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**Standard for Examination of Documents for
Indentations**



Standard for Examination of Documents for Indentations

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Foreword

This standard provides the best practices to be used by forensic document examiners for the examination, visualization, recording, and evaluation of indentations on documents.

Indentation examinations have been within the purview of document examiners since the earliest discussions of pen pressure, erasures, and indented writings. Books displaying photographs of indentations were published as early as 1910. Journal articles regarding techniques in indented writing examinations can be found at least as far back as the 1950s. Early techniques involving lighting, stereomicroscopy, photography, and other visual aides were expanded upon as technology advanced, and were greatly aided by the introduction of electrostatic detection devices in the 1970s. This standard draws upon many years of discussion, testing and research, and practical applications (see Annex 1, Bibliography).

This standard cannot replace the requisite knowledge, skills, or abilities acquired through appropriate education, training, and experience (SWGDOC *Guide for Minimum Training Requirements for Forensic Document Examiners*, 2013) and is to be used in conjunction with professional judgment by individuals with such discipline-specific knowledge, skills, and abilities.

This document was revised, prepared, and finalized as a standard by the Forensic Document Examination Consensus Body of the AAFS Standards Board (ASB). It was originally drafted by the Scientific Working Group on Forensic Document Examination (SWGDOC). That document was updated by the Forensic Document Examination Committee under the Organization of Scientific Area Committees (OSAC) for Forensic Science, who in turn updated and approved the draft document.

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

Keywords: *indentations, impressions, indented writing, electrostatic detection device, forensic document examination*

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Standard for Examination of Documents for Indentations

1 Scope

This standard summarizes commonly accepted techniques, technologies, and procedures used by forensic document examiners for the examination of documents for indentations.

2 Normative References

There are no normative reference documents. Annex A, Bibliography, contains informative references.

3 Terms and Definitions

For purposes of this document, the following definitions apply.

3.1

electrostatic detection device

EDD

An instrument that uses an electrostatic charge along with toner distribution as the mechanism to visualize paper fiber disturbances (for example, indentations and erasures).

3.2

fixing film

Clear plastic sheet with a pressure sensitive adhesive layer.

3.3

imaging film

Thin transparent plastic material that covers the item during an examination using an EDD.

3.4

indentations

Latent or visible impressions and/or embossments in paper or other media. This also includes paper fiber disturbances which do not optically appear as impressions.

3.5

lift

A product of an EDD examination. The developed toner image on the imaging film is preserved by applying fixing film to create a lift.

3.6

recipient document

The document or other substrate that received indentations, other paper fiber disturbances, or other markings.

3.7

originating document

The document or other substrate with the handwriting, machine, or other markings that caused indentation(s) on a document(s) or other substrate beneath it (the recipient document).

3.8**primary indentation**

An impression on a document(s) or other substrate(s) beneath the originating document caused by the act of writing or other dynamic actions.

3.9**secondary indentation**

Fiber disturbance(s) not caused by the act of writing or other dynamic actions, rather caused by dynamic contact with the embossed side of an indentation(s) or other raised surface.

3.10**side lighting**

Illumination from a light source at a low angle of incidence, or even parallel, to the surface of the item. Syn. oblique lighting, grazing illumination, raking lighting.

4 Significance and Use

4.1 Indentations made through the act of handwriting or action of a mechanical device can occur when markings are impressed from one substrate to another, typically paper products. Indentations are not always visible to the unaided eye and can often be visualized by a variety of techniques.

4.2 The procedures in this standard are grounded in the generally accepted body of knowledge and experience within the forensic document examination discipline.

4.3 This standard provides the best practices to be used by forensic document examiners for the examination, visualization, recording, and evaluation of indentations on documents.

4.4 This standard cannot replace the requisite knowledge, skills, or abilities acquired through appropriate education, training, and experience (SWGDOC *Guide for Minimum Training Requirements for Forensic Document Examiners*, 2013) and is to be used in conjunction with professional judgment by individuals with such discipline-specific knowledge, skills, and abilities.

4.5 The results of indentation examinations can, but might not always:

- a) develop graphic representations of indentations;
- b) associate one document to another, or to an individual;
- c) provide dating information;
- d) determine production sequence;
- e) provide other information regarding the source, production, or history of a document or other item.

4.6 The techniques in this standard are used to visualize paper fiber disturbances (e.g., those caused by pressure from a writing instrument, erasures, paper tears, or dynamic contact with other items.)

4.7 This standard can also be appropriate for examinations of other types of indentations on paper, including those caused by fasteners, transport rollers, and postal processing. This standard includes evaluation of the material available for examinations.

4.8 The particular techniques used will depend on the nature of the material under examination.

4.9 This standard cannot anticipate all aspects of examinations of unusual or uncommon substrates, or other variables involved in the creation or handling of the document prior to submission.

4.10 This standard does not address all safety concerns, if any, associated with its use. The user is responsible for establishing appropriate health and safety practices prior to use.

5 Requirements

5.1 Interferences

5.1.1 Certain items submitted for examination can have inherent limitations. The size, shape, density, or condition of an item might make it less suitable for the EDD portion of the procedure (for example, bound documents, large file folders, and items that have been wet or damaged after indentations were made).

5.1.2 The results of prior storage, handling, or testing can interfere with the examination of certain characteristics. Items should be handled as little as possible prior to EDD examination to avoid contamination in the form of new latent prints, indentations, or DNA. Improper handling, such as rubbing the document with cloth gloves, may also impede EDD examination results. Submitters and other personnel should be advised not to brush documents (e.g., to remove debris, to flatten a folded document, to develop latent prints) or to rub with a pencil. Dusting or other acts of friction applied to the document can negate the electrostatic effect and can introduce new paper fiber disturbances.

5.1.3 Whenever possible, document examinations should be conducted prior to any chemical or other destructive processing. Chemical processing usually interferes with indentation examinations, particularly when the EDD is needed. Destructive processing should take place after indentation examinations. Submitters should be advised of this when applicable and feasible. Chemicals, including water, can negate the electrostatic effect which allows an EDD to work.

5.1.4 If examinations in other disciplines of forensic science are requested on the same item, coordinate sequence of examinations according to laboratory policy, and with the other disciplines.

5.1.5 Wrinkles and folds in the document can interfere or preclude both development and decipherment of indentations.

5.1.6 Avoid the transfer of biological evidence between examiner, devices, and documents as applicable. Contamination issues can require the use of a barrier sheet(s) between the document and platen on an EDD.

5.1.7 EDD examinations can result in the partial lifting of pencil writing, carbon-film ribbon, and other nonpermanent materials. Examinations dependent on these features should precede EDD examinations.

5.1.8 Levels of humidity can affect EDD examination. On-site empirical studies are the best practice to determine if the working environment needs humidity control in order to obtain better contrast with the EDD in use.

5.1.9 Repeated processing with an EDD can result in degraded images.

5.1.10 It is best practice to use both optical and electrostatic methods when examining documents for indentations. Some indentations might not be visualized with only a single method. Impressions and friction can cause effects which are so subtle that they are not detectable by either method.

5.2 Equipment

5.2.1 The standard equipment used by FDEs for indentation examinations includes the following.

a) Appropriate light source(s) to distinguish fine detail.

NOTE Natural, incandescent, fluorescent, LED or fiber optic lighting sources are generally used. Transmitted, side, and vertical incident lighting are useful techniques. Focusable light sources are particularly helpful.

b) Image capture device(s) capable of sufficient resolution to accurately record fine detail.

c) Electrostatic detection device (EDD).

d) Toner application and preservation mechanisms.

e) Humidity chamber or environmental controls as needed.

f) Software for digital image processing as needed.

g) Optical magnification to resolve fine detail.

h) Other apparatus as appropriate.

5.3 Procedures

5.3.1 The necessary time and facilities should be available to complete all applicable procedures and to maintain the condition of the items under examination.

5.3.2 Perform all applicable procedures. The number and nature of the examinations depend on the items submitted, the examinations necessary to answer relevant questions, the laboratory policies, and the examiner's professional judgment.

5.3.3 Contemporaneously record the examinations performed and relevant observations. Include any relevant facts, methods, evaluations, and conclusions, opinions, or interpretations. The results and accompanying notes and images shall have sufficient detail to allow for an independent review and assessment of the conclusions by a Forensic Document Examiner.

5.3.4 Capture an image of the entire document(s) prior to any examination procedures.

5.3.5 The following procedures do not have to be performed in the order given. It is within the discretion of the examiner to discontinue the procedure at any point during the examination. Record the reasons for such a decision.

5.3.6 Assess each item to determine course of action. Some factors which can affect the suitability of a document for an indentation examination include prior destructive processing, copy versus original, printing process, writing instrument, and substrate.

5.3.7 Throughout the examination process, care shall be taken to avoid degrading, changing, or adding indentations.

5.3.8 Prior to making any necessary permanent changes to any item, such as removing staples or separating notebook pages, permission from the responsible party(s) should be obtained and recorded. This can entail discussions with investigators, owners, or attorneys regarding permanent changes. Document all changes made to the item.

5.4 Optical Examination

5.4.1 Examine both sides of the item using lighting that is directed from various angles and directions. There is no single best way to visualize indentations with illumination. Various illumination techniques have been demonstrated to successfully visualize indentations.

5.4.2 Determine if indentations, or other fiber disturbances, are visualized.

5.4.3 Evaluate and record any detected indentations or other fiber disturbances and artifacts. Use magnification as needed. Recording techniques to preserve the information may be as simple as transcription, but should involve imaging. Imaging with still images or video while using a moving light source shall be of sufficient quality to record significant detail.

5.4.4 Evaluate any interaction of indentations with other components of the document. These components can include pen strokes, folds, machine printing, stamp impressions, and seal impressions. Use magnification as needed.

5.4.5 If appropriate, the examiner may choose other visualization techniques that are documented in peer reviewed literature and which are nondestructive.

5.4.6 If indentations are not observed, document the lack of visible indentations.

5.4.7 Determine whether the item is suitable for EDD examination. If the item is not suitable, rely on optical methods and report accordingly.

5.5 Electrostatic Detection Device (EDD) Examination

5.5.1 Follow laboratory procedures regarding humidification of the item(s) prior to EDD processing.

5.5.2 Operate the EDD in accordance with the instructions provided in the operating manual, laboratory procedures, and technical research.

5.5.3 Develop and record a control indentation on the day of examination. A control strip of appropriate size may be included with each item processed.

5.5.4 If the control indentation is not successfully visualized or auditory or visual clues signal a potential problem with the instrument, then troubleshoot, correct and document the problem before any further indentation examinations are conducted with that instrument.

5.5.5 Process both sides of each relevant sheet of paper or other item. Repeating this step one or more times might be necessary, and can involve the rotation of the item. It can be necessary to process the item multiple times as conditions dictate. Information can be missed if both sides of an item are not processed; however, there are situations where it can be logically determined that both sides of an item do not need to be processed.

5.5.6 When beads are used, all beads should be removed from the imaging film before applying fixing film.

5.5.7 Preserve the result by using fixing film, or imaging, or both. Record any detected indentations or other fiber disturbances and artifacts. Use magnification as needed. Recording techniques to preserve the information should involve imaging, and may include photography before or after applying fixing film, video during processing, or scanning of the lift. Imaging shall be of sufficient quality to record significant detail.

5.5.8 A brayer, squeegee, or other device may be used to smooth the fixing film of the lift; however, this shall not be done while the lift is still in contact with the item being processed.

5.5.9 If no indentations are developed, document or preserve the results, or both, according to laboratory policy.

5.5.10 In situations where the developed results are faint or there is background interference, or both, results can be difficult to see. In such instances, the results should be evaluated using an appropriate background and documented accordingly.

5.5.11 Maintain lifts and images according to laboratory policy.

5.6 Indentation Evaluation

5.6.1 Analyze and evaluate the totality of the results of both the optical and EDD examinations.

5.6.2 Study visualized indentations or other images and decipher as needed.

NOTE If the EDD developed results are repeating, weak, fragmented, or diffuse, the possibility that they are secondary indentations should be considered. Corresponding embossing that was, or could have been, in contact should be considered.

5.6.3 Lifts or other images may be used to create various enhancements or illustrations. It can be helpful to use overlays of multiple lifts.

5.6.4 Some examinations and evaluations may be considered complete at this point.

5.6.5 Additional examinations may be conducted, such as the determination of the:

- a) source document;
- b) source device;

- c) writer;
- d) time line in which indentations were created;
- e) sequence of production of indentations and ink strokes.

5.7 Report

5.7.1 Evaluate results and report all conclusions that are reached after following the appropriate procedures outlined in this standard.

5.7.2 Record observations and limitations, as well as the bases and reasons for the conclusions, findings, or determinations.

5.7.3 Once examinations and evaluations have been completed, report the following as applicable:

- a) whether indentations were observed;
- b) whether decipherable indentations were observed;
- c) a record of the indentations and any decipherments;
- d) observations, interpretations, and conclusions as to the source, sequence, or date of indentations;
- e) requested examinations which were not conducted will be noted and explained.

5.7.4 If no indentations are detected, or no useable results are obtained, use caution in reporting results. It is not advised to report that no indentations or friction effects are present. It is advised to use phrases to the effect of “...no indentations were detected using the following methods.”

5.7.5 Report any limitations to the examinations, interpretations, or decipherments.

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.

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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 Minimum Training Requirements for Forensic Document Examiners, 2013



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