



Best Practice Manual for the Forensic Examination of Handwriting

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Background

This Best Practice Manual (BPM) belongs to a series of 10 BPMs issued by the European Network of Forensic Science Institutes (ENFSI) in November 2015. The series covers the following forensic disciplines:

1. Forensic Examination of Digital Technology
2. Forensic Examination of Handwriting
3. Chemographic Methods in Gunshot Residue Analysis
4. Road Accident Reconstruction
5. Microscopic Examination and Comparison of Human and Animal Hair
6. Fingerprint Examination
7. DNA Pattern Recognition and Comparison
8. Application of Molecular Methods for the Forensic Examination of Non-Human Biological Traces
9. Forensic Recovery, Identification and Analysis of Explosives Traces
10. Forensic Investigation of Fire Scenes which have resulted in Fatalities*
11. Forensic Investigation of Fire Scenes which involve the Clandestine Manufacture of Improvised or Homemade Explosive Devices*
12. Forensic Investigation of Fire Scenes which Involve the Clandestine Manufacture of Illicit Synthetic Drugs*

* *The three specific areas on Forensic Investigation of Fire Scenes (numbers 10 -12) were combined into one BPM 'Investigation of Fire Scenes'.*

In the years 2014 and 2015, so-called Activity Teams have - in parallel - developed the 10 BPMs. The activities were performed within the project 'Towards European Forensic Standardisation through Best Practice Manuals (TEFSBPM)' and co-ordinated by the ENFSI Quality and Competence Committee. The realisation of the BPMs was supported by the Prevention of and Fight against Crime Programme of the European Commission – Directorate General Home Affairs (code: PROJECT HOME/2012/ISEC/MO/4000004278). The core project concept was that the BPMs will enhance the quality of the forensic services available to law enforcement and justice across Europe and thereby encourage forensic standardisation and cross-border cooperation between countries.

ENFSI expects that the issuing of this series will stimulate the improvement of already existing BPMs as well as the creation of new BPMs on disciplines that are not covered yet.

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Official language

The text may be translated into other languages as required. The English language version remains the definitive version.

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Best Practice Manual for the Forensic Examination of Handwriting

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1. AIMS

This Best Practice Manual (BPM) aims to provide a framework of procedures, quality principles, training processes and approaches to the forensic examination of handwriting. This BPM can be used by Member laboratories of ENFSI and other forensic science laboratories to establish and maintain working practices in the field of forensic handwriting examination that will deliver reliable results, maximize the quality of the information obtained and produce robust evidence. The use of consistent methodology and the production of more comparable results will facilitate interchange of data between laboratories.

The term BPM is used to reflect the scientifically accepted practices at the time of creating. Despite its implicit suggestion that alternative, equivalent Practice Manuals are excluded at beforehand, in this series of ENFSI Practice Manuals the term BPM has been maintained for reasons of continuity and recognition.

2. SCOPE

This BPM is aimed at experts in the field and assumes prior knowledge in the discipline. It is not a standard operating procedure and addresses the requirements of the judicial systems in general terms only.

Documents, of various types, are routinely encountered in casework and are required to be examined for a number of reasons (see Appendix 1 – Key Knowledge Requirements for the Forensic Examination of Handwriting). The examination of these documents may reveal information which is invaluable to the investigation of a crime, or which may provide evidence which indicates that a crime has been committed.

This guidance document covers the process from the receipt of the test items into the “handwriting laboratory” to the presentation of evidence in the courts. As such it encompasses the systems, the procedures, the personnel, the equipment and the accommodation requirements for the forensic examination of handwriting.

The law enforcement framework and the legal systems within which a forensic laboratory is working will determine the degree of direct control that individual practitioners have over each stage of a process. Where the practitioner is not directly involved in any particular stage they should still be in possession of sufficient knowledge to ensure the maintenance of good scientific practice.

3. DEFINITIONS AND TERMS

For the purposes of this Best Practice Manual (BPM), the relevant terms and definitions given in ENFSI documents, the ILAC G19 “Modules in Forensic science Process”, as in standards like ISO 9000, ISO 17000 and 17020 apply. In this section only the field specific terms and definitions, which assist in the interpretation of this BPM, are listed.

Forensic Handwriting Examiner - An individual that undertakes a Forensic Handwriting Examination. This includes both Reporting Scientists and Analysts/Assistants.

Forensic Handwriting Examination - The scientific examination and comparison of handwritten documents to determine whether or not two or more pieces of handwriting have been completed

by one individual. This includes authentication of one or more questioned signatures by comparison with a set of known signatures.

4. RESOURCES

4.1 Personnel

People are likely to be the most important resource in any forensic application and in order to allow staff to work effectively and efficiently everybody concerned in the process must understand the nature of the tasks and the human qualities required to perform them. It is accepted that individual organisations will recruit Forensic Handwriting Examiners in accordance with the requirements of that organisation (and this may include legal considerations as well as academic qualifications or work experiences). As such it is acknowledged that Forensic Handwriting Examiners will have a wide variety of experience, training and background knowledge. All of these can be obtained through a range of different processes, but should include the criteria detailed in Appendix 1 - "Key Knowledge Requirements for the Forensic Examination of Handwriting".

4.1.1 Roles and responsibilities

The key roles for Forensic Handwriting Examinations are:

- Reporting Scientist – The forensic scientist responsible in a particular case for directing the examination of the items submitted, interpreting the findings, writing the report and providing evidence of fact, and opinion, for the court.
- Analyst/Assistant – An individual carrying out general casework examinations or analytical tests under the supervision of a Reporting Scientist and who is able to provide information to assist with the interpretation of the tests.

Both of these roles can be carried out by the same individual.

4.1.2 Competence requirements

The qualifications, competences and experience that individuals require to carry out the various aspects of Forensic Handwriting Examination will depend on the intellectual and practical demands of the various aspects of the work. Appendix 1 – "Key Knowledge Requirements for the Forensic Examination of Handwriting" details the general levels of knowledge required for individuals to undertake the particular aspects of work, whilst Appendix 2 - "Training Requirements for Forensic Handwriting Examiners" details the training requirements and the assessments that will be applied.

The following experience and areas of competence would be expected as the minimum standard for the key roles defined above, in forensic handwriting examination:

- Reporting Scientist - Knowledge of the theories, analytical techniques and procedures applicable to forensic handwriting examination; competence in the evaluation and interpretation of findings in handwriting cases; knowledge and experience of the requirements and procedures of the criminal justice system for the presentation of evidence, both written and oral
- Analyst/Assistant - Knowledge of the theories, analytical techniques and procedures applicable to forensic handwriting examination; the practical skills to

operate specialist equipment and to carry out forensic handwriting analysis safely and reliably in compliance with laboratory protocols; an understanding of the requirements of the criminal justice system

4.1.3 Training and Assessment

The levels of training and assessment are dependent on the role being undertaken; however the following must be addressed in developing a training and assessment programme:

- laboratories should have written standards of competence for each role, a documented training programme and processes for assessing that trainees have achieved the level of competence required;
- all training should be completed within the specified time frame and the outcome of assessments documented on the individual's training records;
- the assessment of competence can be accomplished through a combination of appropriate means, including:
 - practical tests
 - written and/or oral examinations
 - role exercises (for example "mock" courts)
 - casework conducted under close supervision
 - a portfolio of previous work

A trainee should only be recognised as competent when he or she has been assessed as meeting the defined standards of performance and only then be permitted to undertake independent casework in the relevant area. All personnel involved in the field of forensic handwriting examination will also be required to demonstrate that they have maintained their competence at regular intervals, not exceeding 12 months (for example with the use of collaborative exercises or proficiency tests).

4.2 Equipment

The principle equipment required for Forensic Handwriting Examination is a suitable form of magnification (such as a stereo-zoom microscope).

Other instrumentation, (see Appendix 3 Section 7) often falling within the remit of forensic document examination, may assist the Forensic Handwriting Examiner. This is not covered within this documentation.

Only appropriate and properly operating equipment should be employed in casework, and then only within the limits of the performance checks carried out.

4.3 Reference materials

No specific requirements

4.4 Accommodation and environmental conditions

The principle considerations for forensic handwriting examination are the need for sufficient, secure work space to allow for efficient and effective working and the need for good quality lighting, preferably natural daylight.

When necessary correct anti-contamination procedures must be used to prevent cross-contamination.

4.5 Materials and Reagents

No specific requirements

5. **METHODS**

5.1 Anti-Contamination Procedures

All items submitted for handwriting examinations should first be examined for the integrity of their packaging. Any deficiency in the packaging, which may compromise the value of a laboratory examination, should be noted, and the customer informed. Such a deficiency may be grounds for refusal to carry out the laboratory examination.

Where applicable staff should wear suitable protective clothing to minimise the risk of accidentally leaving trace evidence, such as fingerprints or DNA, on the items being examined.

5.2 Examination Techniques and Methods

Whilst it is accepted that individual organisations will have their own, accredited methods, the principle of each method should be carried out in accordance with the recommendations in the appendices to this Manual (Appendix 3 - "Overview Procedure for Forensic Handwriting Examinations and Comparisons").

5.3 Analysis Protocols

The actual work that is carried out in individual cases should be determined by the requirements of the case and will depend on the value of any other evidence which may be available. But a systematic approach should always be adopted, to ensure consistency of delivery of services that they are fit for purpose.

Whatever work is done, the Forensic Handwriting Examiner should always use the combination of techniques available that offers the greatest potential for recovering any forensically viable information, taking into account the volume of work to be undertaken.

The choice of the most suitable methods of examination can only be made at the time of the initial assessment by the Forensic Handwriting Examiner involved. Given the same case circumstances, all laboratories would ideally adopt the same analysis protocol, but in practice the extent to which such harmonisation can be achieved will be limited. This protocol can thus act only as a guide.

Non destructive tests should be given priority.

5.4 Case Records

The exact requirements for recording casework information will depend on the legal system of the country/state of jurisdiction. As a minimum, however, the records should be in sufficient detail to allow another Forensic Handwriting Examiner, competent in the same area of expertise, to identify what has been done and to verify the findings.

For casework involving the forensic examination of handwriting, the records should include details of:

- the items that were submitted to the laboratory, the information accompanying the items on submission and the nature of the work requested
- the method of submission (e.g. by hand, by post, etc.), by whom and on what date(s)

- all movement of casework material within the laboratory system, the person(s) responsible for the movement and the date(s) the movements took place
- the method of return of items to the submitting organisation (e.g. by hand, by post, etc.), by whom and on what date(s)
- any changes, or additions to the items
- all communications within the laboratory and between the laboratory and the submitting organisation about the case
- for each item examined, the labelling, method of packaging and integrity of packaging on receipt
- what examinations have been carried out, when, in what order, where and by whom
- all observations made, photographs taken and analytical data generated
- the specific examination methods and procedures used
- all draft and final reports or statements generated
- administrative and technical review, when and by whom

Wherever possible, written records should be made on standardised forms.

5.5 Peer Review

It is important within Forensic Handwriting Examinations that the results of any examinations undergo Peer Review. The Peer Review will cover, as a minimum, the Critical Findings in the case. The Peer Review should also cover the Technical Findings.

5.5.1 Critical findings

Whilst the exact legal requirements may be different for different organisations, in general findings of critical evidential value should be confirmed by a second Reporting Scientist who has been authorised and is competent to carry out such checks. Findings are considered critical when:

- they make a significant contribution to the findings in the case, and
- are incapable of being confirmed at a later time, or are subject to possible differences in interpretation by different Reporting scientists,

A written record of these checks should be made on the case notes, bearing the signatures of both the reporting scientist and the reviewer.

Where critical findings have not been reviewed, the submitting body should be informed that the results are preliminary.

5.5.2 Technical findings

The technical findings are the results of the examination(s). These findings must be justified and supported by documentation within the casefile. Areas that should be covered by the technical review include:

- is there adequate documentation for all the materials examined
- have the appropriate examinations/analyses been carried out
- have the relevant QA procedures been followed
- have analytical identifications/comparisons been checked
- is the statement/report accurate and does it refer to all items submitted

6. VALIDATION AND ESTIMATION OF UNCERTAINTY OF MEASUREMENT

6.1 Validation

The laboratory should, where possible, only use validated techniques and procedures for the forensic examination of handwriting and the interpretation of their significance in the context of the case.

Validation requires as a minimum that:

- there is an agreed requirement for the technique or procedure;
- the critical aspects of the technique or procedure have been identified and the limitations defined;
- the methods, materials and equipment used have been demonstrated to be fit for purpose in meeting the requirement;
- there are appropriate quality control and quality assurance procedures in place for monitoring performance;
- the technique or procedure is fully documented;
- the results obtained are reliable and reproducible;
- the technique or procedure has been subjected to independent assessment and, where novel, peer review;
- the individuals using the technique or procedure have demonstrated that they have been trained and have demonstrated that they are competent.

Where the techniques or procedures have been validated elsewhere, the laboratory is required to carry out a verification exercise to demonstrate that it can achieve the same quality of results in its own environment.

6.2 Estimation of uncertainty of measurement

Whilst it can be accepted that within forensic handwriting comparisons examiners do not routinely make the sort of measurements described in paragraph 5.4.6 of ISO 17025, the standard indicates that:

- any laboratory should at least attempt to identify all the components of uncertainty and make a reasonable estimation of the uncertainty and
- and that any reasonable estimation should be based on knowledge of the performance of the method. This should make use of for example, previous experience and validation data.

As such it is necessary to demonstrate that the issue of “uncertainty components” is addressed. Consideration should be given to each of these components when the Forensic Handwriting Examiner is assessing the material as part of their examination, including:

6.2.1 Sample size - The results (and strength of the results) of any handwriting and signature examinations may depend on the amount of material submitted for comparison. The results also depend on other criteria such as the complexity of the handwriting and the stylisation of the signature.

6.2.2 Quality of material examined - The quality of the submitted material will have an intrinsic effect on any examination. The following list indicates a number of instances where this will occur:

- Handwriting that has been submitted as photocopies does not possess all of the detail present in original handwriting
- Inks that have been treated with a solvent are more difficult to differentiate than untreated inks
- Non-standard writing tools and/or surfaces (such as sprays, paint and outdoor surfaces)

6.2.3 Complexity of handwriting/signatures - Handwriting and signature examinations and comparisons, and the results of those examinations and comparisons, depend significantly on the relative complexity or stylisation of the handwriting or signatures.

6.2.4 Human error - There are a number of circumstances where human error can be critical. To counter these consideration should be taken to address each of the potential areas, for example:

- Training - all examiners undergo a formal, scheduled and detailed, training programme, during which their progress is monitored and assessed. Where errors or misidentifications are made, the trainee is made aware of those misidentifications or errors, and any corrective actions undertaken.
- Competency - The competency of each practitioner is routinely checked and monitored against a set of specified criteria.
- Procedures - standard operating procedures are in place to ensure a uniformity and conformity of approach to each examination. These procedures are used during the training programme, and the work of the trainee and other members of staff are periodically reviewed against these procedures.
- Repeat analysis - examinations are carried out independently by a second practitioner. The results of both practitioners are subsequently discussed, and a consensus result reached (this is usually, but not exclusively, in agreement with the more cautious set of results). Occasionally, where the examination may be more complicated or result in more contentious findings, the material is given to a third practitioner, for their opinion.
- Collaborative Exercises/Proficiency Testing (CE/PT) - The ability of each examiner is tested regularly, over the range of examinations undertaken, using external CE/PTs. The reported results are assessed against the “known” answers, and any areas of disagreement are discussed and any corrective actions undertaken.

7. PROFICIENCY TESTING

Proficiency tests should be used to test and assure the quality of Forensic Handwriting Examinations. A list of currently available PT/CE schemes as put together by the QCC is available at the ENFSI Secretariat. “Guidance on the conduct of proficiency tests and collaborative exercises within ENFSI” provides information for the ENFSI Expert Working Groups (EWGs) on how to organise effective proficiency tests (PTs) and collaborative exercises (CEs) for their members.

The Forensic Handwriting Examiners should participate in at least one externally generated proficiency test each year. Participants in the test should follow the standard laboratory procedures for casework. They should not give the test any special treatment that would not be given in the same circumstances to casework.

The laboratory QA Manager should be informed of all PT/CEs undertaken.

Any results not in accordance with the expected outcome should be brought to the attention of the laboratory QA Manager as soon as possible.

8. HANDLING ITEMS

The examiner must ensure that any alterations to items within their possession are in accordance with the customer's requirements and are recorded within the casenotes.

The examiner must ensure that, whilst within their possession, there is no contamination (for example extraneous fingerprints and/or DNA) to items that might require further examination.

The examiner must consider the potential health hazards with the item (see paragraph 14.1) and take the appropriate precautions when handling any relevant items.

9. INITIAL ASSESSMENT

9.1 Introduction

In general all casework should undergo an initial case assessment to determine the suitability of the material for examination and the applicability of material submitted before any examination is undertaken.

9.2 Assessment at the laboratory

Before starting work on any case the examiner should carry out an assessment of the information available and the items provided for examination in light of the agreed customer requirement. The examiner should seek to redress any deficiencies through consultation with the customer.

Any work carried out will be to meet a particular customer requirement. At each stage, however, it is important that the course of action selected is based on an assessment of both the propositions put forward by the customer and the known alternative(s) to this.

The examiner should also make an assessment of the risk of contamination, or any other issue that could affect the integrity of the items before examination commences.

The examiner should then consider to what extent the proposition put forward by the customer can be tested and should also frame at least one alternative proposition favourable to the 'defence'.

The examiner should consider what they might expect to find if each proposition were correct and should make an assessment of the likely strength of the findings.

10. PRIORITISATION AND SEQUENCE OF EXAMINATIONS

10.1 General Considerations

Where there is more than one item and/or evidence type involved in the examination of a case then priorities and sequences for the examinations will need to be considered.

Before commencing any examinations within a case the following matters should be considered:

- the urgency and priority of the customer's need for specific aspects of the information

- the other types of forensic examination which may have to be carried out
- which evidential types or items have the potential to provide the most information in response to the various propositions and alternatives
- the perishable nature of any material that may be present
- health and safety or security considerations

10.2 Considerations for forensic handwriting examinations

The Forensic Handwriting Examiner must consider the most appropriate sequence of examinations, the implications of which will have to be considered in conjunction with:

- the availability of items for examination
- the amount of material, within the items, available for examination
- the potential value of the information available from each examination and the impact this has on the various propositions

11. RECONSTRUCTION OF EVENTS

Not applicable

12. EVALUATION AND INTERPRETATION

When determining the authorship of a piece of handwriting and/or signature, a number of hypotheses must be considered during the evaluation and interpretation of all of the information received and gathered relating to a specific examination process.

Each hypothesis must be considered equally against:

- the background information available about the case and the original expectations formulated during case assessment
- the significance of any findings from the examination

and an overall opinion formed of the most likely authorship of the handwriting and/or signatures.

13. PRESENTATION OF EVIDENCE

13.1 General

The overriding duty of those providing expert testimony is to the court and to the administration of justice. As such, evidence should be provided with honesty, integrity, objectivity and impartiality.

Evidence can be presented to the court either orally or in writing. Only information which is supported by the examinations carried out should be presented. Presentation of evidence should clearly state the results of any evaluation and interpretation of the examination.

The Reporting Scientist's findings and opinions are normally provided, in the first instance, in written form, as a report or statement of witness, for use by the investigator and/or the prosecutor/court. Oral evidence may subsequently be required.

13.2 Written evidence

Written reports should include all the relevant information in a clear, concise, structured and unambiguous manner as required by the relevant legal process. Written reports must be peer

reviewed.

Whilst formal advice is available on the format of reports and statements the scope for consistency may be limited by the requirements of the criminal justice system for the country of jurisdiction. In general, however the following should be included:

- the unique case identifier
- the name and address of the laboratory(s) where the Forensic Handwriting Examiner is employed
- the identity of the Forensic Handwriting Examiner(s), and evidence of their status and qualifications where this is a requirement
- the signature of the Forensic Handwriting Examiner(s)
- the date on which the report/statement of Forensic Handwriting Examiner (s) was signed
- the date of receipt of the material that has been examined
- the name and status of the submitter
- a list of the material submitted, identified by source
- if relevant a comment relating to the condition of submitted material and its packaging when received, particularly where there is evidence of alteration, either by tampering, damage, contamination or any other means
- details of all relevant information received with, or in addition to the material
- the purpose of the examination
- details of the examinations/analyses carried out
- the results of the examination/analyses
- an assessment of the significance of the results in the context of the information provided
- the witness's expert opinion, where appropriate, and any findings which may influence it
- comment covering any material that was not examined, and the reasons for this
- details of any submitted material, or parts of such material, not being returned to the submitter, and the reasons why

The use of schedules and/or photographic charts or illustrations, including interpretations and original data, can be a helpful aid in presenting the information clearly.

13.3 Oral evidence

Persons expected to present oral testimony should have received instruction and/or mentoring in the procedural requirements of the particular criminal justice system in which the evidence is to be presented.

Only information which is supportable by the examinations carried out should be presented.

When giving oral evidence the Forensic Handwriting Examiner should resist responding to questions that take them outside their field of expertise unless specifically directed by the court, and even then a declaration as to the limitations of their expertise should be made.

14. HEALTH AND SAFETY

There are occasional health hazard issues with items submitted for forensic handwriting examination, including biological contamination (for example excrement or biological powders) and chemical contamination (fingerprint treatment reagents). Caution must be taken when examining these types of items, and occasionally no examination can be undertaken.

15. BIBLIOGRAPHY

There are many books, journals and individual papers published on the subject of Handwriting Examinations. It is impossible to compile a complete list of all of these. The following list contains some of the significant publications that relate to the examination of Handwriting.

15.1 English language texts

Ellen, D.

The Scientific Examination of Documents - Methods and Techniques, Ellis Horwood, London, 1989

Harralson, H.H. & Miller L.

Developments in Handwriting and Signature Identification in the Digital Age, Routledge, 2012

Harrison, W.R.

Suspect Documents. Sweet and Maxwell, London, 1958 and 1966

Hilton, O.

Scientific Examination of Questioned Documents, Elsevier, New York, 1982

Huber, R.A. & Headrick, A.M.

Handwriting Identification: Facts and Fundamentals, CRC Press, New York, 1999

Kelly J.S. & Lindblom B.S.

Scientific Examination of Questioned Documents, CRC Press, New York 2006

Morris, R.N.

Forensic Handwriting Identification - Fundamental concepts and principles, Academic Press, London, 2000

Osborn, A.S.

Questioned Documents. Boyd, Albany, New York, 1929

15.2 German language texts

Michel, L

Gerichtliche Schriftvergleichung, Berlin: Walter de Gruyter 1982

Hecker, M.R

Forensische Handschriftenuntersuchung, Heidelberg: Kriminalistik-Verlag, 1993

Conrad, W; Stier, B.: Grundlagen,

Methoden und Ergebnisse der Forensischen Schriftuntersuchung, Lübeck: Schmidt-Römhild, 1989

16. AMENDMENTS AGAINST PREVIOUS VERSION

Not applicable.

APPENDIX 1

KEY KNOWLEDGE REQUIREMENTS FOR THE FORENSIC EXAMINATION OF HANDWRITING

SCOPE

All analysis involving the examination and comparison of handwriting and signatures, both original and non-original.

The purpose of the examination is to determine whether or not there is evidence that two or more pieces of handwriting (including signatures) have a common authorship (that is to say “Is there any evidence that these pieces of handwriting were written by the same person?”).

The approach relies on a visual examination of the characteristics of the handwriting or signatures, and an assessment of the similarities and differences found between pieces of handwriting.

DETAILED KNOWLEDGE

Forensic Handwriting Examiners performing these examinations should have detailed knowledge of the following, gained through a comprehensive and documented training programme:-

Process of handwriting comparison includes following.

Pertaining to Analysis:

- Different writing implements
- Variations in handwriting
 - o Within a piece of handwriting
 - o Between two pieces of handwriting
 - o Accidental variation
 - o Long-term development of handwriting
- Styles of handwriting/Classification systems
 - o Upper-case
 - o Cursive lower-case
 - o Disconnected lower-case
 - o Signatures
 - o Graffiti
- Systems of handwriting
 - o Different alphabets (e.g. Roman, Greek, Cyrillic, Arabic etc.)
- Determination of pen-path
- Determination of fluency
 - o Variation in pen-pressure
 - o Tapering ends in individual characters
 - o Connectivity between characters
 - o Effects of speed in handwriting
- Graphic Maturity
 - o Effects of complexity
 - o Illiteracy

External factors affecting handwriting such as

- Writing position and writing surface
- Visibility and lighting conditions
- Motion
- Guided / Assisted hand signatures

Internal factors affecting handwriting such as

- Illness and medication
- Alcohol
- Drugs
- Handedness
- Infirmary and age
- Stress

Pertaining to Comparison:

Effects of copying

- Freehand
- Tracing
- Transferred / Transposed signatures (e.g. photocopies)

Effects of disguise

- Types of disguise
 - o Stencil
 - o Fluency
- Maintenance of disguise within both known and questioned

Correct sampling techniques

- Known handwriting
 - o Dictate
 - o Correct writing style
 - o Sufficient quantity
 - o Disguise
- Course of business handwriting
 - o Different sources
 - o Verification/identification
 - o Contemporaneous sampling covering the relevant time period
- Benefits of correct sampling process

Pertaining to Evaluation

- Considerations
 - o Significance of similarities and differences
 - o Chance resemblance
 - o Simulation
 - o Disguise

- o Limited populations
- o Class characteristics (foreign writing)
- o Individual/class characteristics
- Bayesian Approach/Likelihood ratios

Different styles of conclusion scales in common usage

- Certainty of conclusions and probabilities

Grouping - management of large cases

Presentation of evidence

- Orally
- In written format

Contamination

GENERAL AWARENESS

Forensic Handwriting Examiners should also be able to demonstrate an awareness of the following:-

Teaching methods and taught styles

Graphology – graphology is traditionally considered to be a discipline where the personality of an individual is determined from their handwriting.

Electronic systems for handwriting classification and retrieval

- FISH
- Graphlog
- CEDAR-FOX
- FlashID

Electronic signature verification

Challenges to Forensic Handwriting Examinations

- 1993 US court decision in *Daubert v Merrill Dow Pharmaceuticals*
 - o Five critical considerations for admissibility of expert evidence
- How to prepare for a challenge on the scientific nature of handwriting comparisons

Various arguments governing the uniqueness of handwriting

Non-destructive document examination methods

- Indented impressions
- Lighting and filtering techniques
 - o Absorbance (Visual & infra-red)
 - o Luminescence (Visual, infra-red & ultra-violet)
- Printing processes
 - o Non-impact printing
 - o Impact printing
 - o Commercial printing processes

- Simple paper examinations
 - o Use of lighting techniques
 - o Shredded documents
 - o Watermarks

Partially destructive document examination methods, including

- Thin layer chromatography
- FTIR
- Raman
- SEM

Other forensic examinations that may be impacted upon by a Forensic Handwriting Examination

- Fingerprint enhancement techniques
- DNA examinations

APPENDIX 2

TRAINING REQUIREMENTS OF FORENSIC HANDWRITING EXAMINERS

1. BACKGROUND

- 1.1 This appendix details the requirements for the training of both a Reporting Scientist and an Analyst/Assistant (see paragraph 4.1.1. of the “Guidelines for Best Practice in the Forensic Examination of Handwriting”).
- 1.2 Whilst it is recognized the length of time taken to train a Reporting Scientist and an Analyst/Assistant is dependent on each individual organization, it is important that a number of significant steps and milestones is addressed in the training programme.
- 1.3 This document does not cover other aspects of the trainee’s training (including background information on other forensic activities and the role of a Forensic Scientist at court).

2. GENERAL INTRODUCTION

- 2.1 Each organization must:
 - Generate an individual training programme for each new trainee that covers the whole training period of the trainee. An example of a suitable Training Programme is shown at the end of this Appendix.
 - Ensure that all relevant aspects of the “Key Knowledge Requirements for the Forensic Examination of Handwriting” (Appendix 1) are covered within the training programme.
 - Ensure that there is a periodic assessment of the development of the trainee as a Forensic Handwriting Examiner.
 - Ensure that there is a clear and unambiguous process of final assessment of the capabilities of the trainee.
 - Ensure that there is on-going training and assessment of all Forensic Handwriting Examiners within your organization.
- 2.2 The duration of the training period shall be determined by the laboratory management in conjunction with the trainee.

3.1 PHASE 1 - INITIAL TRAINING

- 3.1 Prior to commencing training, all trainees must have a general overview of the training programme, including a defined timetable with significant milestones.
- 3.2 During the initial period of training, all trainees should be introduced to:
 - The specific methodology used within the organisation
 - Referenced textbooks and relevant journals and scientific papers
 - Test item handling
 - Use of relevant instrumentation
 - Basic notetaking, including the use of specific forms (if relevant)

4 PHASE 2 – USE OF TRAINING CASES/MOCK MATERIAL

4.1 Use of specifically generated material (with known results) to examine specific features encountered within handwriting, for example:

- Types of handwriting including
- Natural handwriting
- Disguised handwriting
- Copied/simulated handwriting
- Types of writing instrument
- Levels and features of fluency
- Differences in individual character construction, and combinations of characters

4.2 The purpose of this section of the training is to install the knowledge of the significance of personal characteristics as opposed to class characteristics

4.3 This section of the training programme will also introduce the process of the comparison process as well as introducing the trainee to the wide variations in characteristics encountered in handwriting.

5. PHASE 3 - INTRODUCTION TO CASEWORK MATERIAL

5.1 This phase introduces the trainee to the critical aspects of examining casework material, including

- Introduction to any relevant casework management systems employed by the organisation
- Understanding the purpose of submission and identifying what the potential outcomes of the examination may be.
- Determining that suitable and relevant material has been submitted and determining what other material may be required to complete the examination
- Awareness of the other forensic opportunities that may be available, including other aspects of Forensic Document Examination
- Awareness of the impact of the examinations on other areas of forensic science, including any potential contamination issues
- Assessment of known and questioned material for internal consistency

6. PHASE 4 - CONSOLIDATION

- 6.1 This phase of the training is critical as it will introduce the trainee to the wide-range of material submitted to the laboratory and will involve many separate examinations, potentially involving many different case examples.
- 6.2 Features to be encountered at this stage will also include:
- Introduction to various types of material
 - Introduction to various case situations, including both size and complexity, and how they can be managed
 - Awareness of relevant databases including IHIS (which includes international copybook styles and handwriting samples)
 - Introduction to the relevant conclusion scales
 - Preparation of forensic reports, including court comparison charts
 - Advising the submitting organization/individual on the need for suitable samples
- 6.3 Each specific case should be reviewed by the trainer within a reasonable timescale

7. PHASE 5 - FINAL COMPETENCE ASSESSMENT

- 7.1 At the culmination of the documented training period, the trainee will undertake a series of competence assessments. These assessments should include:
- Review of the casework material examined during Phases 3 and 4 of the training programme. This material will form a portfolio of material which can be assessed both internally, and if appropriate by external scrutiny
 - Successful outcomes from a number of proficiency tests
 - Presentation skills, relating specifically to forensic handwriting comparisons
 - Report writing skills
- 7.2 Following confirmation that the trainee is competent and confident to present evidence in court, the trainee will be considered suitable for undertaking and reporting casework

8. PHASE 6 - CONTINUED RE-EVALUATION

8.1 It is important to remember that the Training and Final Competence Assessment is a milestone in the Trainees' progress. All Forensic Handwriting Examiners must maintain their competence. This can be achieved via a number of processes but should include:

- Regular participation in proficiency tests
- Peer review of casework
- Maintenance of competence through regular discussion and independent examinations
- Maintained awareness of developments in the field through literature, training sessions and seminars/workshops

8.2 Following any prolonged absence or period of inactivity with regards to handwriting comparisons the Forensic Handwriting Examiner must undergo a reassessment for competence (similar to that described in Phase 5, paragraph 7).

Typical example of training programme. Detailed timings will be dependent on organisational requirements.

Handwriting examinations – Training Programme

Name: James Smith

General information

The examination and comparison of handwriting is one of the most subjective of forensic disciplines and it is essential that anyone being trained in the subject is given adequate time to gain experience. The only way to gain experience is by examining handwritings – and plenty of them – and being told about the significance of handwriting features by an experienced handwriting expert.

In reaching conclusions, and expressing opinions, handwriting experts have to make assessments of the significance of the handwriting features under examination. To ascribe high significance to relatively common features is a sure and certain way to an erroneous conclusion. Therefore it is essential that the trainee examines handwriting on a daily basis and not just in a piecemeal or occasional manner (ENFHEX BPM).

Activity	Training Time	Target date	Completion	
			Trainee	Trainer
Initial Training	<ul style="list-style-type: none"> • Introduction to the Quality System and Methodology • Review of relevant textbooks and scientific papers • Test item handling • Introduction to basic notetaking • Use of relevant instrumentation 			
Initial case notetaking	<ul style="list-style-type: none"> • Confirming relevant items • Identifying requirements (Handwriting comparison, signatures, indented impressions etc.) • Notetaking (including ink types, colours, printing process etc. 	3 days per week (minimum)		

Activity	Training Time	Target date	Completion	
			Trainee	Trainer
Detailed notetaking	<ul style="list-style-type: none"> • Magnification • Sketching handwritings • Highlighting features • Individual features (proportions, shapes, structures) 	3 days per week (minimum)		
Assessment of the significance of handwriting features	<ul style="list-style-type: none"> • Pictorial similarity • Chance resemblance • Quantity/Quality of handwriting 	3 days per week (minimum)		
Interpretation of the significance of handwriting features	<ul style="list-style-type: none"> • Management of large casefiles • Grouping of handwriting 	As and when cases become available		
External influences	<ul style="list-style-type: none"> • Disguised handwriting • Copying and forgery • Effects of drugs and alcohol on handwriting • Effects of illness and age on handwriting • Writing with the unaccustomed hand • Positional influences 	As and when cases become available		
Reporting Results	<ul style="list-style-type: none"> • Conclusion scales 	On-going		

Activity	Training Time	Target date	Completion	
			Trainee	Trainer
Report writing	On-going			
Competence Assessment	As determined by Trainee and Trainer			
Background reading	On-going			

Notes:

- ◆ The bulk of the training will consist of shadowing an expert using case examples. During the preliminary aspects of the training both in-house generated examples and previous casework will be utilised.
- ◆ All aspects of training will be regularly reviewed and discussed with the trainee
- ◆ Any slippage in the timetable may result in the "Competence Assessment" date being postponed.

APPENDIX 3

OVERVIEW PROCEDURE FOR FORENSIC HANDWRITING EXAMINATIONS AND COMPARISONS

1. INTRODUCTION

The purpose of the examination is to determine whether or not there is evidence that two or more pieces of handwriting have a common authorship (that is to say “Is there any evidence that two or more pieces of handwriting were written by the same person?”). The approach relies on a visual examination of the characteristics of the handwriting, and an assessment of the similarities and differences found between pieces of handwriting.

2. SCOPE

2.1 The scope of this procedure covers the forensic examination and comparison of handwriting (in all forms including signatures and graffiti), both original and non-original.

3. PRINCIPLES

3.1 There are five main principles that need to be considered when examining handwriting. Each of the following principles is dependent on the quality and quantity of available handwriting.

3.1.1 No two people write exactly alike,

3.1.2 No one person writes exactly the same way twice, and no two naturally written signatures are exactly the same (assuming that a “signature machine” has not been used).

3.1.3 The significance of any feature, as evidence of identity or non-identity, and the problem of comparison becomes one of considering its rarity, complexity, the relative speed and naturalness with which it is written, and its agreement or disagreement with comparable features.

3.1.4 No one is able to imitate all of the features of another person’s handwriting and simultaneously write at the same relative speed and skill as the writer that he/she is seeking to imitate.

3.1.5 In those cases where the writer disguises their normal handwriting or imitates the handwriting of another person, it is not always possible to identify the author of the handwriting.

4. HEALTH & SAFETY

Occasionally items are submitted which have been:

- Treated with chemical reagents to enhance fingerprints
- Exposed to biological material (for example blood products etc)

Caution must be maintained when examining this type of material, and on occasion the contamination may be such that, on health and safety grounds, no examination can be undertaken.

5. TERMS AND DEFINITIONS

For Terms and Definitions see Appendix 4.

6. PRESERVATION AND HANDLING OF ITEMS

- 6.1 All test items should be handled as little as possible, and normally by an individual wearing gloves or using tweezers.
- 6.2 All test items should be protected from damage by packing securely in plastic bags or envelopes.
- 6.3 The sequence of all relevant tests should be assessed prior to any examinations. Consideration should be given to the potential contamination of the items during the handwriting examination. For optimum recovery of information the items should be examined by the Forensic Handwriting Expert prior to any destructive examination (such as fingerprint treatments and/or chemical ink analysis).

7. EQUIPMENT/INSTRUMENTATION/OPERATING CONDITIONS

The following is the minimum instrumentation required to undertake a handwriting examination:

- A microscope, or other magnifying instrument, with sufficient magnification to allow the examination of the fine detail of the handwriting
- A suitable light source with enough intensity of light to allow the examination of the fine detail of the handwriting
- A suitable lighting system that allows for infra-red absorbance and luminescence.
- Oblique lighting

8. CROSS REFERENCED MATERIAL

- Guidelines for Best Practice in the Forensic Examination of Handwriting
- Appendix 1 - Key Knowledge Requirements for the Forensic Examination of Handwriting
- Appendix 2 - Training Requirements for Forensic Handwriting Examiners
- Appendix 4 - Terminology used in Forensic Examination of Handwriting

9. PROCEDURE

- 9.1 The flow diagram shown at the end of this appendix gives a schematic representation of the steps undertaken during the course of a forensic examination and comparison of handwriting.
- 9.2 The notes detailed below give some of the features that should be assessed during the course of the examination. It may well be that some of these features are not relevant in every case, and should be addressed on a case by case basis.
- 9.3 **Quality and quantity of handwriting**
 - 9.3.1 Features to be noted include:

- 9.3.1.1 Whether the handwriting is original or in the form of a copy document. If possible and practicable examine the original documents. **[Note:** If the handwritten entries are copies of originals, continue with this procedure (making the relevant observations - where possible), but see section 9.7 of this procedure before continuing].
- 9.3.1.2 The physical and/or mental state of an individual can have a significant impact on the handwriting of that individual. Consider the potential impact on the writing of the physical and/or mental state of all individuals concerned including:
- Fatigue
 - Illness
 - Intoxication
 - Age of individuals involved
- 9.3.1.3 Note any external physical circumstances which may affect the overall appearance of the handwriting (e.g. writing made while standing up, writing on a rough surface).
- 9.3.1.4 Note any information supplied concerning the nationality of the potential writer (e.g. Arabic, Asian etc.)
- 9.3.1.5 Nature of the inks including
- Type of ink (for example ball point pen, liquid ink or gel ink etc.)

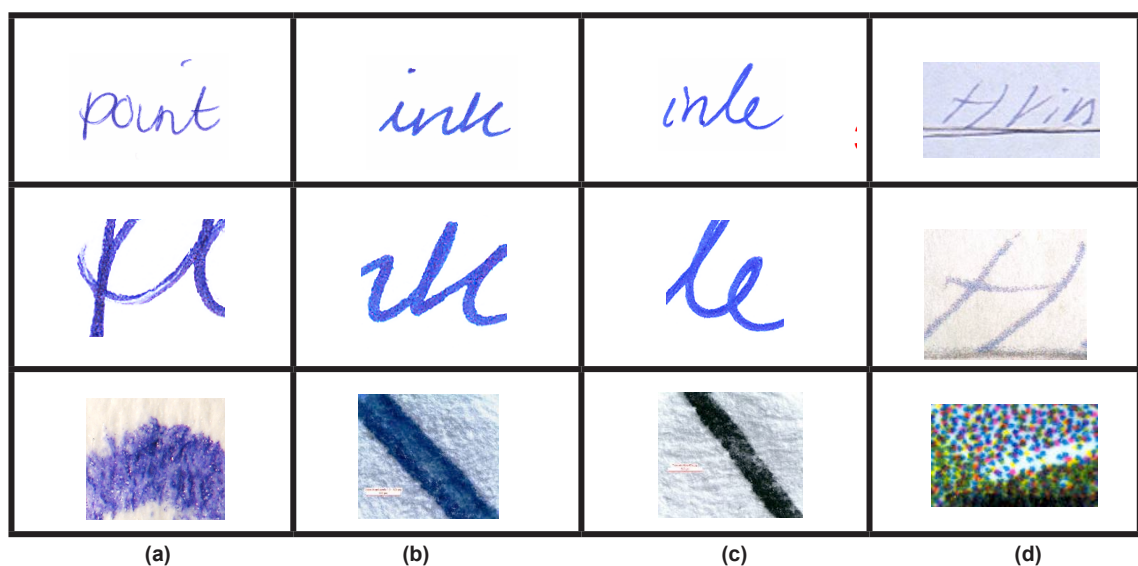


Fig 1. Different types of writing implement (a) ball-point pen ink (b) liquid ink (c) Gel ink (d) handwriting produced by an ink-jet printer.

- Colour
 - Type of writing implement (pencil, pen spray paint etc.)
- 9.3.1.6 Assess the amount of available material for examination and comparison
- Is there sufficient material to be able to assess the range of variation, or are there limitations with the amount of material available?
 - Are there any limitations within the “known” handwriting or within the “questioned” handwriting?

9.3.1.7 Determine the type or style of handwriting submitted for examination

- Block capitals. Disconnected upper-case characters (occasionally through speed of writing the characters demonstrate some degree of connectivity).



Fig 2. Examples of different pieces of upper-case handwriting. This is sometimes referred to as “printed handwriting” or block capital handwriting.

- Disconnected lower-case handwriting. Lower case handwriting with each character disconnected from the neighbouring characters. Each individual character is often distinct and legible.

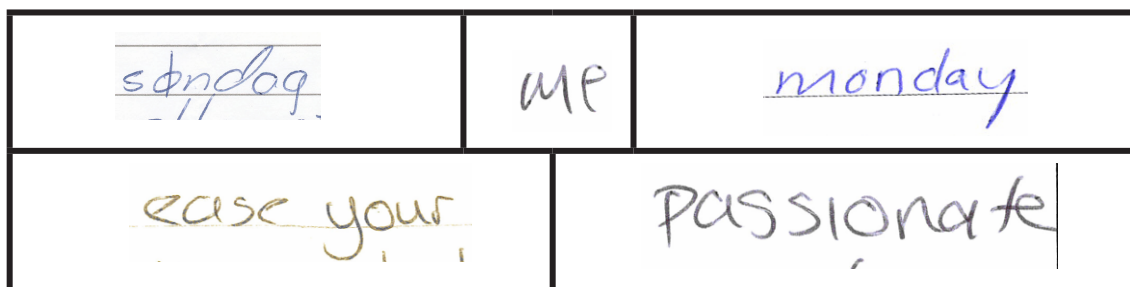


Fig 3. Examples of different pieces of disconnected lower-case handwriting

- Connected lower-case handwriting. This style of handwriting is often also known or referred to as cursive or “joined-up” handwriting. There is normally a high level of connectivity between characters.

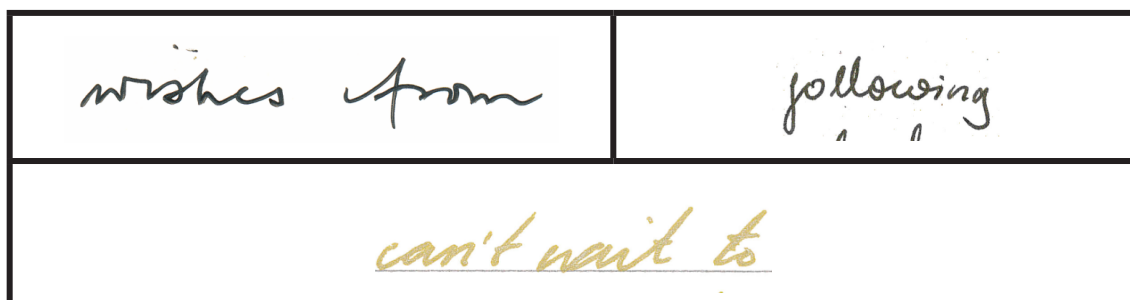


Fig 4. Three examples of “joined up” or cursive lowercase handwriting showing a degree of connectivity between each character.

- Mixed writing forms (either mixed cursive and disconnected, or mixed upper-case and lower-case)



Fig 5. Words that contained a mixture of upper-case and lower-case characters (left) or a mixture of connected and disconnected characters (right).

- Numerals

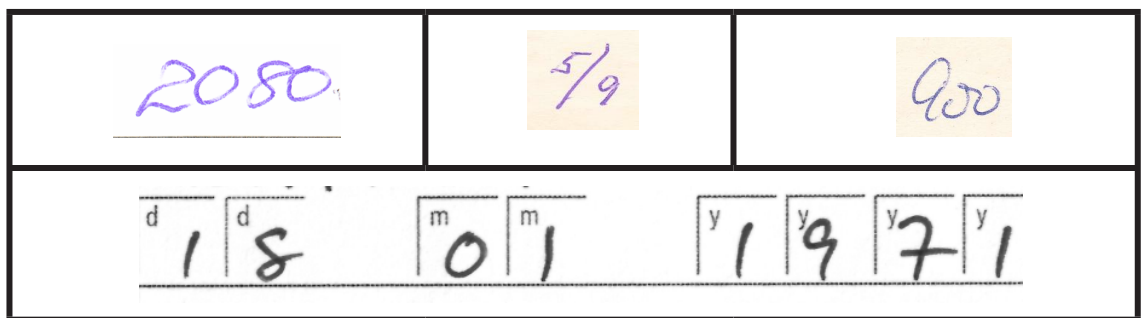


Fig 6. Examples of numerals

- Graffiti – like signatures a particular type or style of handwriting which has its own unique requirements when being examined. **[Note:** Caution needs to be taken when examining this type of handwriting]



Fig 7. Various examples of graffiti, showing examples of handwriting (left) and more artistic styles (centre and right).

- Signatures – often very simple, but on occasions a complex, individualised design representing an individual's name

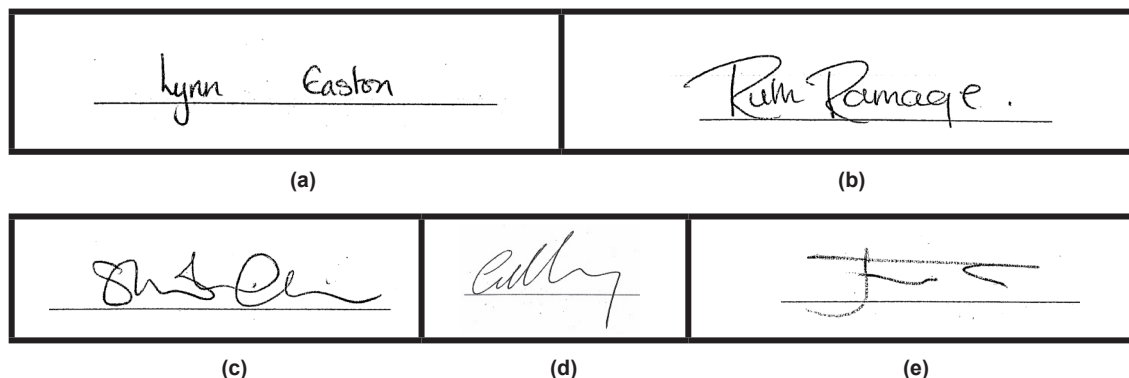


Fig 8. Images showing examples of both legible signatures ((a) and (b)) and those of a more illegible design ((c) to (e)). Signatures (c) and (d) can be considered more complex.

9.4 General characteristics

9.4.1 Features to be noted for both handwritten entries and signatures include:

- *Style and legibility*

Features which may be noted in this category relate to the general appearance, such as the “angularity”, how “readable” the handwriting is etc. The lack of legibility, especially in signatures, is often encountered.

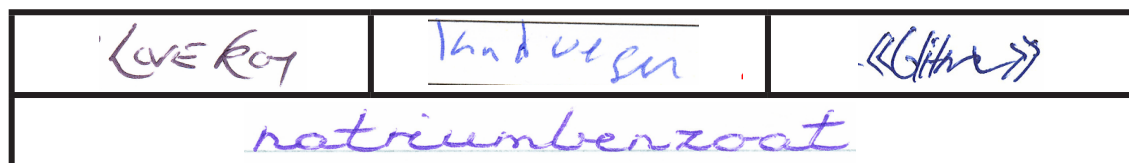


Fig 9. Examples of both legible and illegible handwriting

- *Size*

Features such as the relationship between the size of the characters and the writing lines. Occasionally the size of the paper may constrain the space for the handwriting and this may affect recognizable features.

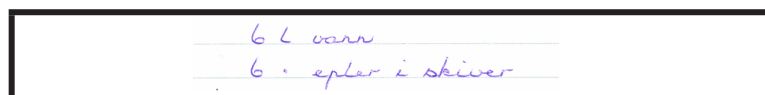


Fig 10. Images showing relative height of handwriting compared with printed lines.

- *Proportions*

Relative size of letters in words, for instance a larger capital letter at the beginning of each word.



Fig 11. Two pieces of handwriting showing distinctly different sizes to characters within words.

- *Spacing*

Reference can be made to the relative spacing between individual characters, between words etc.

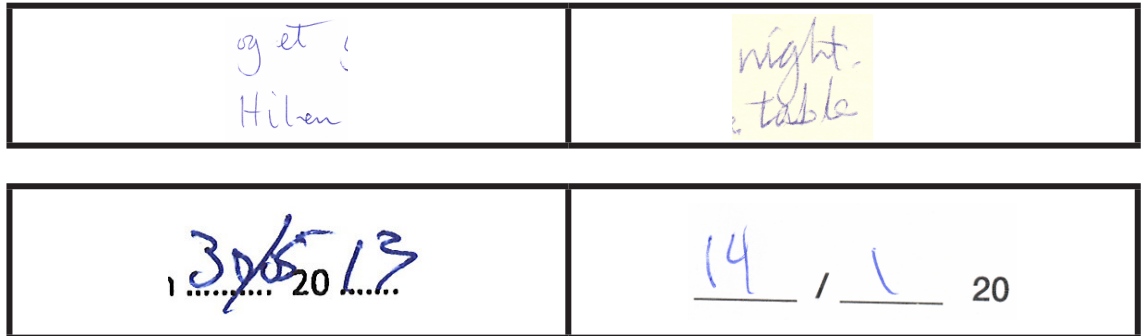


Fig 12. The effect of limited space on handwriting as well as examples of spacing in routine handwriting.

- *Slope*

Note the upright, backward, forward or variable slant of the handwriting (occasionally the handwriting of an individual varies with the change of angle of writing).

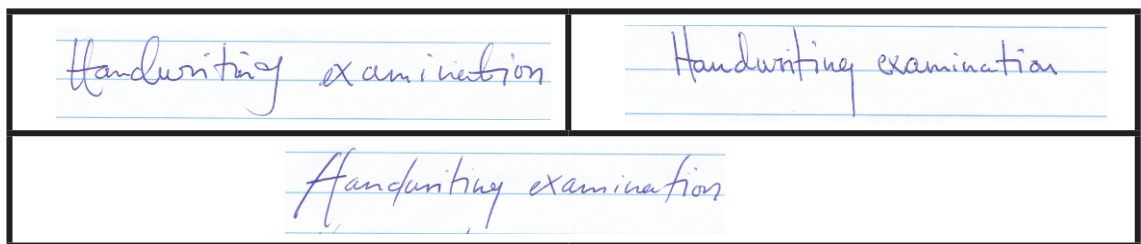


Fig 13. Three examples of handwriting. All produced by one person showing the effects of altering the slope of the handwriting.

- *Fluency/Pressure*

Reference can be made to whether the writing appears to be skilfully or poorly produced, whether there is hesitation in the pen line (pen lifts, tremor etc.), whether the writing line is smooth flowing and whether the writing line has variable pressure, or constant, hard pressure. Three main elements of fluency are connective strokes between characters, tapered ends within characters and variation in pressure within the writing.



Fig 14. Images showing the differences in fluency between two words. The left hand image shows connective strokes, tapered ends and variation in pen pressure, the right hand image lacks these features.

- *Tracing*

Check if there is evidence of tracing, including guidelines. If present these should be noted.

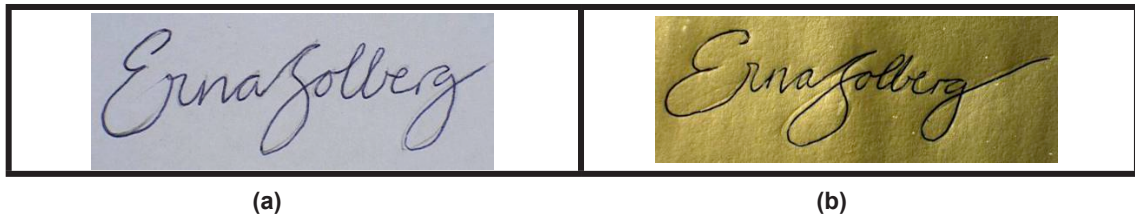


Fig 15. Example (a) shows a signature with pencil guidelines at certain point, whilst image (b) shows indented guidelines around the edge of the signature.

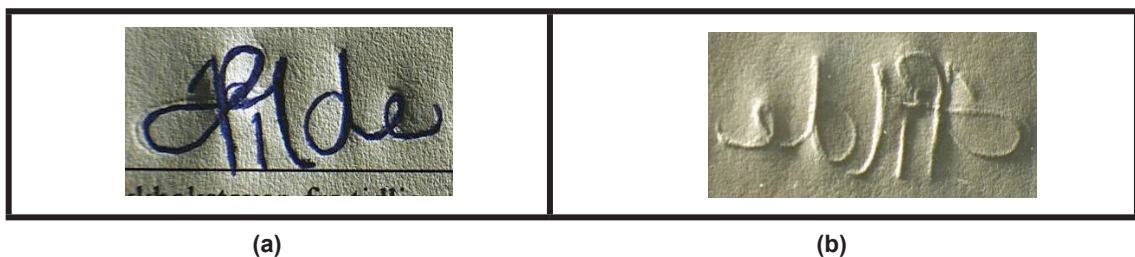


Fig 16. Above images (a) and (b) show the front and back of a signature with oblique light.

- *Layout*

Some consideration of the layout of the handwriting should be mentioned. The layout of a document may be the individual trait of the person who made the entries.

9.5 Detailed examination

9.5.1 Features to be noted include:

- *Individual character shape*

Roundness of the character, angularity etc.

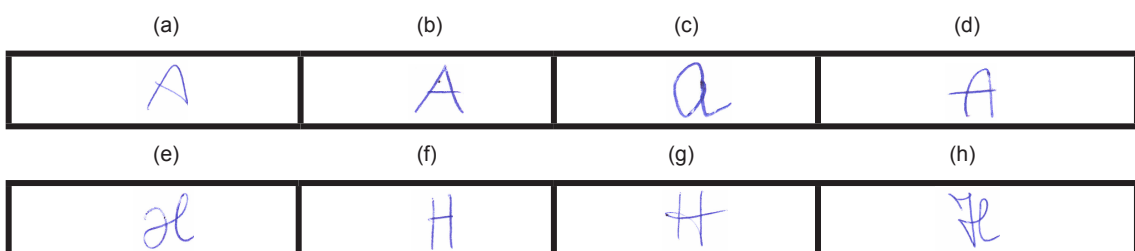


Fig 17. Images (a) to (d) show four different block capital 'A's produced by four different persons. The same four persons produced the range of 'H's shown in images (e) to (h).

- *Individual character proportions*

For instance the relative size of the top loop in a "B" compared with the bottom loop



Fig 18. Letters B showing differences in the proportions of each character.

- *Individual character construction*

The pen path over the surface of the document, the number of strokes in a character etc.

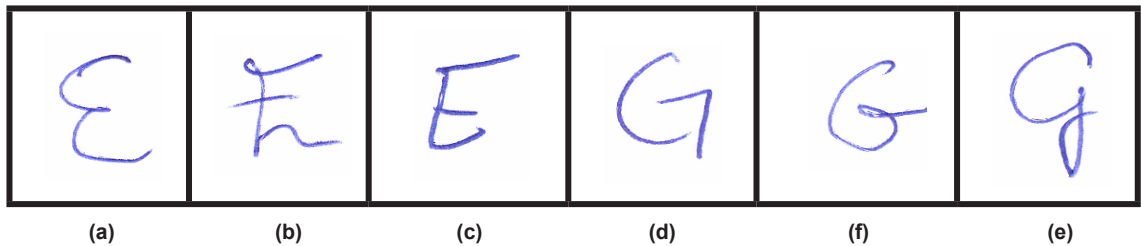


Fig 19. Images (a), (b) and (c) show three different constructions for an upper-case 'E', whilst images (d), (e) and (f) show variations in the pen-path for the letter 'G'.

- *Individual parts of the signature*

Note or sketch the individual parts of the signature. Note whether the parts of the signature are rounded, angular, oval etc. in shape.

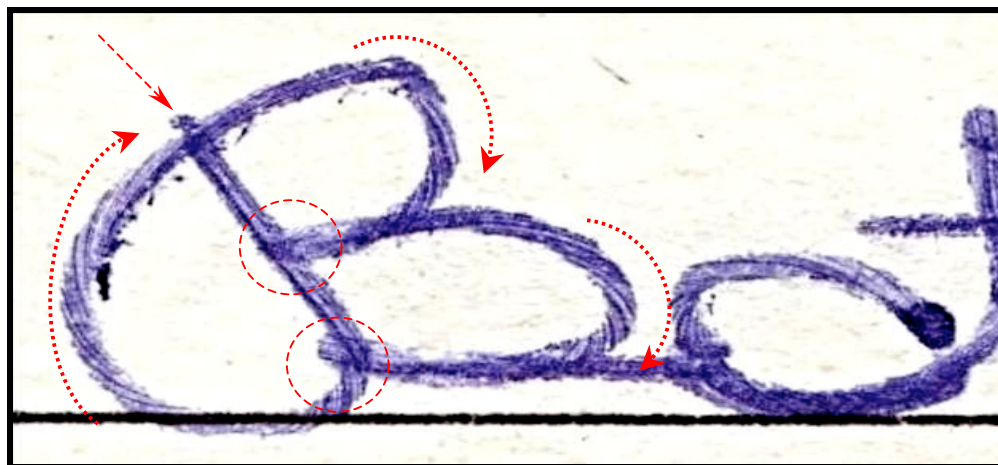


Fig 20. Images showing the various different components to the initial character in a word.

- *Character combinations*

The relative proportions of two or more characters together, for instance "th" joins or "ch" joins.

- *Connection of letters*

How are two characters joined, for instance at the top or at the bottom.

9.6 Similarities and differences between writing

9.6.1 Features to be noted, and compared, include:

- *Quantity and quality of handwriting*

Note similarities and differences in the quantity and quality of the handwriting (see Section 9.3)

- *General Characteristics*

Note similarities and differences between the General Characteristics (see Section 9.4)

- *Character types*

Note similarities and differences between the character types (see Section 9.5). Features to be assessed include character shape, proportions, structure, as well as character combinations etc.

9.7 Examination of copy documents

9.7.1 Copy documents (such as photocopies, faxes, microfiche copies) do not contain all of the detail present in the original documents, and the quality of copy documents varies from item to item. If an examination and comparison is to be made using copy documents, the following observations must be made:

- Determine the clarity of the copy document. Is the handwriting sufficiently detailed for comparison purposes?
- Comment in the notes on the fact that copy documents have been examined
- There must be a disclaimer that the examination is commenting only on the handwriting and is not commenting on the authenticity of the document.
- There must be comment within the notes that the results of any examination may be limited due to the fact that copy documents have been examined.

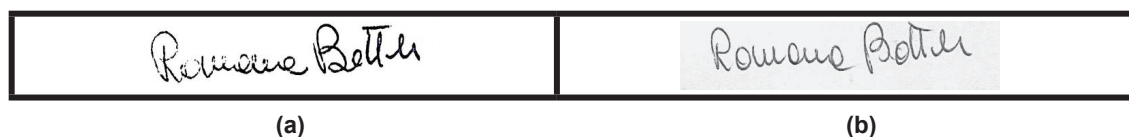


Fig 21. Image (a) shows a poor quality photocopy, with much detail lost whilst image (b) shows a good quality copy with great detail features.

9.7.2 If the clarity of the copy document is poor, then comment should be made to this effect, and no significance should be attributed to any comparison made.

10. QUALITY ASSURANCE AND COMPETENCY

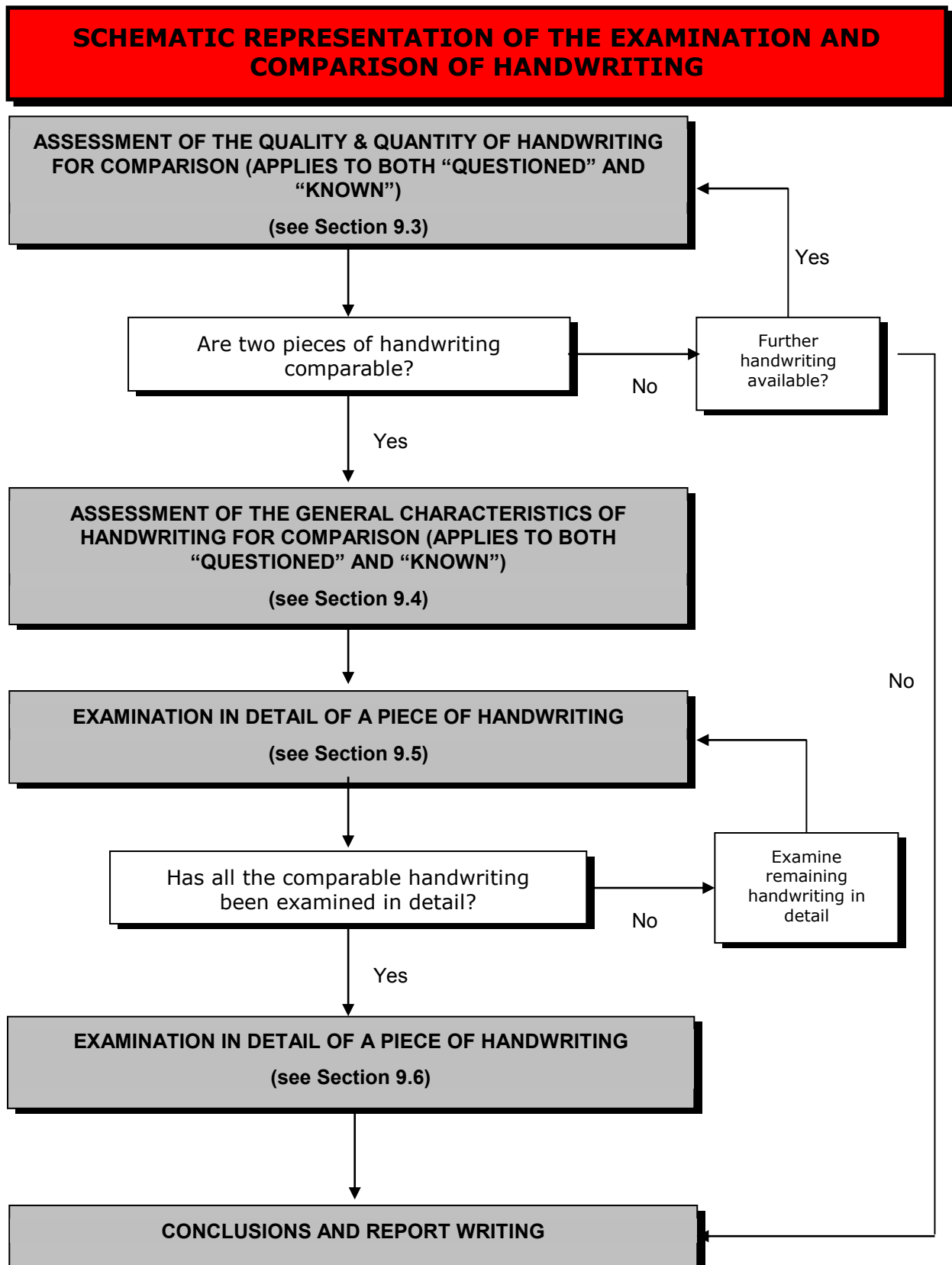
10.1 A competent examiner should be able to use the Instrumentation listed in Section 7.

10.2 The competencies relevant to the Examination and Comparison of Handwriting are summarised in the Key Knowledge Requirements for Forensic Examination of Handwriting.

10.3 The specific quality procedures for each department should be detailed by the relevant department

11. REFERENCES.

11.1 There are many books, journals and individual papers published on the subject of Handwriting Examinations. It is impossible to compile a complete list of all of these. The principle books are detailed in the Guideline for the Best Practice in Forensic Handwriting Examinations.



APPENDIX 4

TERMINOLOGY USED IN FORENSIC EXAMINATION OF HANDWRITING

SCOPE

The following list, although not exhaustive, includes many of the basic terms used in the examination of handwriting and signatures.

TERMINOLOGY

Authorship

The author of a piece of handwriting and/or signature is the individual who physically produced the piece of handwriting and/or signature.

Class characteristics

Handwriting features common to writers that were taught to write with the same copybook system of handwriting

Conclusion

The opinion given by the Reporting Scientist as to the level of similarity and/or difference between two pieces of handwriting.

Differences

Dissimilarities between two pieces of handwriting (either within or between two documents) in both the overall image and in the fine detail structure of characters and combinations of characters.

Disguise

The deliberate action of an individual to alter or hide their personal characteristics of their handwriting

Fluency

The fluency of the handwriting relates to the level of connectivity, variation in pen pressure and relative “smoothness” of the written line. Fluency also considers elements of tremor in the pen line as well as elements of unusual pen lifts or changes in pen direction.

General features

Features within the handwriting, such as document layout, slope, size of text, relative proportions of characters within words etc.

Individualisation/Graphic Maturity

The degree to which the handwriting has developed and moved away from the taught and/or copybook style.

Known handwriting - Course of business handwriting

Course-of-business writing or non-request specimens is handwriting produced by an individual on some other occasion and normally contains the individuals' natural handwriting. Where possible this should include material produced during a similar time period to the questioned handwriting.

Known handwriting - Request or sample handwriting

Handwriting produced specifically for an enquiry at the request of the investigating body. This handwriting is usually directly comparable with the questioned handwriting.

Questioned handwriting

Handwriting of which the authorship is in dispute.

Range of variation

Any individual exhibits, within their handwriting, a range of variation. This is shown by differences in individual character construction and proportions as well as differences in the combination of characters together. Understanding and determining this range of variation is critical to the examination undertaken by the Forensic Handwriting Expert.

Signature

A signature is a handwritten (and often stylized) depiction of someone's name, nickname, or even a simple "X" or other mark that a person writes on documents as a proof of identity and intent.

Similarities

Similarities exist when there is consistency between two pieces of handwriting (either within or between two documents) in both the overall image and in the fine detail structure of characters and combinations of characters.

Styles of handwriting

There are three basic styles of handwriting, block writing/capitals/uppercase, cursive/connected lower-case or script/disconnected lower-case. For a useful examination the comparison material must be in the same style (i.e. like for like).

Writing implement

Handwriting can be produced using a number of different writing means (for example ball-point pen, liquid ink, spray paint etc.)



Best Practice Manual for the Forensic Examination of Handwriting

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