic unit' (FU) refers to all providers of forensic science, whether commercial, public sector or internal to a police service. FUs can be small teams in larger organisations, sole practitioners or large providers and can be instructed by the prosecution or the defence.

## 6. Organisational Responsibility

### ISO/IEC 17025:2017 sec.4; Codes sec. 8, 9 and FSR-I-400

- 6.1.1 A nominated senior responsible person shall be identified to support a quality standards environment for friction ridge detail examination and be accountable for ensuring that the requirements set out in the appendix are met. This individual shall be at executive board or chief officer level within the organisation /FU.
- 6.1.2 FUs shall recognise that practitioners may be influenced in their decisions by contextual information. Processes and procedures shall be put in place to safeguard against the risk of cognitive bias and influence, for example, the use of blind verification. Further guidance can be found in FSR-G-217

‘Cognitive bias effects relevant to forensic science examinations’. Additional safeguards shall include a level of training in cognitive bias that is proportional to the practitioner’s level of responsibility and exposure to situations that may be prone to bias.

6.1.3 The FU shall recognise that friction ridge detail analysis and comparison activities are one part of the fingerprint examination end to end workflow (recovery to final report) and should not operate in isolation as they are reliant on the quality of the product from upstream processes. Procedures shall cover the provision of guidance and feedback to the fingermark recovery and fingermark visualisation practitioners based on the quality of the submissions received, this might include what and how to prepare the friction ridge detail (lift, photograph or digital image) for subsequent processing.

## 6.2 Collaborative Working and Communication

6.2.1 The FU should take a collaborative approach with respect to the recovery of friction ridge detail and the search/comparison activities; acknowledging that the scene examination and laboratory work is part of the fingerprint examination workflow. It is important that those recovering fingermarks and those using them for comparison purposes (assuming these are differently skilled practitioners) shall have an understanding of each stage in the end to end fingerprint examination workflow.

## 6.3 Professional Responsibility

6.3.1 All personnel have a legal duty to the court; part of this duty is defined in the Criminal Procedures Rules: to assist the court by giving objective, unbiased opinion on matters within their expertise. This duty;

- a. Overrides any obligation to the person from whom the practitioner receives instructions or by whom they are paid; and
- b. Includes an obligation to inform all parties and the court if the practitioner’s opinion changes from that contained in a report served as evidence or given in a statement.

6.3.2 The basic explanation of fingerprint examination carried out within the United Kingdom (UK) that can be provided to the court is set out in annex 1. Practitioners shall understand the implications of work undertaken as it relates to current law, the FU's policies, operating procedures and guidelines relevant to:

- a. The analysis and comparison of forensic materials within their area of examination;
- b. Health and safety, information and data handling, other related legislative requirements and requirements of the criminal justice system;
- c. The level of authority to access information, and where additional authority may be needed; and
- d. Maintaining effective communications with others.

## 6.4 Fingerprint evidence and its place in the Criminal Justice System

6.4.1 The comparison of fingerprints is a cognitive process that relies on the competence of the practitioners to perform examinations and form conclusions based on their findings. The conclusions drawn shall be made based on their skill and experience; however, the basis for these conclusions shall be traceable and clearly evidenced.

6.4.2 Regardless of the certainty in the mind of a fingerprint practitioner once a conclusion is reached, the evidence presented shall be considered as an opinion, not a statement of fact.

6.4.3 Any report or statement shall disclose whether practitioners involved in the examination are in disagreement with the reporting outcome.

6.4.4 Differences of opinion in the reporting outcomes shall be noted and documented in the case file and disclosed in line with the Criminal Procedure and Investigations Act 1996 as amended by the Justice Act 2003 and the revised Code of Practice. General guidance is given in the Crown Prosecution Service (CPS) Guidance for Experts on Disclosure, Unused Material and Case Management.

## 7. Control of Non-Conforming Testing Work

**ISO/IEC 17025:2017 sec.7.10; Codes sec. 15**

7.1.1 An error should not be confused with a difference of opinion. When an error has been established, either technical or administrative, a non-conformance shall be raised.

## 8. Technical Records

**ISO/IEC 17025:2017 sec.7.5; Codes sec. 16.2**

8.1.1 The **FU** shall have procedures for the production of technical records. The records system need not necessarily be paper based, but if electronic record keeping is used, such as case management systems, then they shall be capable of recording examination notes contemporaneously in a format that is clear and auditable.

8.1.2 Procedures shall define and reference the documentation (also referred to as case notes) associated with the fingerprint examination process.

8.1.3 The level of detail recorded shall be clear and sufficient to allow for an appropriate audit trail.

8.1.4 All records shall include the date they were made and the identity of the person responsible for each entry. Technical records shall as a minimum demonstrate the examination sequence and include:

- a. A unique reference number;
- b. Records of materials used in course of examination;
- c. Records of the examination;
- d. The sequence of recording contemporaneous notes;
- e. Results/outputs;
- f. The reporting outcomes of the fingerprint examinations; and
- g. Records of communication.

## 9. Personnel

**ISO/IEC 17025:2017 sec.6.2; Codes sec. 18.1 and 19.**

### 9.1 Practitioner Competence

- 9.1.1 The FU shall establish a competency assessment framework for new (including those with previous experience) and existing fingerprint practitioners. This framework shall include the ongoing process of training, assessment and review to ensure the maintenance of practitioner competence. This framework shall also include the process for managing and supporting individuals whose competence has lapsed.
- 9.1.2 The details of a structured training programme to attain initial competence and a programme of assessment to demonstrate ongoing competence shall be documented.
- 9.1.3 Competency assessment shall include manual and/or computer-based comparisons and the use of any AFIS. Assessment of initial and on-going competence shall be objective and therefore include items of known outcomes, for example, from ground truth data.
- 9.1.4 Competence assessment (initial and on-going) shall include demonstration of the ability to appropriately achieve optimal optical performance (see 11.1.3 below).
- 9.1.5 The FU shall provide feedback on the quality of fingerprints or friction ridge detail submitted from scene and laboratory practitioners as well as other organisations that are unsuitable for comparison. The information shall be used as part of developing and monitoring practitioner decision making competence for identifying suitable friction ridge detail (vetting) for comparison purposes.

## 10. Accommodation and Environmental Conditions

**ISO/IEC 17025:2017 sec.6.3; Codes sec. 20**

10.1.1 The workspace and equipment used for fingerprint comparison shall be fit for the practitioner's needs and conducive to fingerprint examination. This should include, but not be limited to:

- a. Good ergonomic design to meet the individual practitioner's physical needs;
- b. Suitable lighting with areas with access to natural light sources;
- c. Adjustable working temperature throughout the year;
- d. Height adjustable work benches; and
- e. Fit-for-purpose chairs and stools.

## 11. Equipment

**ISO/IEC 17025:2017 sec.6.4; Codes sec. 24**

11.1.1 The requirements for computers and automated equipment are set out in the Codes.

11.1.2 The FU shall have procedures for the control, maintenance, calibration and performance checking of critical equipment, such as printers, screens and rulers.

11.1.3 Suitable means shall be available to improve magnification / resolution to ensure that the combination of the practitioner and the equipment is such that it optimises optical performance. Tests shall be undertaken to demonstrate that appropriate optical performance can be achieved.

11.1.4 Maintenance, calibration and performance checks shall be recorded.

## 12. Test Methods and Method Validation

ISO/IEC 17025:2017 sec.7.2; Codes sec. 21

### 12.1 General considerations

- 12.1.1 The FU shall have documented procedures describing the activities it undertakes, including manual and/or computer based comparison and how it uses any AFIS within its workflow.
- 12.1.2 The fingerprint examination process used in relation to friction ridge detail shall consist of the stages referred to as Analysis, Comparison and Evaluation (ACE). These terms provide useful descriptors of the processes undertaken by the practitioner in determining their conclusion. Although this process sets out the stages sequentially it is important to note that it is not a strictly linear process as the analysis and comparison stages are not mutually exclusive.
- 12.1.3 ACE can be followed by a Verification stage (V). This process provides a structure for the verification of fingerprint examination results. Verification is a review of the original conclusion and the examination records made by another practitioner using the examination process.
- 12.1.4 The process for verification of complex (challenging) marks and comparisons shall also be documented in the FU's procedures.
- 12.1.5 Verification can be blind or open and the circumstances where these options are used shall be clearly defined in the FU's procedures.
- 12.1.6 The FU shall clearly define and document a procedure for the management of circumstances where a variance in practitioner opinion has arisen.

### 12.2 Reporting outcomes

- 12.2.1 The test method (ACE-V) will deliver one of the following outcomes:
- a. Identified;
  - b. Excluded;
  - c. Insufficient; or
  - d. Inconclusive.

12.2.2 When reporting an inconclusive outcome consideration should be given to including an explanation as to why the outcome is inconclusive.

12.2.3 Where relevant reports should include the 'mark status' following an action, for example, 'searched with a negative result and remains unidentified'.

12.2.4 As the reporting outcome is an opinion then the requirements set out in LAB 13 Guidance on the Application of ISO/IEC 17025 Dealing with Expressions of Opinions and Interpretations apply.

### 12.3 Use of automated fingerprint identification system in friction ridge detail examination

12.3.1 Where an automated fingerprint identification system (AFIS) is used for comparison activities (one to many and/or one to one) the FU shall understand the operation and limitations of the system in their workflow and shall:

- a. Understand the model/basis of the search method employed;
- b. Understand the performance of friction ridge detail auto encode function of the system against manual encoding by competent practitioners;
- c. Understand the efficiency (i.e. success rate) of the search method to return the appropriate respondent lists (i.e. true positive);
- d. Understand the type (quality/sufficiency) of friction ridge detail where the appropriate respondent is not returned from one to many searches (i.e. false negative);
- e. Determine the re-launch strategies (manual and/or automated) for negative outcomes to address the incidence of false negative outputs;
- f. Determine the optimum number of respondents<sup>1</sup> for conducting manual comparisons to minimise the risk of not identifying the appropriate candidate; and
- g. Process all identifications that result from an Automated Fingerprint Identification System (AFIS) search in accordance with the established

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<sup>1</sup> This can be determined by crime type and may differ between volume and serious crime.

verification procedures. On-screen verification is acceptable providing that a documented audit trail is available.

## 13. Validation

### **ISO/IEC 17025:2017 sec.7.2.2; Codes sec. 21.2; FSR-G-201 and FSR-G-230**

- 13.1.1 The FU shall demonstrate competency in, and understanding of, the requirements for validating its processes for friction ridge detail analysis and comparison. This will be evidenced through the design and development of its validation plan and completion of an appropriate validation with further validation and/or periodic validation review as required.
- 13.1.2 Validation shall be undertaken by the FU to ensure the reliability of examination outcomes. Further detail is contained in the Codes, guidance can be found in FSR-G-201 'Validation', and FSR-G-230 'Validation: Friction Ridge Detail (Fingerprint) Search Algorithm'.
- 13.1.3 The validation exercise shall incorporate known source friction ridge detail. In addition to the process detailed in the Codes, it shall include:
- a. All friction ridge detail typically encountered, including varying quality and marks enhanced using typically encountered treatments / processes;
  - b. Procedures to ensure that the system delivers expected results;
  - c. Some form of measure of uncertainty/known error rate; and
  - d. Determination of the performance and limitations of the visual examination and low power magnification used for analysis and comparison;
- 13.1.4 Where an automated fingerprint identification system (AFIS) is used the FU shall either validate or verify the performance by using ground truth data using the full range of friction ridge detail encountered; further details can be found in FSR-G-230 'Validation Friction Ridge Detail (Fingerprint) Search Algorithm'.

- 13.1.5 The method used for the electronic capture, storage and transfer of fingerprint images shall be validated including appropriate calibration.

## 14. Estimation of Uncertainty of Measurement

**ISO/IEC 17025:2017 sec.7.6; Codes sec. 22; UKAS M3003**

- 14.1.1 Procedures under ISO/IEC 17025 shall be put in place to establish the uncertainty of a given process. For example, practitioner, technical equipment and procedural error rates can be determined initially from the validation of the methods and processes to assess consistency and variances of opinion.

- 14.1.2 The uncertainty of measurement shall be periodically reviewed using data from dip sampling, quality control, competency and proficiency tests.

## 15. Control Of Data

**ISO/IEC 17025:2017 sec.7.11; Codes sec. 23**

- 15.1.1 Procedures shall be in place to protect, secure, control, review and retain the data generated by the FU, these may relate to:

- a. Case management systems;
- b. The Automated Fingerprint Identification System (AFIS);
- c. Digital image transfer and storage systems; and
- d. digital comparison software.

### 15.2 Use of Digital Images and Processing Tools

- 15.2.1 Policies and procedures shall be in place for the digital capture, storage, retrieval, display, and transmission of images used as evidence. The method(s) used shall maintain the identity, security and integrity of the data.

- 15.2.2 Further requirements are detailed in FSR-C-127 'Fingermark (Friction Ridge Detail) Visualisation and Imaging'.

## 16. Sampling

**ISO/IEC 17025:2017 sec.7.3;**

16.1.1 Sampling in this context relates to case assessment leading to the appropriate selection and targeting of comparisons to facilitate rapid disclosure of results based on the needs of the investigation.

16.1.2 The criteria for the selection of the friction ridge detail shall be determined by the relevance of the exhibit and consideration given to the quality of the friction ridge detail. This shall be recorded within the contemporaneous notes.

16.1.3 If any friction ridge detail is not subject to an examination the reason for this shall be documented.

## 17. Handling of Test Items

**ISO/IEC 17025:2017 sec.7.4; Codes sec. 26**

17.1.1 The FU shall have documented procedures for quality assuring any items received for comparison or search.

17.1.2 Procedures detailing the storage and preservation of friction ridge detail shall be documented.

17.1.3 Exhibits shall be securely sealed where required and continuity recorded. If marks are electronically transmitted to fingerprint FUs, the digital capture and transmission device shall ensure that all movements and enhancements are recorded and available for audit should the need arise.

17.1.4 An audit trail shall be available to track the continuity of all case-related items.

## 18. Assuring The Quality Of Test Results

**ISO/IEC 17025:2017 sec.7.7; Codes sec. 27**

18.1.1 FUs shall have documented procedures for verification that will manage the process of checking critical findings for fingerprint examination. Blind

verification forms part of the risk management approach adopted to mitigate risks associated with cognitive bias.

18.1.2 FUs shall participate in suitable inter-laboratory comparisons (ILCs), collaborative exercises (CE) and/or proficiency test (PT) programmes. A plan for the level and frequency of participation, and the resulting outcomes, shall be documented and in accordance with TPS 47 UKAS Policy on Participation in Proficiency Testing Schemes'.

18.1.3 The FU shall determine a process for monitoring the systems (including AFIS) and processes used in their friction ridge detail analysis and comparison outcomes. For example, through a proportional and representative schedule of dip sampling, this shall also include cases where the friction ridge detail has not progressed to comparison and where nominated candidates have been excluded as the source of the friction ridge detail.

18.1.4 The FU shall have a process for monitoring to identify trends and issues amongst examiners.

18.1.5 The FU shall have a policy and procedure to deal with differences of opinion.

## 19. Reporting The Results

**ISO/IEC 17025:2017 sec.7.8; LAB 13; Codes sec. 28; FSR-G- 200 and FSR-G- 225**

19.1.1 The FU shall meet the requirements of LAB 13 in relation to the provision of opinions and interpretations related to friction ridge detail comparison and have this included in their ISO 17025 scope of accreditation.

19.1.2 The FU shall have policy that clearly defines the process for the provision, amendment and retention of both written and verbal reports.

19.1.3 Where reports contain opinions that rely on results obtained from data or tests performed by the fingerprint enhancement laboratory, for example, orientation of the fingerprint or ridge detail formed by blood, these shall be recorded.

- 19.1.4 All reports of the examination results that are produced shall be subject to a defined quality check, including critical findings review of the examination prior to being communicated to the recipient. If there is a need to provide results prior to the production of this quality checked final report, for example, a verbal communication, then the provisional status of the results shall be made clear to the recipient through the use of appropriate caveats.
- 19.1.5 Legal obligations are set out FSR-I-400 and disclosure requirements in the CPS Guidance for Experts on Disclosure, Unused Material and Case Management. The requirements for expert and non-expert statements are set out in FSR-G-200 and FSR-G-225 respectively.

## 20. Review

- 20.1.1 This document is subject to review in accordance with the Codes and other appendices.
- 20.1.2 The Forensic Science Regulator welcomes comments. Please send them to the address as set out at: [www.gov.uk/government/organisations/forensic-science-regulator](http://www.gov.uk/government/organisations/forensic-science-regulator), or email: [FSREnquiries@homeoffice.gov.uk](mailto:FSREnquiries@homeoffice.gov.uk)

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## 22. Abbreviations and Acronyms

Abbreviation	Meaning
ACE	Analysis, Comparison and Evaluation
AFIS	Automated Fingerprint Identification System
BS	British Standard
CPS	Crown Prosecution Service
DC	District of Columbia
DNA	Deoxyribonucleic acid
EN	European Norm
FSR	Forensic Science Regulator
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardization
PT	Proficiency testing
SFR	Streamlined Forensic Report
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
US	United States of America

## 23. Glossary

### ACE

The acronym used to describe the main elements that comprise the fingerprint examination test process – Analysis, Comparison and Evaluation. Although this is a process with defined steps, it is a cyclic or iterative process, rather than a linear process.

### Administrative Error

Incorrect data or information is recorded or assigned.

### Analysis

Step or stage of the ACE test process. This is the assessment of an impression to determine suitability for comparison. The practitioner examines and analyses all variables influencing the friction ridge detail in question. When examining friction ridge detail, several factors must be taken into account. Some of these factors are:

- a. The material upon which the impression has been deposited;
- b. The enhancement process or processes involved;
- c. Deposition pressure when the impression was left; and
- d. Clarity.

This list is not exhaustive but will be dependent on the impression being analysed. The quantity and quality of the friction ridges are also analysed and the practitioner decides whether the impression has sufficient information to proceed to the next phase – comparison.

### Blind Verification

The independent application of the ACE process conducted by another practitioner who has no prior knowledge of:

- a. The findings of previous practitioners;
- b. The information on which any previous conclusions have been based;  
or
- c. Any further information relating to case context or stakeholder communications.

### **Cognitive Bias**

A pattern of deviation in judgement whereby inferences about other people and situations may be drawn in an illogical fashion. These include, expectation, confirmation, contextual and motivational biases, anchoring effects or focalism (related to expectation and confirmation biases), role effects (e.g. adversarial roles) and reconstructive effects (rely on memory rather than contemporaneous notes).

### **Comparison**

Step or stage of the ACE test process. It is when two or more impressions are compared to determine the level of agreement between two areas of friction ridge skin and to establish the existence of discrepancies or similarities. The comparison can be either manual (using hard copy images) or computer based (using electronic/digital/on-screen images).

### **Competence**

The skills, knowledge and understanding required to carry out tasks within a role, evidenced and assessed consistently over time through performance in the workplace.

### **Complex (Challenging) Mark**

A mark which has difficult, unusual or image resolution aspects to it. Examples of types of marks that could be considered as challenging could include but are not limited to:

- a. A mark in blood;
- b. The only mark available for comparison with element(s) of risk for comparison identified in the case.
- c. A mark that has previously been deemed 'insufficient' and then subsequently identified;
- d. A mark that is compared even though there are very few clear ridge characteristics and the prospects of a potential identification may be considered low; or
- e. A mark that has previously been compared to the identified person and excluded or a negative automated search result.

### **Conclusion**

A result stemming from the examination and assessment of all available data within an impression whilst removing and/or limiting bias as much as is possible. The practitioner will **evaluate** all of the available information and come to their final opinion about the **result of the comparison**. See reporting outcome.

### **Contemporaneous Notes**

This is defined as an accurate record, made at the time, **or when this is not possible** as soon as practicable **afterward**. It is a record of relevant evidence that is seen, heard or done by the maker of the note(s).

### **Critical Findings**

An outcome that meets one or more of the following criteria:

- a. It has a significant impact on the conclusion reached and the interpretation and opinion provided;
- b. It cannot be repeated or checked in the absence of the exhibit or sample; or
- c. It could be interpreted differently.

### **Error**

An outcome that is unexpected or **incorrect** when the true answer is known. Errors can be categorised into various types, such as technical and administrative errors. If an error occurs then it can have a detrimental effect on the outcome of a comparison or search. There are various processes that can be used to minimise the **risk of** different types of errors occurring, but these processes may vary from organisation to organisation.

### **Error Rate**

The **frequency** to which errors occur. The error rate of fingerprint conclusions will vary depending on the methods, processes and quality assurance measures used. See measurement of uncertainty.

### **Evaluation**

Step or stage of the ACE test process. This is where a practitioner assesses the details observed during the analysis and the comparison steps and reaches a conclusion resulting in a Reporting Outcome.

### **Examination**

Activity or process of observing, searching, detecting, recording, prioritising, collecting, analysing, measuring, comparing and/or interpreting.

### **Excluded/ Exclusion**

There are sufficient features in disagreement to conclude that two areas of friction ridge impressions did not originate from the same person.

### **External Proficiency Test**

A test conducted by an agency independent of the practitioners (analysts) or laboratory being tested.

### **Fingerprint**

An impression of the friction ridges from all or any part of the finger.

### **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. [Source: ILAC-G19:08/2014 Modules in a Forensic Science Process.]

### **Friction Ridge Detail**

An area comprising the combination of friction ridge flow, friction ridge characteristics, and friction ridge structure to include creases. See Friction Ridge Detail (Fingerprint) Examination – Terminology, Definitions and Acronyms, FSR-C-126].

**Identified/Identification (Ident)** [This term is used in fingerprint comparison evidence and its use is familiar to the criminal justice system. This term will be replaced in the future when an evaluative interpretation method for fingerprint comparison is further developed]

A practitioner term used to describe the mark as being attributed to a particular individual/person. There is sufficient quality and quantity of ridge flow, ridge characteristics and/or detail in agreement with no unexplainable differences that in the opinion of the practitioner two areas of friction ridge detail were made by the same person.

### **Identity Confirmation**

The comparison of a set of fingerprints against a previously taken set of known prints to determine the identity of the person based on the personal data previously recorded, i.e. tenprint to tenprint comparisons.

### **Inconclusive**

The determination that the level of agreement and/or disagreement is such that it is not possible either to conclude that the areas of friction ridge detail originated from the same donor, or to exclude the particular individual as a source for the unknown impression/mark.

The outcome may be inconclusive for a number of reasons; these reasons should always be made clear as part of reporting the final outcome. Provision of an indication to exclude or associate/attribute features to an individual might also be possible.

### **Insufficient**

The ridge flow and/or ridge characteristics revealed in the area of friction ridge detail (mark) are of such low quantity and/or poor quality that a reliable comparison cannot be made. The area of ridge detail contains insufficient clarity of ridges and characteristics or has been severely compromised by extraneous forces (for example, superimposition, movement) to render the detail present as unreliable and not suitable to proffer any other decision.

### **Known Print**

The prints of a person, associated with a known or claimed identity, and recorded either electronically, by ink, or by another medium under controlled conditions.

### **Mark**

The term used to refer to an area of friction ridge detail from an unknown donor/person. Usually recovered, enhanced or imaged from a crime-related item, or directly retrieved from a crime scene. See also **Friction Ridge Detail (Fingerprint) Examination – Terminology, Definitions and Acronyms, FSR-C-126.**

### **Mark Status**

This is the description or standing of an area of friction ridge detail following comparison and/or searching. It describes the status of an area of ridge detail when all actions have been completed. The mark may be identified, unidentified or insufficient. Where a mark is unidentified it may be excluded for certain individuals.

### **Measurement Of Uncertainty**

The estimation of the uncertainty of measurement is an ISO/IEC17025 requirement and is based upon the principle that all measurements are subject to uncertainty and that a value is incomplete without a statement of accuracy. Sources of uncertainty can include unrepresentative samples, rounding errors, approximations and inadequate knowledge of the effect of external factors. See error rate.

### **Note Taking**

A contemporaneous record of the practitioner's observations and findings when undertaking certain aspects of their work, for example, noting areas with information such as 'movement' or 'background interference'.

### **Objective**

Undistorted by emotion or personal bias; based on impartial, transparent, observable phenomena.

### **Open Verification**

Verification conducted by another practitioner who has knowledge of the conclusions proffered by the original practitioner in the previous examination.

## **Opinion**

An opinion is the conclusion of the practitioner who, by study or experience, has specialist knowledge and objective evidence of competence to form a sound judgement.

The opinion is the conclusion of the practitioner established at the evaluation stage of the ACE process. If necessary, the opinion will be supported and evidenced by demonstrating their decision-making process by the use of working notes.

## **Proficiency Test (PT)**

The determination of the testing performance of a forensic unit, i.e. tests to evaluate the competence of practitioners (analysts) and the quality performance the forensic unit.

These tests can vary:

- a. External proficiency test: a test conducted by an agency independent of the practitioners (analysts) or laboratory being tested.
- b. Blind or undeclared proficiency test: a test in which the practitioners (analysts) are not aware that they are being tested. and
- c. Open or declared proficiency test: a test in which the practitioners (analysts) are aware that they are being tested.

## **Report**

Any media used to communicate the examination results. These include but are not limited to:

- a. Streamlined Forensic Reports (SFRs);
- b. Section 9 statements (Criminal Justice Act 1967);
- c. Interim reports; or
- d. email.

## **Reporting Outcome**

The result following a test is evaluated and interpreted by the examiner and expressed as one of four opinions. This is reached at the evaluation stage after the analysis and comparison of marks has been completed. This is the

decision that is communicated to the investigator or officer in the case and is recorded as one of the four following possibilities:

- a. Identified;
- b. Excluded;
- c. Insufficient; and
- d. Inconclusive.

Where a mark is excluded the mark status is also given as either Unidentified, (unattributed) or Insufficient.

### **Search**

A comparison of friction ridge detail against other friction ridge detail held in files or databases. Searches can be manual or automated.

### **Specificity**

The discriminating strength of a feature.

### **Subjective**

The opposite of objective – activity taking place within the mind that is modified by an individual's personal experiences and bias.

### **Technical Error**

The incorrect result or reported outcome derived by the practitioner's judgement and opinion from the examination of the mark and print, for example, a false inclusion/exclusion.

### **Unidentified (Unattributed)**

The status of a mark after it has been compared with the known print of a nominated individual (elimination or suspect) or has been searched on a database and has not been attributed to any individual person.

### **Validation**

The process of providing objective evidence that a method, process or device is fit for the specific purpose intended. It is a method to check the reliability of a process and the outcomes of that process. The validation

should demonstrate that the same result should be obtained to show that the process works.

### **Verification**

In fingerprint examination it is the final step of the ACE-Verification process. It can be defined as the independent application of the ACE process, utilised by a subsequent practitioner to either support or refute the conclusions of the original practitioner. This independent examination by another practitioner or practitioners, using the ACE process provides a cross-check to ensure that the outcome decision is not based on a subjective judgement of one individual but acceptance as the consensus conclusion of more than one practitioner.

## **24. Further Reading**

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## Annex 1

### 25. Basic Fingerprint Examination Explanatory Note

25.1.1 The text below is intended for the use by practitioners and reflects current practice within the United Kingdom (UK).

#### 25.2 Introduction

25.2.1 The Forensic Science Regulator has set out the standard for fingermark (friction ridge detail) visualisation and image capture (FSR-C-127) and fingerprint comparison (FSR-C-128) in appendices to the Codes of Practice and Conduct (the Codes) and the terminology, definitions and acronyms currently applicable to friction ridge detail (fingerprint) examination in England and Wales (FSR-C-126).

25.2.2 The purpose of this annex is to provide the basis of fingerprint examination to aid the courts

#### 25.3 Fingerprints

25.3.1 Fingerprint examination is a long established forensic discipline and has been used within the Criminal Justice System in Britain since 1902. It is based on the comparison of friction ridge detail of the skin from fingers and palms.

25.3.2 The comparison of fingerprints is a cognitive process that relies on the competence of the practitioners to perform examinations and form conclusions based on their observations and findings. The results following an examination are communicated in the form of opinion and not a statement of fact.

#### 25.4 What is Friction Ridge Detail?

25.4.1 The skin surface found on the underside of the fingers, palms of the hands and soles of the feet is different to skin on any other part of the body. It is made up of a series of lines known as ridges and furrows and this is called friction ridge detail.

25.4.2 The ridges and furrows are created during foetal development in the womb and even in identical siblings (twins, triplets) the friction ridge development is different. It is generally accepted that friction ridge detail is unique to each individual, although this cannot be definitively proved.

25.4.3 Located at intervals along the top of the ridges are pores which secrete sweat. When an area of friction ridge detail comes into contact with a receptive surface, an impression of the friction ridge detail, formed by sweat residue, may be deposited on that surface.

25.4.4 These impressions are often not visible in their natural form and require the application of an appropriate powder or chemical treatment to allow the impression to be developed (made visible) and subsequently lifted and/or photographed for fingerprint examination.

25.4.5 Visible impressions may also be made by contact of friction ridge skin with contaminants such as paint, blood, ink or grease.

25.4.6 The analysis of friction ridge detail is commonly known as fingerprint examination.

## 25.5 Basis for Fingerprint Examination

25.5.1 Friction ridge detail persists throughout the life of the individual without change, unless affected by an injury causing permanent damage to the regenerative layer of the skin (dermis) for example, a scar. The high degree of variability between individuals coupled with the persistence of the friction ridge detail throughout life allows it to be used for identification purposes and provides a basis for fingerprint comparison as evidence.

## 25.6 Fingerprint Examination

25.6.1 The purpose of fingerprint examination is to compare two areas of friction ridge detail to determine whether they were made by the same person or not.

25.6.2 Friction ridge detail recovered from the scene of a crime is known as a mark and friction ridge detail obtained from a known individual is commonly referred to as a print.

25.6.3 A print is usually of good quality as it is obtained under controlled conditions, whereas, a recovered crime scene mark is a chance deposition which will vary in quality dependent on the circumstances under which it was deposited.

25.6.4 The comparison process is subjective in nature and the declared outcomes rely on the observations and evaluation of a competent fingerprint practitioner. The practitioner gives an opinion based on their observations, it is not a statement of fact, nor is it dependent upon the number of matching ridge characteristics.

## 25.7 Examination Process

25.7.1 The fingerprint examination process consists of stages referred to as analysis, comparison and evaluation, known as ACE. These stages are descriptors of the process undertaken by the practitioners in determining their conclusions. Although the process sets out the stages sequentially, it is not a strictly linear process. ACE can be followed by a verification stage. Verification is conducted by another practitioner (independent examiner) using the ACE examination process to review the original conclusion and the examination records made by a previous examiner.

25.7.2 There are four possible opinions that will be reported from a fingerprint examination Identified, Excluded, Inconclusive or Insufficient.

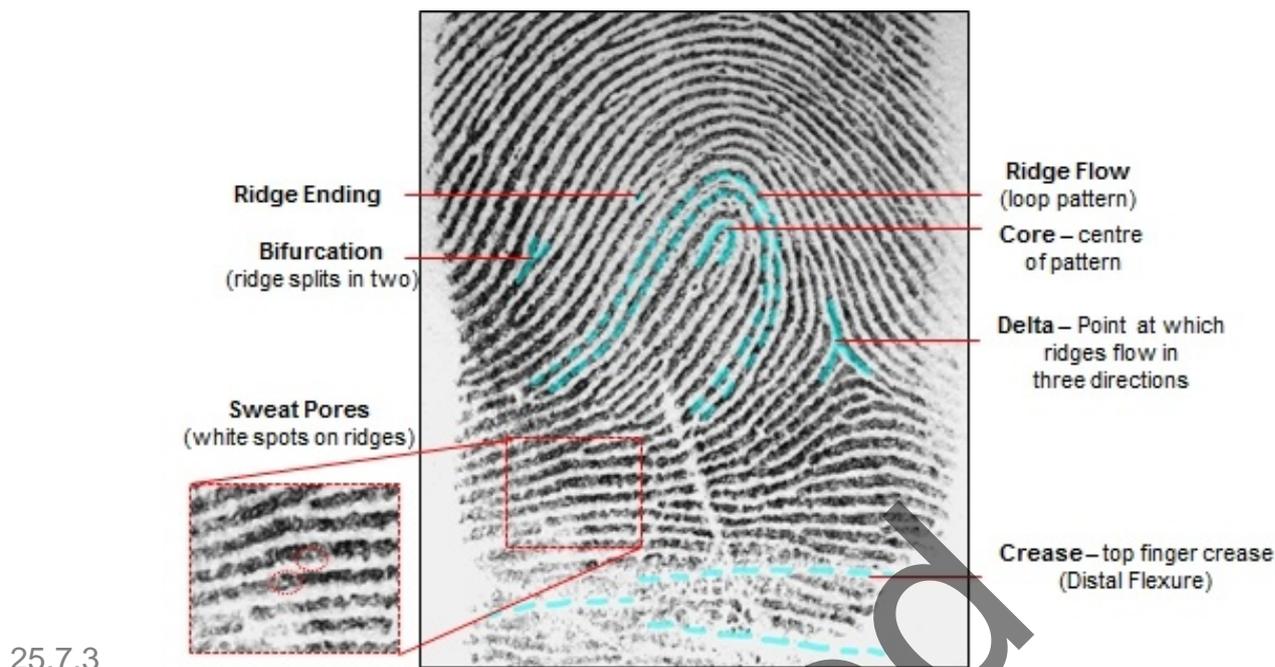


Image courtesy of Lisa J Hall, Metropolitan Police Forensic Science Services; permission to reproduce granted.

**Figure 1:** Friction ridge detail impression deposited from the top of a finger. The black lines are the ridges and the white spaces are the furrows. The ridges flow to form shapes or patterns. This is an example of a loop pattern exiting to the left. There are natural deviations within the ridge flow known as characteristics such as ridge endings or bifurcations. There are white spots along the tops of the ridges known as pores and there are other features present for example creases, which are normally observed as white lines.

## 25.8 Analysis

25.8.1 The practitioner conducts an examination of the general ridge flow of an impression and the shapes or patterns formed by the ridges. They observe the location of the naturally occurring deviations within the ridge flow which form features or characteristics, such as ridge endings and bifurcations. The practitioner evaluates the quality and quantity of the ridge flow together with the features and the specificity of the characteristics to determine its suitability for further examination. Using a holistic approach to review the detail observed within the mark and other external variables for example, the surface on which the mark was left or any apparent distortion, the practitioner establishes whether they can progress the examination and comparison process.

## 25.9 Comparison

25.9.1 The practitioner will systematically compare two areas of friction ridge detail, for example one area from a mark against one from a print. This process generally consists of a side-by-side comparison to determine whether there is agreement or disagreement between the ridge flow, features and characteristics. The practitioner compares the type, specificity, sequence and spatial relationship of all the observed ridge characteristics, whilst considering the tolerance(s) they have allowed for any issues relating to clarity or distortion of the ridge detail. The practitioner will establish an opinion as to the level of agreement or disagreement between the sequences of ridge characteristics and features visible in both.

## 25.10 Evaluation

25.10.1 The practitioner will review all of their previous observations and come to a final opinion and conclusion about the outcome of the examination process undertaken.

## 25.11 Outcomes

25.11.1 The outcome determined from the examination will be one of the following:

- a. **Identified:** [This term is used in fingerprint comparison evidence and its use is familiar to the criminal justice system. This term will be replaced in the future when an evaluative interpretation method for fingerprint comparison is further developed] A practitioner term used to describe the mark as being attributed to a particular individual. There is sufficient quality and quantity of ridge flow, ridge characteristics and / or detail in agreement with no unexplainable differences that in the opinion of the practitioner two areas of friction ridge detail were made by the same person.
- b. **Excluded:** There are sufficient features in disagreement to conclude that two areas of friction ridge detail did not originate from the same person.

- c. **Inconclusive:** The practitioner determines that the level of agreement and / or disagreement is such that, it is not possible to conclude that the areas of friction ridge detail originated from the same donor, or exclude that particular individual as a source for the unknown friction ridge detail. The outcome may be inconclusive for a number of reasons; those reasons are documented in the practitioners report. Provision of an indication to exclude or associate/attribute features to an individual might also be possible.
- d. **Insufficient:** The ridge flow and / or ridge characteristics revealed in the area of friction ridge detail are of such low quantity and/or poor quality that a reliable comparison cannot be made. The area of ridge detail contains insufficient clarity of ridges and characteristics or has been severely compromised by extraneous forces (superimposition, movement etc.) to render the detail present as unreliable and not suitable to proffer any other decision.

## 25.12 Verification

- 25.12.1 Is the process to demonstrate whether the same outcome is obtained by another competent practitioner or practitioners who conduct an independent analysis, comparison and evaluation, thereby confirming the original outcome.

## 25.13 Complex (Challenging) Comparisons

- 25.13.1 FUs should build on the basic information above to explain the issues of complexity encountered in specific individual cases for the judiciary and jury to understand the practitioner/experts' opinion.
- 25.13.2 When appropriate a more detailed explanation for an inconclusive outcome and the limitations that imposes on the findings should be provided in the report.

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