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Standard for the Examination of Documents for Alterations

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Forward

Forensic Document Examiners (FDE) are often asked to determine if documents have been changed or altered since originally created. This determination requires the FDE to conduct a variety of examinations.

An alteration is a revision or modification to a document by physical, chemical, electronic, or mechanical means, or a combination thereof. An alteration can generally be categorized as an addition, deletion, obliteration, or substitution of information and can be revealed by a variety of techniques. Examination of an alteration requires a broad range of knowledge, skills, and abilities to effectively apply appropriate scientific and technical methods, and properly evaluate the findings in order to reach appropriate conclusions. This standard summarizes commonly accepted techniques, technologies, and procedures.

This document was revised, prepared, and finalized as a standard by the Forensic Document Examination Consensus Body of the AAFS Standards Board. The draft of this standard was developed by the Forensic Document Examination Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science.

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The following applies to all ASB documents:

the term **'shall'** indicates that a provision is mandatory, and can be audited for compliance

the term **'should'** indicates that a provision is not mandatory, but recommended as good practice.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

Keywords: *forensic document examiner, alterations, obliterations, insertions, deletions, interlineations additions, substitutions.*

Table of Contents

Standard for the Examination of Documents for Alterations

1 Scope

This document establishes the minimum required procedure(s) used by Forensic Document Examiners (FDE) in the examination of documents for alterations.

2 Normative References

The following reference is a document that is indispensable for the application of the standard. For a dated reference, only the edition cited applies.

SWGDOC *Standard for Scope of Work of Forensic Document Examiners*, 2013

3 Terms and Definitions

For purposes of this document, the following definitions apply.

3.1
alteration
A modification made to a document by any combination of physical, chemical, or mechanical means including, but not limited to, obliterations, additions, overwritings, or erasures.

3.2
digital image
An image that is stored in numerical form.

3.3
document
Any material that conveys a message or contains information on which a set of observations can be made. May be used interchangeably with "item".

3.4
digital image processing
Any activity that transforms a digital image.

3.5
electrostatic detection device
EDD
An instrument that uses electrostatic charge as the mechanism to visualize paper fiber disturbances (for example, indentations, erasures, typewritten material/lift off).

3.6
erasure
The area where material has been removed from a document by chemical, abrasive, or other means.

3.7
fluorescence
A process by which radiant flux of certain wavelengths is absorbed and reradiated nonthermally at other, usually longer, wavelengths.

3.8
infrared
IR
Referring to radiant flux having wavelengths longer than the wavelengths of visible light, usually from ~700 nm to 1400 nm (~0.7 µm to 1.4 µm) as per the International Commission on Illumination (CIE) for IR-A.

3.9
infrared luminescence
IRL
The emission of radiant energy during a transition from an excited electronic state of an atom, molecule, or ion to a lower electronic state (fluorescence or phosphorescence, or both), where the spectrum of the excitation source is in the ultraviolet (UV) or visible region of the electromagnetic spectrum, or both, and the spectrum of the emitted energy is in the far red or infrared (IR) region of the electromagnetic spectrum.

3.10
indentations
Latent or visible impressions in paper or other media.

3.11
side lighting
Illumination from a light source that is at a low angle of incidence, or even parallel, to the surface of the item. Syn., oblique lighting.

3.12
transmitted light
Illumination that passes through a document.

3.13
ultraviolet
UV
Referring to radiant flux having wavelengths shorter than the wavelengths of light, usually wavelengths from about 10 nm to 380 nm.

4 Requirements

4.1 Competence

4.1.1 General

Competency in the examination of altered documents is based upon a combination of the requisite knowledge, skills, and abilities acquired through appropriate education, training, and experience specific to forensic document examination.

4.1.2 Requisite Knowledge, Skills, and Abilities

It is critical that the FDE has a knowledge base that includes the manufacturing processes of materials used in the production and preservation of documents as well as the skills and abilities to

analyze, compare, and evaluate case-related items. Training requirements can be found in SWGDOC *Standard for Scope of Work of Forensic Document Examiners*, 2013.

4.2 Equipment

4.2.1 General

The FDE shall ensure that all equipment and apparatus is properly maintained and calibrated, as required by manufacturer's specifications, and documented as required by the laboratory practices and quality assurance procedures.

4.2.2 Standard Equipment

4.2.2.1 Appropriate light source(s) to distinguish fine detail shall be available. Natural, incandescent, fluorescent, light emitting diode (LED), or fiber optic lighting sources are generally used. These may include transmitted, side, and vertical incident lighting.

4.2.2.2 Optical or digital magnification necessary to resolve fine detail shall be available. The magnification level and the equipment used to observe the feature(s) should be recorded.

4.2.2.3 Image capture device(s) capable of sufficient resolution to record accurate detail shall be available. The equipment used and the resolution needed to observe the feature(s) should be recorded.

4.2.2.4 Infrared (IR) image conversion device or system with appropriate light sources and filters for use in infrared reflectance (IRR) and infrared luminescence (IRL) examinations shall be available.

4.2.2.5 Long-wave, mid-wave, and short-wave ultraviolet (UV) sources shall be available.

4.2.2.6 Measuring devices shall be available, these may include paper micrometer, typewriter grids, rulers, and magnifiers with reticle patterns.

4.2.2.7 An electrostatic detection device (EDD) shall be available.

4.2.2.8 The FDE shall have the time, facilities, and equipment necessary to complete all applicable procedures and prevent deleterious effects. The FDE shall conform to the requirements in SWGDOC *Standard for Scope of Work of Forensic Document Examiners*, 2013.

4.2.2.9 Other equipment or devices generally accepted in the forensic document examination discipline that should be available for the examination of documents for alterations, as deemed appropriate by the FDE, may include:

— hand tools (e.g., scalpel, spatula, tweezers);

— magnetic properties detector;

— software for digital image processing.

4.3 Considerations and Limitations

4.3.1 Items submitted for examination can have limitations that interfere with the procedures in this standard. Limitations can be due to the submission of non-original documents; the condition, quantity, or comparability of the material submitted; or from limited discriminating characteristics. The FDE shall ensure that limitations are noted and recorded.

NOTE This standard may not cover all aspects of unusual, uncommon, or specialized examinations.

4.3.2 The examination of the original item(s) is always preferable, as images and copying processes can mask physical characteristics of a document. The FDE should request the original item(s) if not previously submitted.

4.3.3 If the original item(s) is not made available for examination, the FDE should use the best available evidence to assess the quality of the significant details present in the item(s). If the details have been reproduced with sufficient clarity for examination purposes, continue with the applicable procedures to the extent possible.

4.3.4 Document examinations should be conducted prior to any destructive processing (e.g., latent prints, DNA, ink chemistry). The FDE shall handle the items as required to avoid compromising subsequent examinations. The results of prior storage conditions, handling, testing, or destructive processing can interfere with the examination.

4.3.5 The procedures in this standard can require destructive changes to an item. Prior to making such changes, the FDE shall obtain and record permission from the responsible party requesting the examination and advise them as to the potential benefits and subsequent limitations of these examinations and the extent of possible physical changes to the document. Destructive examinations are defined in section 4.6.

4.3.6 The FDE shall ensure that images are captured and documented before and after making destructive changes to the evidence or to the images of the evidence. The FDE shall contemporaneously record the procedures performed to allow for an independent review and assessment of the images by another FDE, including any relevant setting(s) and variable(s) (see SWGDOC *Standard for Use of Image Capture and Storage Technology in Forensic Document Examination*, 2013 for additional information).

4.3.7 The FDE shall ensure that material(s) removed from the item under examination shall be documented and may be imaged prior to and after removal, and preserved separately for subsequent examination(s). These materials can be of value and can include staples, other binding devices, other attached documents, and trace materials.

4.3.8 The FDE shall consider that characteristics associated with alteration may have occurred during normal preparation, handling, and storage of the document. Some alterations might not have observable physical characteristics or be detectable based on the type of examination(s) in this standard or due to the examination of a non-original document. The absence of observed physical characteristics does not support a definite determination that the document is unaltered.

4.3.9 This standard does not apply to chemical ink examinations. For additional information, refer to SWGDOC *Standard for Test Methods for Forensic Writing Ink Comparison,* 2013.

4.4 Procedures

4.4.1 The FDE shall conduct an initial assessment of the document to determine the appropriate examinations, the sequence of examinations, and the potential limiting factors.

4.4.2 Subsequent to the completion of the initial assessment, the FDE shall proceed to the applicable examinations. The FDE may discontinue the procedure at any point during the examination. The FDE shall record the reason(s) for such a decision.

NOTE The remaining procedures in section 4.4 need not be performed in the order listed below. All procedures may not be applicable to the item(s) being examined.

4.4.3 The FDE shall perform applicable procedures and contemporaneously record examinations performed and relevant observations in the notes. The results and accompanying notes should have sufficient detail to allow for an independent review and assessment of the conclusions by another FDE. The FDE shall include any relevant information, observations, equipment used, methods, evaluations, and conclusions, opinions, or interpretations.

4.4.4 The examination of a document for alterations can include observations of the following:

a) handwriting;

   1) overwriting or obliteration of entries;

   2) crowded or awkward spacing of writing;

   3) inconsistent handwriting features;

   4) characteristics of the writing media, such as variation in color and intensity or class of writing instrument;

b) printing processes and defects;

   1) variation in features used to characterize printing processes;

   2) type of printing process;

   3) color or intensity of printing media;

   4) physical characteristics of the print media, such as the morphology, magnetic, infrared, and ultraviolet properties;

   5) use of different fonts, sizes, styles, spacing, and margins;

   6) crowded or awkward placement of printed text, such as irregular vertical and/or horizontal alignment;

   7) different class characteristics, such as artifacts and misspellings;

c) paper characteristics;

1) area(s) of discoloration or other physical changes to the optical properties of the substrate;

2) paper fiber disturbance;

3) variation in paper characteristics, such as thickness, length, width, opacity, guillotine marks, watermarks, and UV fluorescence;

4) paper cuts, tears, perforations, and folds;

5) indentations;

d) fastening or binding characteristics;

1) inconsistent or multiple binding methods;

2) presence, absence, or removal of adhesives;

3) alignment and number of staples and staple holes;

4) the makeup, condition, placement, and effect of paper clips on a document;

5) presence and alignment of multiple hole punches and perforations;

6) presence or absence of expected markings;

e) miscellaneous characteristics;

1) presence of an obscuring substance;

2) smearing of printing/writing media;

3) sequence of preparation of elements of the document, such as intersections of writing media, mechanical impressions, folds, and printed text;

4) cutting and pasting or substitution;

5) insertion(s) or omission(s) of pages or entries.

4.5 Non-destructive Examinations

4.5.1 The FDE shall ensure that applicable non-destructive procedures be performed.

4.5.2 The FDE shall visually examine all sides of the item macroscopically and microscopically.

4.5.3 The FDE shall record observations, measurements, or both in the case notes, to include but not limited to the following:

a) paper;

b) letter, word, line, and margin spacing;

c) color;

d) fastening and binding marks;

e) facsimile information;

f) trash, roller, and picker bar marks.

4.5.4 The FDE shall examine the document using various optical techniques and light sources, such as side lighting, transmitted lighting, UV, IRR, and IRL.

4.5.5 The FDE shall examine the document with imaging techniques, such as photography or digital image processing.

4.5.6 A measurement scale shall be included in the image area when photographing a submitted item.

4.5.7 Capture conditions, including resolution, color, and bit depth, shall be permanently recorded, within the metadata or otherwise, when a submitted item is scanned.

4.5.8 The FDE shall examine the print media with a magnetic properties detector, if available.

4.5.9 If the documents require examination for latent indentations, the FDE shall process the physical documents using oblique lighting and/or EDD.

4.5.10 The FDE shall record visualized entries.

4.5.11 The FDE may attempt to decipher and transcribe visualized entries.

4.5.12 The FDE shall analyze and compare the observed features and characteristics of the document to known items (if available), and evaluate the findings.

4.5.13 The FDE shall determine the need for destructive examinations. If unnecessary, discontinue examinations, reach a conclusion(s), and report accordingly.

4.6 Destructive Examinations

4.6.1 Destructive examinations are those that damage or otherwise change the item. They should be performed after non-destructive methods have been exhausted. All findings shall be recorded in the case notes. Consideration should be given to the order in which destructive examinations are performed.

4.6.2 The FDE shall inform the party requesting a potentially destructive examination as to the potential benefits and limitations of the procedure and the extent of possible physical changes to the document.

NOTE Destructive testing may consume the item(s) or otherwise limit subsequent examinations by any party.

4.6.3 Prior to destructive testing, obtain and record permission from the responsible party requesting the examination.

4.6.4 The use of destructive examinations can interfere with other types of forensic examinations (for example, chemical analysis of ink or latent print examinations).

4.6.5 The item shall be imaged before and after the use of destructive techniques, as outlined in section 4.3.6.

4.6.6 When an obscuring substance is present (e.g., correction fluid, correction tape), the obscured entry can be visualized by several destructive methods.

4.6.7 When using solvents, the FDE shall ensure that testing be performed prior to general application to each item in order to determine the best course of action.

CAUTION Exposure to solvents, in an attempt to counteract the obscuring substance, can have a deleterious effect on inks, toner, or the substrate. Refer to the Safety Data Sheet (SDS) for proper application and any health and safety effects.

4.6.7.1 Prior to application of a liquid to the item submitted for examination, initial testing should be performed on non-casework items, that are made of similar materials.

4.6.7.2 Apply a solvent or other visualization substance to make paper translucent for visualization of the obscured entry.

4.6.7.3 Apply a solvent capable of counteracting the obscuring substance.

4.6.8 If applicable, physically remove (for example, abrade, scrape, lift, or peel) the obscuring substance from the entry.

4.6.9 Entries physically obscured by synthetic or biological substances (such as blood, grease, tape, or gum) may be recovered by removal of the substance after freezing.

4.6.10 The FDE shall analyze and compare the observed features and characteristics of the document to known items (if available), and evaluate the findings.

4.6.11 The FDE shall conduct other forensic document examinations as appropriate (e.g., handwriting comparison, typewriter comparison), resulting from observations made during or after destructive processing.

4.6.12 The conclusions or opinions resulting from the procedures in this standard can be reached after the examination(s) have been conducted. The number and nature of examination(s) are dependent on the material being evaluated.

4.6.13 The conclusions or opinions based on the results of the above examinations, comparisons, and evaluations shall be reported accordingly.

4.7 Reporting

4.7.1 Reports generated as the result of the procedures used in this standard shall be complete and thorough. The report shall contain the stated purpose of the examination(s), the

examination(s) conducted, observations, conclusions and/or opinions, limitations and sources of uncertainty (as applicable), and includes the method(s) used.

4.7.2 The conclusions and/or opinions in the report shall address the following, as appropriate:

a) whether or not characteristics indicative of alterations were observed;

b) whether or not any of the altered entries were decipherable;

c) the text or description of altered and original entries;

d) the method or sequence of alterations;

e) images of alterations and original entries; and

f) apparent alterations in documents that can actually be the result of software, hardware, or user affected variations, and can occur during normal or legitimate document production.

5 Conformance Requirements

5.1 Conformance

Conformance to this standard will be achieved if an implementation and its associated data records conform to normative ("shall") Section 4.

Documentation to verify conformance with the above requirements shall be maintained by each laboratory and individual FDE and shall be made available to auditors upon judicially or administratively authorized request.

5.2 Conformance to Equipment

Conformance to 4.2 Equipment requires that the forensic document examiner ensures that all equipment and apparatus is properly maintained and calibrated (4.2.1) and maintains the documentation. The forensic document examiner shall also demonstrate that the Standard Equipment (4.2.2) is always accessible and useable upon demand for any examinations that the laboratory or individual forensic document examiner might agree to undertake.

5.3 Conformance to Competence

Conformance to 4.1 Competence, requires the laboratory or individual FDE to maintain and supply evidence of technical competence in the examination of altered documents (e.g., by maintaining records of completion of training to competence in areas specific to forensic document examination, including initial training, continuing education, and training on specific equipment; participating in inter-laboratory comparison; participating in individual proficiency testing; or by demonstrating laboratory accreditation in accordance with ISO/IEC 17025:2017 or individual certification issued in accordance with ISO/IEC 17024:2012 and ISO/IEC 17011:2017).

Annex A
(informative)

Bibliography

This is not meant to be an all-inclusive list as the group recognizes other publications on this subject may exist. At the time this standard was drafted, these were the publications available for reference. Additionally, any mention of a particular software tool or vendor as part of this bibliography is purely incidental, and any inclusion does not imply endorsement.

1] Aginsky, V.N., "Determining the sequence of non-intersecting media on documents: ballpoint pen ink and laser toner entries," *J. Am. Soc. Questioned Doc. Examiners*, 2003. 5, 1.

2] Aginsky, V.N., "Examination of Paper and Toner in Page Insertion/Substitution Cases using TLC, GC-MS and FT-IR Microspectroscopy," *JASQDE*, 2012. 15(2).

3] Berx, V., and J. De Kinder. "The Application of Profilometry in the Analysis of the 'Crossing Lines' Problem," paper presented at the ASQDE Annual Meeting, San Diego, CA, August 14–18, 2002. (JASQDE. Vol 8. No 1, pp1-8, 2005)

4] Casey, M.A., "Alteration of pari-mutuel tickets," *J. Criminal Law Criminol. Police Sci*., 1971, 62, 282.

5] Casey, M.A. and D.J. Purtel. "IBM correcting Selectric typewriter: an analysis of the use of the correctable film ribbon in altering typewritten documents," *J. Forensic Sci*., 1976. 21, 208.

6] Ferrer, A., C.S. Silva, M.F. Pimentel, R.S. Honorato, C. Pasquini, J.M. Prats Montalbán, A.J. Ferrer Riquelme. "Near Infrared Hyperspectral Imaging for Forensic Analysis of Document Forgery," *Analyst*, 2014,139, 5176-5184

7] Flynn, W.J., "Paper Mate's new erasable pen," *J. Police Sci. Admin*., 1979. 7, 346.

8] Godown, L., "Recent developments in writing sequence determination," *Forensic Sci. Int*., 1982. 20, 227.

9] Godown, L., "Sequence of writing," *J. Criminal Law Criminol. Police Sci*., 1963. 54, 101.

10] Hammond, D.L., "Validation of LAB Color Mode as a Nondestructive Method to Differentiate Black Ballpoint Pen Inks," *Journal of Forensic Sciences*, 2007. 52: 967–973.

11] Harris, J.L., "Eyeing the evidence," *Southern Calif. Alumni Rev.*, 1940. 21, 16.

12] Hilton, O., "Characteristics of Erasable Ball point Pens", Forensic Science Journal, 26, pp 269-275, 1984.

13] Hilton, O., "Photographic methods of deciphering erased pencil writing," *Int. Criminal Police Rev*., 1955. 85, 47.

14] Hilton, O., "Proof of an unaltered document," *J. Criminal Law Criminol. Police Sci*., 49, 601, pp. 60, 162. 1959

15] Igoe, T.J. and BL. Reynolds. "A lifting process for determining the writing sequence of two intersecting ball-point pen strokes," *Forensic Sci. Int.*, 1982. 20, 201.

16] Jones, W., R.B., Cody, J.F., McClelland, "Differentiating Writing Inks Using Direct Analysis in Real Time Mass Spectrometry," *Journal of Forensic Sciences*, July 2006, Vol.51(4), p.915-918.

17] Kumar, R., NR. Pal, B. Chanda, JD. Sharma. "Forensic Detection of Fraudulent Alteration in Ball-Point Pen Strokes, Signal Processing and Analysis," *IEEE Transactions on Information Forensics and Security*, April 2012, Vol.7(2), pp.809-820.

18] Li, B. and G. Ouyang. "An Examination of the Sequence of Intersecting Seal and Laser Printing Toner Line," *J Forensic Sci*, 2017. 62: 476–482.

19] Licht, G.A., "Common chemicals for common criminals: check washing again," *J. Am. Soc. Questioned Doc. Examiners*, 2000. 3, 65.

20] Licht, G.A. and J.L., Brown. "Shandon Xylene Substitute in Document Examinations," *J. Am. Soc. Questioned Doc. Examiners*, Vol.2 No.2, 94, 1999.

21] Longhetti, A. and P.L. Kirk. "Restoration and decipherment of erasures and obliterated or indented writing," *J. Criminal Law Criminol*., 1950. 41, 518.

22] Lukáš, G., M. Oravec, P. Gemeiner, M. Čeppan. "Principal Component Analysis for the Forensic Discrimination of Black Inkjet Inks Based on the Vis–NIR Fibre Optics Reflection Spectra," *Forensic Science International*, December 2015, Vol.257, pp.285-292.

23] Maldonado, H.I., A.H. Sierra. "Crayon Obliteration Over Ballpoint Pen Writing," *Journal of Forensic Sciences*, Nov, 1992, Vol.37(6), p.1679-1683.

24] Novotny, M., "Determining the Sequence of Original Ink Writing and Toner Printing," paper presented at the ASQDE Annual Meeting, San Diego, CA, August 14–18, 2002. (JASQDE, Vol 8, No 1, pp 37-47, 2005)

25] Pfefferli, P. and J. Mathyer. "Eraser Mate un stylo a bille à encre effacable," *Rev. Int. Criminol. Police Tech*. 1979. 4, 407. (English abstract available at: https://www.ncjrs.gov/App/publications/Abstract.aspx?id=70716)

26] Sharf, S., R. Gabbay, S. Brown. "Infrared Luminescence of Indented Writing as Evidence of Document Alteration," *Journal of Forensic Sciences*, Jul 1997, Vol.42(4), pp.729-732.

SWGDOC documents can be downloaded from:

https://www.nist.gov/topics/forensic-science/forensic-document-examination-subcommittee

http://www.swgdoc.org/index.php/standards/published-standards

SWGDOC *Standard for Scope of Work of Forensic Document Examiners*, 2013

SWGDOC *Standard for Test Methods for Forensic Writing Ink Comparison*, 2013

SWGDOC *Terminology Relating to the Examination of Questioned Documents*, 2013

SWGDOC *Standard for Physical Match of Paper Cuts, Tears, and Perforations in Forensic Document Examinations*, 2013

SWGDOC *Standard for Examination of Handwritten Items*, 2013

SWGDOC *Standard for Indentation Examinations*, 2013

SWGDOC *Standard for Non-destructive Examination of Paper*, 2013

SWGDOC *Standard for Minimum Training Requirements for Forensic Document Examiners*, 2013

SWGDOC *Standard for Examination of Documents Produced with Liquid Ink Jet Technology*, 2013

SWGDOC *Standard for Examination of Documents Produced with Toner Technology*, 2013

SWGDOC *Standard for Examination of Typewritten Items*, 2013

SWGDOC *Standard for Use of Image Capture and Storage Technology in Forensic Document Examination*, 2013

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