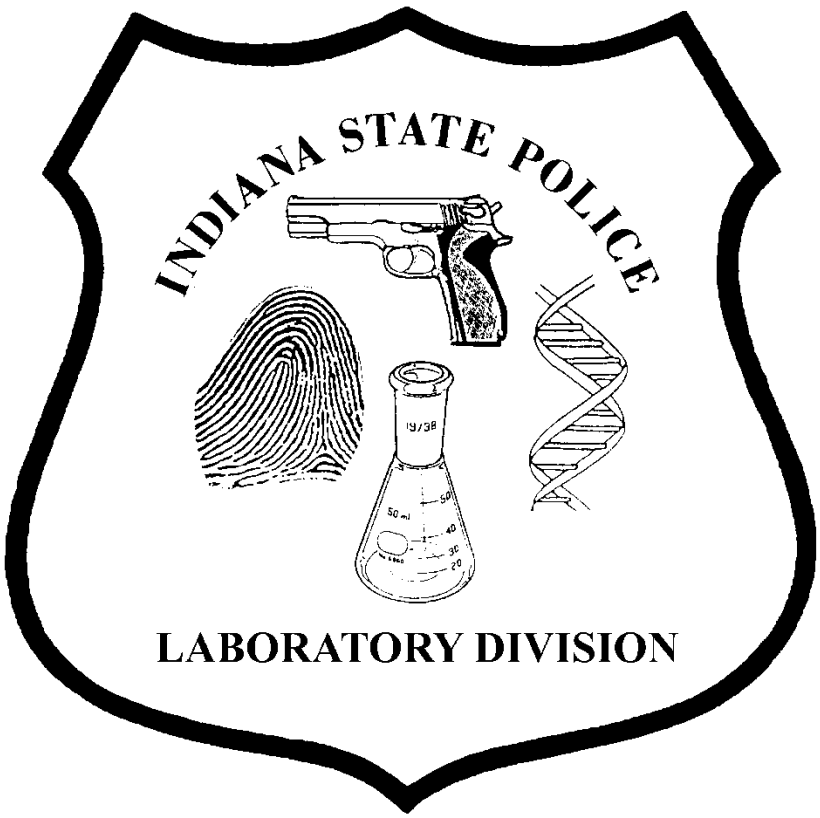
FORENSIC DOCUMENT UNIT



TEST METHODS

FORWARD

The Forensic Document Unit (FDU) of the Indiana State Police Laboratory Division is responsible for conducting scientific examinations, comparisons, and analyses of documents in order to 1.) establish authenticity or non-genuineness, to make known alterations, additions, or deletions, 2.) identify or eliminate persons as the source of handwriting, 3.) identify or eliminate the source of typewriting or other impressions, marks or related evidence, and 4.) write reports or give testimony, when needed. These services are provided to criminal justice agencies and at no cost to the customer.

The FDU is staffed with trained examiners who have, at a minimum, baccalaureate degree with science courses. Forensic Document Examiners have completed an extensive formalized training that requires a minimum of two years to complete, under the direction of the Laboratory Division Commander and are directly supervised by the FDU Supervisor. During the training program, the examiner trainee shall successfully complete written tests, oral examinations, a mock trial, and competency tests. Employees hired, who were trained under a different training program, shall be evaluated regarding the consistency of their work product in accordance with the ISP FDU training program, FDU Test Methods, and Laboratory policies.

The initial training program is followed by two years of 100% technical case review by a qualified examiner.

During the history of forensic document examination, a multitude of individuals and organizations have greatly contributed to the protocols, methods, and procedures that have become a routine part of analysis. References contained in this document are a starting point and should not be considered an all-inclusive list.

This document is a general approach to the examination of documentary evidence. Deviations may be employed with the approval of the Unit Supervisor.

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1. INITIAL EVIDENCE TREATMENT

1.1. **Scope:** This test method for initial evidence treatment shall be used while evidence is in the custody of the examiner.

1.2. **Precautions/Limitations:** The examiner shall treat all evidence submitted for document examinations in a way that protects the integrity of the evidence and that minimizes the potential for contamination and deleterious change during handling, storage and examinations.

1.2.1. Specific procedures shall be used when multiple examination requests are involved on a document. The examiner shall take appropriate precautions to minimize contaminating, altering, or destroying the potential examination of other disciplines.

1.2.2. Should a request for a biological examination also accompany the request for an indented impression examination or the document(s) are marked as a biological hazard, considerations shall be taken to avoid the transfer of biological material.

1.2.2.1. Appropriate personal protective equipment (PPE) shall be worn by the examiner. Gloves shall be changed frequently to avoid contamination of biological substances. Working surfaces shall be cleaned and covered with new paper and changed when appropriate.

1.2.3. Appropriate PPE shall be worn by the examiner for examinations involving documents that are to be protected for latent prints.

1.2.4. Some techniques may be detrimental to the document. Permission shall be obtained from the customer before a destructive examination is conducted.

1.2.4.1. Images of documents shall be taken before any destructive examinations are conducted.

1.3. **Related Information:**

1.3.1. Appendix 1 Worksheets

1.3.2. Appendix 2 Abbreviations

1.3.3. Appendix 3 Definitions

1.4. **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

1.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

1.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

1.4.3. Imaging and other equipment for recording observations.

1.5. Reagents/Materials:

1.5.1. The following shall be available for use: PPE, wiping materials (e.g., Kim-Wipes®, paper towels), a cleaning solution recommended by the ISP Laboratory Division Biology Section, scissors, tweezers, and barrier paper for the work counter.

1.5.2. Workspace and instrumentation shall be cleaned appropriately.

1.5.3. If evidence is being protected from biological contamination, a cleaning solution recommended by the ISP Laboratory Division Biology Section shall be used.

1.5.3.1. If there is surplus material from the preparation of the cleaning solution, the examiner shall mark the container with their initials, the date, the chemical name, concentration with lot numbers if known and affix a safety sticker when appropriate.

1.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include PPE and ventilation, when appropriate.

1.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

1.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

1.7. Reference Materials/Controls/Calibration Checks: Not applicable.

1.8. Procedures/Instructions: Upon receiving evidence for document examinations, the following steps shall be taken:

1.8.1. Review the case to gain an understanding of the nature of the request. Inspect the container and seals. If evidence does not appear properly sealed or if there is evidence where the packaging may have been compromised, the Unit Supervisor, Laboratory Manager, or Evidence Clerk shall be notified. Examiners shall avoid breaking pre-existing seals, when appropriate.

1.8.2. During this initial inventory, appropriate laboratory attire shall be worn which may include PPE.

1.8.3. If the evidence is marked for a latent print examination, the examiner shall be double gloved.

1.8.4. If a document examination (without the need to protect for latent prints or biological contamination) only is requested, general routine precautions shall

be taken to prevent personal exposure to any hazards on or within the items of evidence.

1.8.4.1. An appropriate mask shall be worn when the examiner is likely to be coughing and/or sneezing during any portion of the examination process or in the examination areas where evidence may be subsequently processed for biological evidence.

1.8.4.2. If someone is to observe the initial sample preparation and the examination in cases where contamination of biological evidence or latent print protection is required, they shall wear appropriate PPE.

1.8.4.3. For document evidence suspected or marked as "BIOHAZARD" (e.g., cigarette butts, documents obtained from body cavity seizures, documents obtained from exhumed bodies, evidence from toilet bowls, blood contaminated containers or evidence, etc.) the following procedures shall be used.

1.8.4.3.1. If the evidence is suspected or marked as "BIOHAZARD", the examiner shall wear, at a minimum, gloves during the inventory and examination process until the document(s) is repackaged. After repackaging of the document, gloves shall be removed and disposed of, and hands washed prior to continuing with sealing of the container. Pens and papers shall not be handled with potentially contaminated gloved hands during the examination process. Pens that must be handled with gloves shall be washed with an approved cleaning solution prior to handling with bare hands.

1.8.5. If a document is submitted for both document examination and other forensic discipline examinations, the primary examiners should convene and decide the most appropriate protocol for sampling to minimize the potential for contamination or deleterious change to the evidence.

1.8.6. Once the initial evidence assessment has been conducted, proceed to the appropriate test method.

1.9. **Records:** Notations shall be made in the case notes if an inventory of the evidence or a document examination was conducted in the presence of anyone other than Forensic Document Unit (FDU) personnel. If evidence received is not in agreement with the description on the Request for Laboratory Examination form (or electronic equivalent) or contrary to any descriptions that may appear on the evidence container, these observations shall be recorded in the case notes.

1.10. **Interpretations of Results:** Not applicable.

1.11. Report Writing: The conclusions issued in Certificates of Analysis are listed in the Report Writing section of each Test Method.

1.12. References:

ASTM International E1492-05 Standard Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory

2. HANDWRITING EXAMINATIONS

2.1. Scope: This test method is for the performance of examinations of handwritten documents. This test method includes both visual and instrumental examinations. Handwriting in this context also includes hand printing and signatures.

2.2. Precautions/Limitations: Handwriting examinations may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

2.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

2.2.2. The following are limitations that may be present in a handwriting examination:

2.2.2.1. The submission of non-original documents.

2.2.2.2. Insufficient quantity of writing to demonstrate the natural variation of a writer.

2.2.2.3. Limited individualizing characteristics.

2.2.2.4. Evidence of unnatural writing.

2.2.2.5. Incomparable writing styles.

2.2.2.6. Lack of sufficient repetitions or absent characteristics.

2.2.2.7. Non-contemporaneous writing.

2.2.2.8. Foreign writing not utilizing the Latin alphabet.

2.2.3. Examination of non-original handwriting may result in opinions that are less than definitive.

2.2.3.1. When examining non-original documents, it is not possible to determine whether or not the writing was placed directly onto the submitted document(s) by the writer or if the writing was transferred onto these documents digitally, mechanically, or by other means. Additionally, characteristics indicative of tracings and simulations may be masked.

2.2.3.2. Consideration shall be given to the possibility that various forms of duplications of handwriting can be generated by computer and other resources.

2.2.4. The use of a name in results, opinions, and interpretations assumes the known writings used in the comparison were written by the person to whom they were attributed by the customer.

2.3. Related Information:

2.3.1. Appendix 1 Worksheets

2.3.2. Appendix 2 Abbreviations

2.3.3. Appendix 3 Definitions

2.3.4. Appendix 4 Flow Chart for Q to K Handwriting Comparisons

2.3.5. Appendix 5 Flow Chart for Q to Q Handwriting Comparisons

2.3.6. Appendix 8 Forensic Document Unit Reference Collections

2.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

2.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

2.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

2.4.3. Imaging and other equipment for recording observations.

2.5. Reagents/Materials: Not applicable.

2.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

2.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

2.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

2.7. Reference Materials/Controls/Calibration Checks: Not applicable.

2.8. Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

2.8.1. Visually examine the document(s) using lighting and magnification sufficient to allow fine detail to be observed. Determine if the examination is a questioned (Q) document(s) to a known (K) document(s) (to determine authorship) or if the examination is a questioned document(s) to a questioned documents(s) (common authorship).

2.8.1.1. If the examination is a questioned document(s) to a known document(s) refer to the Flow Chart for Q to K Handwriting Comparisons, Appendix 4.

2.8.1.2. If the examination is a questioned document(s) to a questioned document(s) refer to the Flow Chart for Q to Q Handwriting Comparisons, Appendix 5.

2.8.2. Regardless of the type of examination (Q to K or Q to Q), all handwriting examinations essentially consist of four steps:

2.8.2.1. Examine the questioned document(s) for the following:

2.8.2.1.1. Determine if the document(s) is original. If the document is not original, determine if there is sufficient quality and clarity for examination.

2.8.2.1.2. Evaluate the naturalness of the writing to determine if it is disguised, distorted, or naturally written. Determine if the document is suitable for comparison.

2.8.2.1.3. Determine if class or individual characteristics are present.

2.8.2.1.4. Consideration shall also be made whether or not there is internal consistency.

2.8.2.1.5. It may be appropriate to compare the questioned document to the Robbery Note Reference Collection. Refer to Appendix 8 Forensic Document Unit Reference Collections.

2.8.2.2. Examine the known document(s) for the same elements as listed above in 2.8.2.1.

2.8.2.2.1. Determine whether or not the documents are comparable.

2.8.2.2.2. Determine whether or not the written entries are contemporaneous.

2.8.2.3. Conduct a side-by-side comparison, making annotations in the case notes of both similarities and dissimilarities found in the two bodies of writing.

2.8.2.4. Evaluate similarities, differences, and limitations. Determine their significance individually and in combination. Reach a conclusion according the criteria set forth in 2.11, Report Writing.

2.9. Records: Record in the case record all notes, data and observations. There is no specific worksheet required for handwriting examinations.

2.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

2.11. Report Writing: The examiner shall report the results, opinions, and interpretations to conform to one of the following:

2.11.1. *Identification*— If the evidence contained in the handwriting is in agreement in the individualizing characteristics and there are no significant, inexplicable differences between the questioned and known writings, then an identification is appropriate. This is a definitive opinion, like the opinion of elimination, and is one of the highest degrees of confidence expressed by an examiner in handwriting comparisons.

2.11.2. *Elimination*— If the evidence contained in the handwriting has significant differences between the questioned and known writings at any level of the analyses, then an elimination is appropriate. This is a definitive opinion, like the opinion of identification, and is one of the highest degrees of confidence expressed by an examiner in handwriting comparisons.

2.11.3. When no definitive results, opinions, and interpretations can be reached, the Certificate of Analysis shall clearly communicate the reason(s) and contain the definition of the qualified opinion rendered. (See definitions in Appendix 3)

2.11.3.1. *Qualified Opinions*— If there are similarities or differences of limited significance between the questioned and known writings and there are limiting factors, then the use of qualified opinions is appropriate. The following are the types of qualified opinions:

2.11.3.1.1. *Highly probable*— The evidence contained in the handwriting is very persuasive, yet some critical feature or quality is missing so that an identification is not in order. However, the examiner is virtually certain that the questioned and known writings were written by the same individual.

2.11.3.1.2. *Probably*— The evidence contained in the handwriting points rather strongly toward the questioned and known writings having been written by the same individual. However, it falls short of the “virtually certain” degree of confidence.

2.11.3.1.3. *Indications*— The evidence contained in the handwriting has a few features which are of significance for handwriting comparison purposes. However, there are some similarities between the questioned and known writings. There shall be additional limiting words or phrases such as “but the evidence is far from conclusive”, when this opinion is reported.

2.11.3.1.4. *Indications not*— The evidence contained in the handwriting has few features which are of significance for handwriting comparison purposes. However, there are some dissimilarities between the questioned and known writings. There shall be additional limiting words or

phrases such as “but the evidence is far from conclusive”, when this opinion is reported.

2.11.3.1.5. *Probably not*— The evidence contained in the handwriting points rather strongly against the questioned and known writings having been written by the same individual. However, it falls short of the “virtually certain” degree of confidence.

2.11.3.1.6. *Highly probable not*— The evidence contained in the handwriting is very persuasive, yet some critical feature or quality is missing so that an elimination is not in order. However, the examiner is virtually certain that the questioned and known writings were not written by the same individual.

2.11.3.2. *Could not identify nor eliminate*— The evidence that contains the handwriting possesses minimal significant similarities or significant differences and there are limiting factors, then stating an opinion that a writer could not be identified to nor eliminated from the writing in question is appropriate. This opinion requires an explanation of the limiting factors and a definition of the conclusion in the Certificate of Analysis.

2.11.3.3. *No Conclusion*— The evidence that contains the handwriting possesses significant limiting factors that hinder analysis such as excessive overwriting, a lack of comparable writing, or poor image quality, then the opinion of no conclusion is appropriate. This opinion requires an explanation of the limiting factors and a definition of the conclusion in the Certificate of Analysis.

2.11.4. Examples of wording in a Certificate of Analysis:

2.11.4.1. John Smith (Item 2) could not be identified to nor eliminated from being the writer of the handwriting and hand printing on the sheet of paper in Item 1. Limitations were present in the handwriting examination, such as the presence of a significant amount of class characteristics in the hand printing on the sheet of paper in Item 1 and the lack of comparable handwriting present in the known writing of John Smith (Item 2).

The opinion “could not be identified to nor eliminated from” means that the evidence contained in the handwriting has minimal significant similarities or significant differences and there are limiting factors. This is the zero point of the confidence scale, and the examiner does not have a leaning one way or another.

2.11.4.2. There are indications that Jane Doe (Item 3) was the writer of the hand printing on Page 1, Page 2, and Page 3 in Item 4, but the evidence is far from conclusive. Limitations were present in the handwriting examination, such as a lack of a sufficient repetition of capital letters present in the known writing of Jane Doe (Item 3).

The opinion "indications" means that the evidence contained in the handwriting has a few features which are of significance for handwriting comparison purposes. However, there are some similarities between the questioned and known writings but the evidence is far from conclusive.

2.12. References:

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1658 Standard Terminology for Expressing Conclusions of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E2195 Standard Terminology Relating to the Examination of Questioned Documents

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Harrison, Wilson. R., *Suspect Documents*, Nelson-Hall Publishers, Chicago, IL 1981

Hilton, Ordway., *Scientific Examination of Questioned Documents*, New York, Elsevier, 1982

Huber, R. A. and Headrick, A. M., *Handwriting Identification: Facts and Fundamentals*, Boca Raton, FL, CRC Press, 1999

Kelly, J.S and B. Lindblom, Editors, *Scientific Examination of Questioned Documents, Second Edition*, CRC Press, Boca Raton, FL. 2006

Osborn, Albert S., *Questioned Documents*, Second Edition, Nelson-Hall Co., Chicago, IL 1929

3. INDENTED IMPRESSION EXAMINATION

3.1. Scope: This test method is utilized when conducting indented impression examinations requested by the customer or determined to be appropriate by the examiner. The examination includes both visual and instrumental examination. This test method establishes procedures for visualizing, preserving, and evaluating indented impressions.

3.1.1. Indented impressions occur when sheets of paper are in direct or indirect contact with one another and impressions on the top sheet can produce indented impressions (which may be latent) on the sheet(s) below.

3.1.2. Indented impressions can provide investigative information, associate an individual to a document, associate a document to another document, date a document, determine production sequence, visualize an alteration, or provide other evidence significant to the source or creation of the document(s).

3.1.3. Electrostatic Detection Device (EDD) examinations may be useful in developing other types of impressions on documents such as typewritten material, shoeprints, transport rollers and picker bars, postal cancellation stamps, envelope seams, and paper production marks.

3.2. Precautions/Limitations: Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

3.2.1. Certain documents submitted for an indented impression examination may have inherent limitations due to their size, shape, thickness, or condition, which may render the documents less suitable for the EDD examination.

3.2.1.1. Permission shall be obtained from the customer before a destructive examination is conducted.

3.2.2. The amount and the depth of the indented impressions depend upon several factors. These factors include, but are not limited to, the pressure exerted on the writing instrument or typewriter keys; the sharpness of the writing instrument; the writing surface; the thickness and type of paper; and the number of stacked sheets of material present under the original document.

3.2.3. Not all indented impressions can be deciphered. The reasons for this may also be due to overlapping indented impressions, interfering folds and creases, as well as the interference of the original writing on the document.

3.2.4. Indented impressions may degrade due to environmental conditions, prior forensic testing, improper storage, and excessive handling (e.g., rubbing the documents surface and taking the document(s) in and out of the evidence container multiple times).

3.2.4.1. When possible, indented impression examination should be conducted before any chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

3.2.5. There are inherent limitations that exist and precautions that should be heeded when operating an EDD in an indented impression examination.

3.2.5.1. The EDD process may lift particles of pencil, carbon-film ribbon, and toner off the document being processed. This is typically minor but, on occasion, may be significant. An electronic image of the document(s) containing pencil, carbon-film ribbon, or toner shall be made prior to processing the document with the EDD.

3.2.5.2. The EDD may develop secondary impressions as well as primary impressions. Caution should be taken when attempting to determine whether indented impressions are primary or secondary.

3.2.5.3. Extreme levels of humidity may limit or be detrimental to the indented impression examination.

3.2.5.4. Repeated processing of a document using the EDD may result in the development of indented impressions that are degraded.

3.2.6. Documents shall be handled as little as possible prior to EDD examination to prevent contamination or alteration of the document(s) such as the addition of latent prints, biological materials, and additional indented impressions.

3.3. Related Information:

3.3.1. Appendix 1 Worksheets

3.3.2. Appendix 2 Abbreviations

3.3.3. Appendix 3 Definitions

3.3.4. Appendix 6 Performance Check Procedures

3.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

3.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

3.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

3.4.3. The EDD with associated supplies and materials.

3.4.3.1. Aerosol hood.

3.4.3.2. Glass beads.

3.4.3.3. Black toner.

3.4.3.4. Toner Application Device (TAD).

3.4.3.5. Imaging film.

3.4.3.6. Fixing film.

3.4.3.7. Brayer.

3.4.3.8. Cutting devices.

3.4.3.9. Humidification chamber.

3.4.3.10. The Gradient® and a granite surface plate.

3.4.3.11. Paper barrier sheet(s).

3.4.3.12. Hygrometer.

3.4.4. Software for digital image processing.

3.4.5. Imaging and other equipment for recording observations.

3.5. Reagents/Materials: See 3.4.3.

3.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions shall include personal protective equipment (PPE) and ventilation, when appropriate.

3.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

3.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

3.6.3. The examiner shall review the appropriate Material Safety Data Sheet (MSDS) for toner, developer, and glass beads prior to use.

3.6.3.1. The EDD is a high voltage instrument, at times operating at 8 kV.

3.6.3.2. The EDD shall be operated in an environment that draws airborne toner away from the examiner. If that is not possible, the examiner should wear a surgical facemask.

3.6.3.3. While operating the EDD, at least one glove and a lab coat shall be worn. This may be supplemented with ear protection and a face mask.

3.7. Reference Materials/Controls/Calibration Checks:

3.7.1. A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD. Refer to Appendix 6 for Performance Check Procedures.

3.7.1.1. Results of the reference material shall be recorded in the case notes.

3.7.2. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

3.7.2.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective EDD.

3.8. Procedures/Instructions: These procedures should be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

3.8.1. Changes made to the document(s) to facilitate examination shall be recorded in the case notes (e.g., removing staples, separating sheets of paper from a notebook, etc.).

3.8.1.1. Prior to making significant changes to the documents, permission should be obtained from the customer.

3.8.1.1.1. Images of documents shall be taken and preserved before and after if significant changes are made to the document.

3.8.2. Examine the front and reverse of the document(s) for signs of indented impressions and/or markings using oblique angle lighting directed onto the document(s) from various angles and directions. Observe the surface of the document(s) under magnification, as needed, to visualize any indented impressions. Record observations in case notes.

3.8.3. Record physical characteristics observed on the document(s) such as paper fiber disturbance(s) or chemical staining which may be indicative of an alteration, obliteration, erasure, or eradication.

3.8.4. Determine whether or not the document is suitable for EDD examination.

3.8.4.1. If the document is determined to be unsuitable, interpret any visible indented impressions observed from the use of oblique angle lighting and record observations in case notes.

3.8.4.2. When a request for a biological examination also accompanies the request for an indented impression examination, a clean paper barrier sheet shall be positioned under the document(s) throughout the EDD examination.

3.8.4.2.1. Each document shall have a new paper barrier sheet when it is going to be processed on the EDD.

3.8.4.2.2. The paper barrier sheets shall be disposed of unless there has been a visible transfer of trace evidence from the document(s). In that case, the paper barrier sheet shall be returned with the submitted document(s) by being placed in the original evidence container.

3.8.5. Suitable document(s) should be examined on their front and reverse sides using the EDD. The creation of multiple lifts per document may be necessary.

3.8.5.1. The three methods of applying toner during the EDD examination are cascade, aerosol, and the toner application device (TAD).

3.8.5.1.1. It is the discretion of the examiner to determine when it is appropriate to use which method(s).

3.8.5.2. The humidification chamber shall be used as required in the instrument's operation manual.

3.8.5.2.1. When a request for a biological examination also accompanies the request for an indented impression examination, a paper barrier sheet shall be humidified with the document. The paper barrier sheet shall be positioned between the document and the rack of the humidification chamber.

3.8.5.3. Additional or less humidity, varying the ratio of toner powder to glass beads, or misting of the toner and glass beads mixture may be used to enhance results.

3.8.5.4. When using the cascade method, after processing with the toner mixture and before placing the adhesive film on the imaging film, an attempt shall be made to remove the glass beads.

3.8.6. The EDD lift is created when the fixing film is applied to the imaging film. All EDD developments shall be saved.

3.8.6.1. The EDD lift(s) shall be considered an item created within the Laboratory and shall be documented in the case record and in the Laboratory Information Management System (LIMS) in accordance with Indiana State Police Laboratory Policy Evidence Handling #025.

3.8.6.2. The EDD lift shall be marked with a unique identifier and contain the following additional data, at a minimum: operator's identification, laboratory case number, the date the lift is created, the item number, and the EDD instrument and method(s) used.

3.8.6.2.1. The EDD lift shall be marked with a unique identifier to ensure that it cannot be confused physically with another lift or when referred to in the case record or Certificate of Analysis.

3.8.6.2.2. The EDD lift shall be marked with this information before the EDD lift is photographed, photocopied, and/or electronically imaged.

3.8.6.3. It may be necessary to mark the orientation of the document on the lift (e.g., top, bottom, front, and back) for clarification.

3.8.6.4. If the document(s) needs to be further distinguished from other documents containing the same item number, then a designation shall be made (e.g., page number, date, etc.).

3.8.6.5. If multiple runs are made of the same side of one document, each EDD lift shall be marked with the run number.

3.8.7. Once an EDD lift has been created and the air bubbles between the imaging film and the fixing film are removed using a brayer, the edges should be trimmed.

3.8.8. The EDD lifts shall be returned to the customer. The unique identifier of each EDD lift shall be included in the case record and in the Certificate of Analysis.

3.9. Records: Record in the case record all notes, data and observations.

3.9.1. Notes shall be made of indented impressions observed during the oblique angle lighting examination and when visible on the EDD lifts.

3.10. Interpretations of Results: If indented impressions or other images are visualized, the examiner, when appropriate, shall transcribe the decipherable indented impressions or other images.

3.10.1. Decipherment of the indented impressions may be aided through digital imaging/enhancement, photocopying, or summing of lifts to increase legibility.

3.10.2. When possible and appropriate, the examiner shall:

3.10.2.1. Determine the source document or device of the indented impressions.

3.10.2.2. Establish a time line in which the indented impressions were created.

3.10.2.3. Establish the sequence of the intersections of indented impressions and ink strokes.

3.11. Report Writing:

3.11.1. The basis and reasons for the results, opinions, and interpretations shall appear in the case notes and may appear in the Certificate of Analysis.

3.11.2. Once examinations and evaluations have been completed, the Certificate of Analysis may include the following types of results, opinions, and interpretations:

3.11.2.1. Whether indented impressions were observed.

3.11.2.2. Whether decipherable indented impressions were observed.

3.11.2.3. Interpretation of indented impressions.

3.11.2.3.1. Limitations or uncertainties in the decipherment shall be communicated in the Certificate of Analysis.

3.11.2.4. Information as to the source, sequence, or date of indented impressions.

3.12. References:

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E2291 Standard Guide for Indentation Examinations

ASTM International E2325 Standard Guide for Non-destructive Examinations of Paper

Conway, J.V.P., *Evidential Documents*, Charles C. Thomas, Publisher, Springfield, IL. 1959

Foster, D.J.; Morantz, D.J., An Electrostatic Imaging Technique for the Detection of Indented Impressions in Documents, *Forensic Science International*, 1979, 13, 51-54

Hilton, O., *Scientific Examination of Questioned Documents Revised Edition*, Elsevier Science Publishing Co., New York, NY. 1982

Kelly, J.S. and B. Lindblom, Editors, *Scientific Examination of Questioned Documents, Second Edition*, CRC Press, Boca Raton, FL 2006

Noblett, M.; James, E., Optimum Conditions for Examination of Documents Using an Electrostatic Detection Apparatus (ESDA) Device to Visualize Indented Writings, *Journal of Forensic Sciences*, July 1983, 28, 3, 697-712

Tolliver, D.K., Sobieralski, Carl A. Awareness of the Potential of the EDD Serving as a Source for transfer of DNA, *Journal of the American Society of Questioned Document Examiners*, Vol. 11: 2, 2009

4. PAPER CUTS, TEARS AND PERFORATIONS

4.1. **Scope:** This test method is for the examination of paper cuts including shredded paper, tears, and perforations of paper in order to determine whether or not two or more documents were at one time joined to form a single piece of paper and whether or not an edge is from a mechanical cut or has been torn. This test method includes both visual and instrumental examinations.

4.2. **Precautions/Limitations:** Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

4.2.1. Limitations may include quantity, comparability or the state of the documents submitted for examination. The condition of the paper (e.g., water soaked, stained, soiled, charred, or finely shredded paper) may make it unsuitable for some examinations.

4.2.2. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

4.2.3. In the absence of individual characteristics, it may only be possible to demonstrate an association between two or more documents through class characteristics.

4.3. **Related Information:**

4.3.1. Appendix 1 Worksheets

4.3.2. Appendix 2 Abbreviations

4.3.3. Appendix 3 Definitions

4.4. **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

4.4.1. Appropriate light source(s) of sufficient intensity to allow fine detail to be distinguished.

4.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

4.4.3. Clamps, clips, temporary adhesives, and other supplies that will not adversely affect the document(s).

4.4.4. Imaging or other equipment for recording observations.

4.5. **Reagents/Materials:** Not applicable.

4.6. **Hazards/Safety:** The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

4.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

4.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

4.7. **Reference Materials/Controls/Calibration Checks:** Not Applicable.

4.8. **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

4.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability may indicate that the examiner should discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at that point and report accordingly or to continue with the applicable procedures to the extent possible. The reasons for such a decision shall be documented in case notes.

4.8.2. Determine whether or not the document(s) is cut or torn.

4.8.3. Determine whether or not the document(s) is suitable to be physically realigned.

4.8.4. Evaluate each document for individualizing characteristics, including measurements, luminescence, opacity, etc. following ASTM International E 2325 Standard Guide for Non-Destructive Examination of Paper.

4.8.5. Conduct a side-by-side comparison of the documents using the following steps:

4.8.5.1. Visual inspection of surface markings (e.g., handwriting/hand printing, printing processes, mechanical impressions, indented impressions, and marks from the manufacturing process).

4.8.5.2. Macroscopic alignment (view pieces side-by-side that have similar class characteristics).

4.8.5.3. Microscopic alignment (magnified edge-to-edge examination for tear patterns, distinctive paper fiber separations, etc.).

4.8.6. Reconstruct the paper fragments if appropriate.

4.8.7. Consideration should be given to repackaging the documents in a manner that preserves fragile match areas, facilitates recovery, and permits demonstration. When appropriate, this information should be relayed to the customer so that further examinations are not compromised.

4.9. **Records:** Record in the case record all notes, data and observations. This also includes appropriate documentation of selected non-matches.

4.10. **Interpretations of Results**: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

4.11. **Report Writing:** Certificates of Analysis may include, but are not limited to, the following types of results, opinions, interpretations and other findings:

4.11.1. The paper fragments were at one time joined to form a single, or larger, piece of paper.

4.11.2. Although class similarities were observed, there were insufficient individual features to determine whether or not the paper fragments were at one time joined to form a single piece of paper. When non-definitive conclusions such as this are reached, the limitations of the examination shall be stated in the Certificate of Analysis.

4.11.3. The paper samples did not originate from a single piece of paper.

4.11.4. The Certificate of Analysis may also include information such as the printed text, handwriting, indentations, and/or contaminants observed during the examination.

4.12. **References:**

ASTM International E444 Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732 Terminology Relating to Forensic Science

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E2195 Terminology Relating to the Examination of Questioned Documents

ASTM International E2288 Standard Guide for Physical Match of Paper Cuts, Tears, and perforations in Forensic Document Examinations

ASTM International E2325 Standard Guide for Non-destructive Examination of Paper

International Paper Company, Pocket Pal

Kelly, J.S and B. Lindblom, *Scientific Examination of Questioned Documents, Second Edition*, CRC Press, Boca Raton, FL, 2006

The Mead Corporation, *Paper Knowledge*, 1999

5. Examination of Inks

5.1. **Scope:** This test method is used in ink examinations requested by the customer or determined to be appropriate by the examiner. The examinations of ink on a document may identify the type of writing instrument, discriminate between ink formulations, and/or provide additional information about an ink. This test method includes both visual and instrumental examinations.

5.2. **Precautions/Limitations:** Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

5.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

5.2.2. Most interferences with ink examinations come from variables that interact with the ink. These interactions can result from:

5.2.2.1. Blotting wet ink,

5.2.2.2. Variations in the paper,

5.2.2.3. Environmental or exposure conditions,

5.2.2.4. Chemical testing,

5.2.2.5. Or a combination thereof.

5.2.3. The Indiana State Police (ISP) Forensic Document Unit (FDU) only conducts non-destructive ink examinations. Evidence may be outsourced to a laboratory that conducts chemical analysis not performed by the ISP FDU.

5.3. **Related Information:**

5.3.1. Appendix 1 Worksheets

5.3.2. Appendix 2 Abbreviations

5.3.3. Appendix 3 Definitions

5.3.4. Appendix 6 Performance Check Procedures

5.4. **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

5.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

5.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

5.4.3. Video Spectral Comparator (VSC).

5.4.3.1. Light sources (e.g., visible, Ultraviolet (UV), Infrared (IR), excitation source for IR luminescence).

5.4.3.2. Filters (e.g., colored filters, longpass, shortpass, and bandpass).

5.4.3.3. Equipment capable of IR image capture and recording observations.

5.4.4. Imaging and other equipment for recording observations.

5.5. **Reagents/Materials:** Not applicable.

5.6. **Hazards/Safety:** The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

5.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

5.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

5.6.3. Exposure to shortwave UV light without proper protection for eyes and skin is dangerous and shall be avoided.

5.6.4. Exposure to long periods of UV will have deleterious effects on a document which may affect subsequent examinations for biological evidence.

5.7. **Reference Materials/Controls/Calibration Checks:**

5.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

5.7.1.1. Results of the performance check shall be recorded in the case notes.

5.7.2. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

5.7.2.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective VSC.

5.8. **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures

performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

5.8.1. Observations of the substrate and the ink throughout these procedures shall be documented.

5.8.2. Classification of Writing Instrument:

5.8.2.1. Determine whether or not the ink on the document is original. If the ink is not original, request the original document.

5.8.2.1.1. If the original document is not submitted, evaluate the quality of the document submitted to determine whether the significant details have been reproduced with sufficient clarity for comparison purposes and proceed to the extent possible. If the details have not been reproduced with sufficient clarity, discontinue the examination and report accordingly.

5.8.2.2. Conduct a macroscopic and microscopic examination of the ink for class characteristics such as striations, feathering, nib markings, troughs, or layering.

5.8.2.3. Determine the color of the ink.

5.8.2.4. Classify the writing instrument used to create the entry on the document: ballpoint, non-ballpoint, nib pen, pencil, crayon, etc.

5.8.2.4.1. A determination that a particular written entry on the document is not ink or that a document is lacking in quality or comparability may indicate that the examiner should discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the examination at that point and report accordingly or to continue with the applicable procedures to the extent possible. The reasons for such a decision shall be documented in the case notes.

5.8.2.5. Determine the condition of the ink and the overall appearance of the writing. Record in the case notes anything that may have caused a change in the written entry, such as the interferences described in Section 5.2 and stains, burns, aging, blotting, fading, attempts at mechanical erasure or chemical eradication, and discolorations.

5.8.3. Instrumental Analysis:

5.8.3.1. When comparing the reaction of inks, it is important to view the inks on the same substrate and under the same instrument settings.

5.8.3.2. When recording the observed reactions of inks to a light source, it is important to record in the case notes any influence imparted by the substrate.

5.8.3.3. The reaction of ink can vary at different wavelengths. Therefore in the differentiation of inks, it is useful to use a range of different light

sources, filters, filter combinations, etc. When recording the reaction of inks in case notes, the light sources, filters, and settings shall be documented in the case notes.

5.8.3.4. UV Examination:

5.8.3.4.1. Apply the settings for the UV examination on the VSC.

5.8.3.4.2. Observe the ink under long-wave UV, mid-range UV, and short-wave UV light sources. Record in case notes the reaction of the ink, which may include the presence or absence of fluorescence or a florescent halo around the borders of the ink.

5.8.3.4.3. Record in case notes any reaction of the substrate. Strong fluorescence of the substrate may affect the observer's perception of the reaction of the ink.

5.8.3.4.4. UV examination may reveal indications that the document has been stained by chemicals or other materials that may affect the ink comparison. These chemicals may include chemical ink eradicators, liquid or dry opaquing material, cellophane or other tape, and adhesives. Their presence may have significance beyond the ink comparison and shall be recorded in the case notes.

5.8.3.5. IR Examination:

5.8.3.5.1. Determine the reflected IR (RIR) and IR luminescence (IRL) characteristics of the ink.

5.8.3.5.1.1. RIR

5.8.3.5.1.1.1. Apply the settings for the RIR examination on the VSC.

5.8.3.5.1.1.2. Observe and record in the case notes the characteristics of the ink under the various RIR settings as opaque, transparent, or gradations of opacity. The more the ink absorbs the IR light, the more opaque or darker the ink will appear. The more the ink transmits IR light, the less opaque or lighter the ink appears until it becomes transparent or drops out.

5.8.3.5.1.2. IRL

5.8.3.5.1.2.1. Apply the settings for the IRL examination on the VSC.

5.8.3.5.1.2.2. Observe and record the characteristics of the ink relative to the substrate as luminescent, opaque, transparent or gradations of these under the various IRL

settings. Inks that luminescence more brightly than the substrate will appear lighter than the substrate. Strongly luminescent ink may appear to glow brightly. If ink does not luminescence or does not luminescence as brightly as the substrate, the ink will appear darker than the substrate. Inks that luminescence at an intensity similar to that of the substrate appears transparent or drop out.

5.8.3.5.1.2.3. A luminescent halo is occasionally observed around an ink line; capillary migration of a vehicle component into the substrate is a known cause.

5.8.3.5.1.2.4. Inks that luminescence with similar but not identical intensity can sometimes be differentiated by placing a non-luminescent or brightly luminescent object behind the substrate.

5.9. **Records:** Record in the case record all notes, data and observations.

5.10. **Interpretations of Results:** The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

5.10.1. *Differentiation:*

5.10.1.1. If significant and reproducible differences between inks on the same substrate are found at any level of the optical analysis, it shall be concluded that the inks are different.

5.10.1.1.1. Additional analytical testing may reveal the possibility of batch-to-batch variation within an ink formula. This kind of variation may be detectable utilizing additional analytical methods that are not conducted within the FDU (e.g., chromatography, electrophoresis, spectrometry, spectrophotometry, or a combination).

5.10.2. *Inks that could not be differentiated:*

5.10.2.1. When the comparison of two or more inks by optical analysis reveals no significant and reproducible differences, it shall be concluded that the inks could not be differentiated at that level of analysis. Additional, destructive analytical techniques may be able to differentiate the inks indicating that the inks are of the same formula but different manufacturing batches, two similar formulas, or from different writing or marking instruments.

5.11. Report Writing: The following includes examples of how conclusions of ink examination should be reported:

5.11.1. "At least __ (fill in the number) ink formulations were observed on the page."

5.11.1.1. Specific details of where the different ink formulations were located on the document should be given in the Certificate of Analysis.

5.11.2. "Using the macroscopic and microscopic non-destructive examinations available within the Forensic Document Unit, no differences were observed among the inks on the document."

5.11.2.1. Results, opinions, or interpretations shall not state that two inks are identical or the same ink.

5.11.3. "Using the macroscopic and microscopic non-destructive examinations available within the Forensic Document Unit, at least two different writing instruments were used on the document based on the class characteristics of the ink. One writing instrument was a ballpoint pen containing black ink. The other instrument was a non-ballpoint pen using black ink."

5.11.3.1. Specific details of where the different ink formulations were located on the document should be given in the Certificate of Analysis.

5.11.4. The following limitation shall also be included in Certificate of Analysis when reporting ink examinations: "The Forensic Document Unit (FDU) only conducts non-destructive ink examinations. If chemical analysis is requested of the inks, the evidence may be sent to a laboratory that conducts destructive ink examinations."

5.12. References:

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E1422 Standard Guide for Forensic Writing Ink Comparison

ASTM International E1789 Standard Guide for Writing Ink Identification

Brunelle, R.L., A Systematic Approach to Ink Identification, *Identification News*, November 1972

Brunelle, R.L., Cantu, Antonio A., A Critical Evaluation of Current Ink Dating Techniques, *Journal of Forensic Sciences*, March 1987

Cantu, A.A, Comments on the Accelerated Aging of Ink, *Journal of Forensic Sciences,* July 1987

Conway, J.V.P., *Evidential Documents*, Charles C. Thomas, Publisher, Springfield, IL, 1959

Crown, D.A., Crim, D., and Brunelle, R. L., The Parameters of Ballpen Ink Examinations, *Journal of Forensic Sciences*, 1976

Harrison, W.R., *Suspect Documents*, Nelson-Hall Publishers, Chicago, IL, 1981

Hilton, O., *Scientific Examination of Questioned Documents Revised Edition*, Elsevier Science Publishing Co., New York, NY, 1982

Kelly, J.S., and B. Lindblom, Editors, *Scientific Examination of Questioned Documents, Second Edition*, CRC Press, Boca Raton, FL, 2006

Osborn, A.S., *Questioned Documents Second Edition*, Nelson-Hall Co., Chicago, IL, 1929

Sensi, C.A. and Cantu, A.A., Infrared Luminescence: Is it a Valid Method to Differentiate Among Inks?, *Journal of Forensic Sciences*, January 1982

6. Alteration, Obliteration, and Erasure Examinations

6.1. **Scope:** This test method is for the examination of documents for alterations, obliterations, and erasures as requested by the customer or when determined to be appropriate by the examiner. These examinations generally include multiple visual and instrumental examinations and may incorporate techniques from other test methods.

6.2. **Precautions/Limitations:** Alteration, obliteration, and erasure examinations may have inherent limitations that interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

6.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

6.2.2. The Indiana State Police Forensic Document Unit (FDU) only conducts non-destructive ink and paper examinations. Evidence may be outsourced to a laboratory that conducts chemical analysis not performed by the ISP FDU.

6.2.3. Care shall be taken in the evaluation of characteristics indicative of alterations as they may have occurred during normal preparations, handling, and storage of the documents.

6.2.4. While evidence of an alteration may not exist, the possibility of an alteration cannot be eliminated.

6.2.4.1. Alterations may not be detectable due to the quality of the alteration or the method used to generate the alteration.

6.3. **Related Information:**

6.3.1. Appendix 1 Worksheets

6.3.2. Appendix 2 Abbreviations

6.3.3. Appendix 3 Definitions

6.3.4. Appendix 6 Performance Check Procedures

6.3.5. Appendix 8 Forensic Document Unit Reference Collections

6.4. **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

6.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

6.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

6.4.3. Video Spectral Comparator (VSC).

6.4.4. Electrostatic Detection Device (EDD) with associated supplies and materials.

6.4.5. Calipers.

6.4.6. Rulers.

6.4.7. Typewriter measuring grids or desktop publishing units.

6.4.8. Imaging and other equipment for recording observations.

6.5. Reagents/Materials:

6.5.1. Adhesive neutralizer (e.g., Un-Do®).

6.5.2. Petroleum ether.

6.5.3. Liquid fluorocarbons.

6.5.4. Methanol.

6.5.5. Ethanol.

6.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

6.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

6.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

6.6.3. Safety precautions shall be followed in the use of an adhesive neutralizer or other solvents.

6.7. Reference Materials/Controls/Calibration Checks:

6.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

6.7.1.1. Results of the performance check shall be recorded in the case notes.

6.7.2. A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD.

6.7.2.1. Results of the reference material shall be recorded in the case notes.

6.7.3. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

6.7.3.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

6.8. **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

6.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability may indicate that the examiner should discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at that point and report accordingly or to continue with the applicable procedures to the extent possible. The reasons for such a decision shall be documented in case notes.

6.8.2. Changes made to the document(s) to facilitate examination shall be recorded in the case notes (e.g., removing staples and separating sheets of paper from a notebook).

6.8.2.1. Prior to making significant changes to the documents, permission should be obtained from the customer.

6.8.2.2. Images of documents shall be taken before and after significant changes are made to the document.

6.8.3. Examine the front and reverse of the document(s) for the presence of characteristics indicative of alterations, obliterations, or erasures which include, but are not limited to:

6.8.3.1. Overwriting.

6.8.3.2. Crowded or awkward placement of writing and/or printed text.

6.8.3.3. Paper fiber disturbances.

6.8.3.4. Unexplainable change in font size and/or styles or printing process.

6.8.3.5. Unexplainable change in writing instruments.

6.8.3.6. Presence of cut and paste marks.

6.8.3.7. Presence of an obscuring substance.

6.8.3.8. Smearing of inks and/or other media.

6.8.3.9. Uneven margins.

6.8.3.10. Irregular spacing and alignment, both vertical and horizontal.

6.8.3.11. Differences in fastening and binding marks.

6.8.3.12. Inconsistent handwriting features.

6.8.3.13. Sequence of application anomalies (contrary to what is claimed for legitimate production) involving intersections of writing ink & other media, stamp pad impressions, typewritten text, notary seal embossment, folds, etc.

6.8.3.14. Paper with watermarks that indicate the paper manufacturer and age.

6.8.3.15. Paper variation, staining, or discoloration.

6.8.4. Non-Destructive Examinations

6.8.4.1. Record observations and physical characteristics of the questioned and/or known documents in the case notes. Take measurements of the physical characteristics. Observations and physical characteristics include, but are not limited to:

6.8.4.1.1. Paper type, size, thickness, color, and shape.

6.8.4.1.2. Printed text.

6.8.4.1.3. Tabs, indents, and margins.

6.8.4.1.4. Letter, word, and line spacing.

6.8.4.1.5. Fastening and binding marks.

6.8.4.1.6. Transmitted terminal identifiers.

6.8.4.1.7. Trash, roller, and picker bar marks.

6.8.4.2. Examine both sides of the document(s) macroscopically and microscopically using various lighting techniques, such as direct, side, and transmitted lighting.

6.8.4.3. When appropriate, use the VSC to examine the document(s) with various filters and light sources (e.g., visible light, ultraviolet (UV) light, reflected infrared (RIR), and infrared luminescence (IRL)).

6.8.4.3.1. Record consistencies and variations in optical characteristics of the substrate, ink(s), printed text, obliterated entries, and/or other media present on the document.

6.8.4.4. Attempt to decipher and record in case notes any original entries.

6.8.4.5. Examine the document(s) for indented impressions using side lighting and the EDD.

6.8.4.5.1. Attempt to transcribe any decipherable indented impressions and record in case notes.

6.8.5. If an alteration of typewritten text is suspected, note consistencies and variations in the type-font size, style, date of manufacture, kind of typewriter ribbon used (removable carbon film, fabric/ink, etc.), typewriter technology

(e.g., type-bar, ball element, or print wheel). Use typewriter grids to determine if typewritten text has been added or inserted.

6.8.6. If an alteration of printed text is suspected, examine the questioned text for consistency of printing process(s). Record any inconsistencies in the alignment of text, font size, insertions or cut and paste marks.

6.8.7. Examinations involving possible alterations of identification documents and other official documents may require comparison to known samples, such as those in the Authentic Document Reference Collection, for comparison purposes. Refer to Appendix 8 Forensic Document Unit Reference Collections.

6.8.8. Determine the need for destructive examinations. If unnecessary, discontinue the examination, reach a conclusion, and report accordingly.

6.8.9. Destructive Examinations:

6.8.9.1. Destructive examinations damage or otherwise change the document. They shall be performed after non-destructive methods have been exhausted.

6.8.9.1.1. Prior to performing any destructive testing, obtain and document permission from the customer. The customer shall be informed that destructive examinations may affect or interfere with subsequent examinations.

6.8.9.2. When an obscuring substance is present, obscured entries may be recovered or become visible by various destructive methods.

6.8.9.2.1. Apply an adhesive neutralizer or solvent (e.g., petroleum ether and liquid fluorocarbons) to the reverse of the document from where the obscuring substance is located to make the paper temporarily translucent so that the obscured entry(s) may become visible.

6.8.9.2.1.1. If the obscured entry becomes visible, a photograph shall be taken for the case notes.

6.8.9.2.2. Apply a solvent (e.g., methanol or ethanol) to the obscuring substance. This may aid in removing the substance.

6.8.9.2.3. Physically remove (e.g., abrade, scrape, or peel) the obscuring substance from the document.

6.8.9.2.4. Prolonged exposure to solvents may affect the obscuring substance. Some solvents may dissolve ink or toner.

6.8.9.3. Decipher and record any visualized entries.

6.9. **Records:** Record in the case record all notes, data, and observations.

6.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

6.11. Report Writing: Once examinations have been completed, the Certificate of Analysis may include one or more of the following types of results, opinions or interpretations:

6.11.1. A description of the alteration(s), obliteration(s), or erasure(s) present.

6.11.2. A description of the original entries, deciphered when possible.

6.11.2.1. Limitations or uncertainties in the decipherment shall be communicated in the Certificate of Analysis.

6.11.3. A description of the method or sequence used to create the alteration(s), obliteration(s), or erasure(s).

6.11.4. Other pertinent information about the alteration(s), obliteration(s), or erasure(s).

6.12. References:

Ames, D., *Ames on Forgery*, 1900

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E2331 Standard Guide for Examination of Altered Documents

Hilton, O., *Scientific Examination of Questioned Documents Revised Edition*, Elsevier Science Publishing Co., New York, NY, 1982

Kelly, J.S and B. Lindblom, *Scientific Examination of Questioned Documents Second Edition*, CRC Press, Boca Raton, FL, 2006

Noblett, M.G., Digital Image Processing As An Aid in the Examination of Obliterated Writing, Federal Bureau of Investigation

Osborn, A.S., *Questioned Documents Second Edition*, Boyd Print Co., Albany, NY, 1929

Waggoner, L.R., Obliterated Writing An Unconventional Approach, *Meeting of the American Society of Questioned Document Examiners*, August 1981

7. FACSIMILE TTI AND RTI

7.1. **Scope:** This test method is for examinations involving the classification of make, model, and original equipment manufacturer (OEM) of facsimile machines based on the transmitting/receiving terminal identifier (TTI/RTI) as requested by the customer or determined to be appropriate by the examiner. This test method includes both visual and instrumental examinations.

7.2. **Precautions/Limitations:** The examination of facsimiles may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

7.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

7.2.2. "Cut and paste" techniques may be used to make a document appear to have originated from a facsimile machine that was not used to send the transmission.

7.2.3. It is possible to send a facsimile with no TTI and the content of the TTI can be programmed by the user of the machine.

7.2.4. Facsimiles may be sent by computer software which allows the user to construct TTI information.

7.3. **Related Information:**

7.3.1. Appendix 1 Worksheets

7.3.2. Appendix 2 Abbreviations

7.3.3. Appendix 3 Definitions

7.3.4. Appendix 8 Forensic Document Unit Reference Collections

7.4. **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

7.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

7.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

7.4.3. American Society of Questioned Document Examiners (ASQDE) "Fax Font Project – TTI Database".

7.4.4. Laboratory and published industry resources.

7.4.5. Rulers.

7.4.6. Typewriter measuring grids or desktop publishing units.

7.4.7. Imaging and other equipment for recording observations.

7.5. **Reagents/Materials:** Not applicable.

7.6. **Hazards/Safety:** The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

7.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

7.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

7.7. **Reference Materials/Controls/Calibration Checks:** Not applicable.

7.8. **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

7.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

7.8.2. Determine whether the document(s) contain TTI/RTI entries. If not, discontinue the examination and report accordingly.

7.8.3. Determine whether the TTI/RTI on the document(s) is suitable for examination. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document. Examination of the original document(s) is preferable.

7.8.4. Examine the document(s) for alterations or manipulation of the TTI/RTI. Consult with a qualified technician when appropriate.

7.8.5. Examine the document(s) and assess the characteristics of the TTI/RTI that are used to classify the device. These can include, but are not limited to, the following:

7.8.5.1. Arrangement of the TTI/RTI.

7.8.5.2. Date format.

7.8.5.3. Page number format.

7.8.5.4. Receiver and sending system identifier(s).

7.8.5.5. Phone number format.

7.8.5.6. TTI/RTI field separator(s).

7.8.5.7. Type/font design.

7.8.5.8. Non-alphanumeric characters and elements.

7.8.6. Conduct a side-by-side comparison of the TTI/RTI with any standards submitted.

7.8.7. Attempt to identify possible makes and models of facsimiles based on characteristics of the TTI on the document(s) by utilizing the ASQDE "Fax Font Project – TTI Database". Refer to Appendix 8 Forensic Document Unit Reference Collections.

7.8.7.1. Record in case notes the version of the database being used for the examination.

7.8.7.2. Conduct a side-by-side comparison of the TTI to the results of the ASQDE "Fax Font Project – TTI Database" search.

7.8.8. Attempt to classify the device used to transmit the document(s). When identifying a manufacturer, refer to laboratory and published industry resources. If necessary, contact the appropriate device manufacturer for further technical assistance.

7.9. Records: Record in the case record all notes, data and observations.

7.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

7.11. Report Writing:

7.11.1. If a make and model of a facsimile machine is located within the ASQDE "Fax Font Project – TTI Database" or found to be consistent with a submitted standard, the examiner should use caution when expressing the conclusion of identification. The wording should be similar to "The transmit terminal identifier (TTI) in question was found to have consistent class characteristics with the TTI standards from the make and model XYZ facsimile machine(s). This is not to the exclusion of all other facsimile machines".

7.11.2. If a make and model of a facsimile machine is not located, the wording should be similar to "The class characteristics of the transmit terminal identifier (TTI)

in question was not consistent with the TTI standards available to the ISP FDU".

7.12. References:

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

Kelly, J.S. and B. Lindblom, *Scientific Examination of Questioned Documents Second Edition*, CRC Press, Boca Raton, FL, 2006

Reference collection to identify manufacturers based on the TTI/RTI formatting, e.g., ASQDE "Fax Font VI - TTI Database"

8. Examination of Documents Produced with Toner Technology

8.1. Scope: This test method is for the examination of documents produced with toner technology requested by the customer or determined to be appropriate by the examiner. This test method includes both visual and instrumental examinations and is applicable to examinations involving photocopiers, printers, facsimile devices, and multifunction devices using toner technology.

8.2. Precautions/Limitations: Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

8.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

8.2.1.1. Chemical processing may contribute to the deterioration of toner on a document.

8.2.2. The generation of the document(s), limited quantity or comparability, or condition of the document(s) submitted may restrict examinations.

8.2.3. Consideration should be given to the possibility that various forms of manipulation and duplication of toner produced document(s) can be generated by a computer, scanner, digital camera, graphic pad, or other means.

8.2.4. Care should be taken in the evaluation of characteristics as some may be caused by factors external to the print device (e.g., artifacts from or manipulation of the source computer file) or characteristics common to a particular model of machine.

8.2.5. Some toner supply units are interchangeable between different brands or models of machines. Some toner supply units may also be refilled from suppliers other than the original manufacturer.

8.2.6. Some multifunction devices using toner technology can operate in either printing or copying mode, at different resolutions and can produce both multi-color black (CYMK) and monochrome (one color black).

8.2.6.1. Various outputs from one machine may have significant differences.

8.3. Related Information:

8.3.1. Appendix 1 Worksheets

8.3.2. Appendix 2 Abbreviations

8.3.3. Appendix 3 Definitions

8.3.4. Appendix 6 Performance Check Procedures

8.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

8.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

8.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

8.4.3. Video Spectral Comparator (VSC).

8.4.4. Electrostatic Detection Device (EDD) with associated supplies and materials.

8.4.5. Rulers.

8.4.6. Typewriter measuring grids or desktop publishing units.

8.4.7. Magnetic viewers.

8.4.8. Imaging or other equipment for recording observations.

8.5. Reagents/Materials: Not applicable.

8.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

8.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

8.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

8.7. Reference Materials/Controls/Calibration Checks:

8.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

8.7.1.1. Results of the performance check shall be recorded in the case notes.

8.7.2. A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD.

8.7.2.1. Results of the reference material shall be recorded in the case notes.

8.7.3. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

8.7.3.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

8.8. Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

8.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

8.8.2. Determine whether the document(s) was produced with toner technology. If not, discontinue examination and report accordingly.

8.8.3. Determine whether the examination is a comparison of a questioned document(s) to a known document(s), a comparison of a questioned document(s) to a questioned document(s), or is another type of examination of a questioned document(s) (e.g., to determine date limitations or class of machine).

8.8.4. Determine whether the document(s) is suitable for examination, comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

8.8.5. If no known document(s) or device(s) was submitted, go to 8.8.7.

8.8.6. If a known document(s) is submitted, determine whether the known document(s) is suitable for examination, or comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

8.8.7. If the original is not submitted, evaluate the quality of the best available reproduction to determine whether significant details have been reproduced with sufficient clarity for comparison purposes and proceed to the extent possible. If the reproduction is not of sufficient clarity for comparison purposes, discontinue these procedures and report accordingly.

8.8.8. If a device is examined, its condition should be recorded in the case notes. Service records should be requested.

8.8.8.1. Consult with a qualified technician when appropriate.

8.8.8.2. Note the capabilities, features, and settings of any variable features on each device examined. If the device has internal memory, retain or recover any stored information.

8.8.8.3. Note visible external components of the device such as the platen, slit glass, collators, and cover/automatic document feeder that may contain physical evidence, obstructions, debris, correction fluid, marks, or scratches.

8.8.8.4. Record damage to easily accessible internal components of the device such as the fuser rollers or imaging drum.

8.8.8.5. Before taking exemplars, consideration must be given to the possible destruction or loss of physical evidence within the device (e.g., fragments torn from the questioned document).

8.8.8.6. Prepare appropriate exemplars, taking into consideration the features of the device and possible chemical toner examinations.

8.8.9. If the exemplars or known document(s) submitted are not suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

8.8.10. Examine the questioned document(s) or the questioned and known document(s).

8.8.10.1. When appropriate, use the VSC to examine the document(s) with various filters and light sources (e.g., visible light, ultraviolet (UV) light, reflected infrared (RIR), and infrared luminescence (IRL)) to provide additional information, such as security features or stains.

8.8.10.2. Examine the document(s) for indented impressions using side lighting and the EDD by following the procedures in Test Method 3: Indented Impression Examinations.

8.8.10.2.1. Attempt to transcribe any decipherable indented impressions and record in case notes.

8.8.10.2.2. Examination(s) for indentations may be performed for the purpose of visualizing indented writing or physical characteristics such as marks from the paper transport mechanism.

8.8.10.3. Examination(s) for alterations may be performed by following the procedures in Test Method 6: Alteration, Obliteration, and Erasure Examinations.

8.8.10.4. Identification of the typestyle(s) may provide useful information (e.g., dating information).

8.8.10.5. Compare class characteristics (e.g., paper type, paper supply system, toner type, marks caused by mechanics, color capability). If significant unexplainable differences exist, discontinue and report accordingly.

8.8.10.5.1. If possible, classify the device used to produce a questioned document(s). When identifying a manufacturer of a device used to create a questioned document(s), refer to laboratory and published industry resources. If

appropriate, contact the device manufacturer or distributor for further information.

8.8.10.6. Compare individualizing characteristics such as security features, wear, damage defects, misalignments, reproducible marks, voids, and improper or extraneous toner transfer. Take measurements of individualizing characteristics and record in case notes when appropriate.

8.8.10.6.1. Marks may not appear on every successive page but will often appear in the same position relative to one or more edges of the sheet (assuming the same paper orientation). Two or more marks with a similar cause usually maintain a fixed spatial relation to each other and/or to the image area of the copy.

8.8.10.6.2. Successive copying on the same machine can make marks slightly out of register. Doubling or tripling of a pattern of dots or marks indicates, respectively, two or three generations of copies on the same machine. Copies from more than one device will usually bear the distinctive marks of each machine.

8.8.11. Questioned documents bearing yellow toner identification patterns may be forwarded to the United States Secret Service Laboratory in Washington, DC, in an effort to obtain the machine make, model, and serial number information encoded by these toner patterns.

8.9. Records: Record in the examination documentation all notes, data and observations.

8.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

8.11. Report Writing: The examiner shall report the results, opinions, and interpretations to conform to one of the following:

8.11.1. *Identification*— If there is agreement in all individualizing characteristics and there are no significant, inexplicable differences between two or more documents, then an identification is appropriate.

8.11.2. *Elimination*— If there are significant differences between two or more documents at any level of the analysis, then an elimination is appropriate. Similarities may be present.

8.11.3. *Qualified Opinions*— If there are similarities or differences of limited significance between two or more documents and there are limiting factors, then the use of qualified opinions is appropriate. Qualified opinions require explanation of the limiting factors in the Certificate of Analysis.

8.11.4. *No Conclusion*— If there are no significant similarities or significant differences and there are significant limiting factors, then a Certificate of Analysis that no conclusion can be reached is appropriate. This opinion requires explanation of the limiting factors in the Certificate of Analysis.

8.12. References:

ASTM International E444 Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1658 Standard Terminology for Expressing Conclusions of Forensic Document Examiners

ASTM International E1732 Standard Terminology Relating to Forensic Science

ASTM International E2291 Standard Guide for Indentation Examinations

ASTM International E2390 Standard Guide for Examination of Documents Produced with Toner Technology

9. Documents Produced with Liquid Ink Jet Technology

9.1. Scope: This test method is for the examination of documents produced with liquid ink jet technology requested by the customer or determined to be appropriate by the examiner. This test method includes both visual and instrumental examinations and is applicable to examinations involving photocopiers, printers, facsimile devices, and multifunction devices using ink jet technology.

9.2. Precautions/Limitations: Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

9.2.1. Chemical processing may contribute to the deterioration the ink produced by ink jet technology on a document.

9.2.2. The generation of the document(s), limited quantity or comparability, or condition of the document(s) submitted may restrict examinations.

9.2.3. Consideration should be given to the possibility that various forms of manipulation and duplication of ink jet produced document(s) may be generated by computer, scanner, digital camera, graphic pad or other means.

9.2.4. Care should be taken in the evaluation of characteristics as some may be caused by factors external to the print device (e.g., artifacts from or manipulation of the source computer file) or characteristics common to a particular model of machine.

9.2.5. Some ink supply units are interchangeable between different brands or models of machines. Some ink supply units may also be refilled from suppliers other than the original manufacturer.

9.2.6. The type of substrate used may affect the appearance of the ink on the substrate (e.g., banding, circularity, feathering, bleed, mottling, offset, spatter, or satellite droplets).

9.2.6.1. Some multifunction devices using ink jet technology can operate in either printing or copying mode, at different resolutions and can produce both multi-color black (CYMK) and monochrome (one color black).Various outputs from one machine have many significant differences.

9.3. Related Information:

9.3.1. Appendix 1 Worksheets

9.3.2. Appendix 2 Abbreviations

9.3.3. Appendix 3 Definitions

9.3.4. Appendix 6 Performance Check Procedures

9.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

9.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

9.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

9.4.3. Video Spectral Comparator (VSC).

9.4.4. Electrostatic Detection Device (EDD) with associated supplies and materials.

9.4.5. Rulers.

9.4.6. Typewriter measuring grids or desktop publishing units.

9.4.7. Magnetic viewers.

9.4.8. Imaging or other equipment for recording observations.

9.5. Reagents/Materials: Not applicable.

9.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

9.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

9.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

9.7. Reference Materials/Controls/Calibration Checks:

9.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

9.7.1.1. Results of the performance check shall be recorded in the case notes.

9.7.2. A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD.

9.7.2.1. Results of the reference material shall be recorded in the case notes.

9.7.3. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

9.7.3.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

9.8. Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

9.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

9.8.2. Determine whether the document(s) was produced with liquid ink jet technology. If not, discontinue examination and report accordingly.

9.8.3. Determine whether the examination is a comparison of a questioned document(s) to a known document(s), a comparison of a questioned document(s) to a questioned document(s), or is another type of examination of a questioned document(s) (e.g., to determine date limitations or class of machine).

9.8.4. Determine whether the document(s) is suitable for examination, comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

9.8.5. If no known document(s) or device(s) was submitted, go to 9.8.7.

9.8.6. If a known document(s) is submitted, determine whether the known document(s) is suitable for examination, or comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

9.8.7. If the original is not submitted, evaluate the quality of the best available reproduction to determine whether significant details have been reproduced with sufficient clarity for comparison purposes and proceed to the extent possible. If the reproduction is not of sufficient clarity for comparison purposes, discontinue these procedures and report accordingly.

9.8.8. If a device is examined, its condition should be recorded in the case notes. Service records should be requested.

9.8.8.1. Consult with a qualified technician when appropriate.

9.8.8.2. Note the capabilities, features, and settings of any variable features on each device examined. If the device has internal memory, retain or recover any stored information.

9.8.8.3. Note visible external components of the device such as the platen, slit glass, collators, and cover/automatic document feeder that may contain physical evidence, obstructions, debris, correction fluid, marks, or scratches.

9.8.8.4. Record damage to easily accessible internal components of the device such as the print head or paper transport mechanism.

9.8.8.5. Before taking exemplars, consideration must be given to the possible destruction or loss of physical evidence within the device (e.g., fragments torn from the questioned document).

9.8.8.6. Prepare appropriate exemplars, taking into consideration the features of the device and possible chemical ink examinations.

9.8.9. If exemplars or known document(s) submitted are not suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

9.8.10. Examine the questioned document(s), or the questioned and known documents(s).

9.8.10.1. When appropriate, use the VSC to examine the document(s) with various filters and light sources (e.g., visible light, ultraviolet (UV) light, reflected infrared (RIR), and infrared luminescence (IRL)) to provide additional information, such as security features or stains.

9.8.10.2. Examine the document(s) for indented impressions using side lighting and the EDD by following the procedures in Test Method 3: Indented Impression Examinations.

9.8.10.2.1. Attempt to transcribe any decipherable indented impressions and record in case notes.

9.8.10.2.2. Examination(s) for indentations may be performed for the purpose of visualizing indented writing or physical characteristics such as marks from the paper transport mechanism.

9.8.10.3. Further examination(s) for alteration(s) may be conducted by following the procedures in Test Method 6: Alteration, Obliteration, and Erasure Examinations.

9.8.10.4. Identification of the typestyle(s) may provide useful information (e.g., dating information).

9.8.10.5. Compare class characteristics (e.g., paper type, paper supply system, ink type, marks caused by mechanics, color capability). If significant unexplainable differences exist, discontinue and report accordingly.

9.8.10.5.1. If possible, classify the device used to provide a questioned document(s). When identifying a manufacturer of a questioned document(s), refer to laboratory and published industry resources. If necessary, contact the device manufacturer or distributor for further information.

9.8.10.6. Compare individualizing characteristics such as wear and damage defects, misalignments, reproducible marks, banding voids, and improper or extraneous ink transfer. Take measurements of individualizing characteristics and record in case notes when appropriate.

9.8.10.6.1. Successive copying on the same machine can make marks slightly out of register. Doubling or tripling of a pattern of dots or marks indicates, respectively, two or three generations of copies on the same machine. Copies from more than one device will usually bear the distinctive marks of each machine.

9.9. Records: Record in the case record all notes, data and observations.

9.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

9.11. Report Writing: The examiner shall report the results, opinions, and interpretations to conform to one of the following:

9.11.1. *Identification*— If there is agreement in all individualizing characteristics and there are no significant, inexplicable differences between two or more documents, then an identification is appropriate.

9.11.2. *Elimination*— If there are significant differences between two or more documents at any level of the analysis, then an elimination is appropriate. Similarities may be present.

9.11.3. *Qualified Opinions*— If there are similarities or differences of limited significance between two or more documents and there are limiting factors, then the use of qualified opinions is appropriate. Qualified opinions require explanation of the limiting factors in the Certificate of Analysis.

9.11.4. *No Conclusion*— If there are no significant similarities or significant differences and there are significant limiting factors, then a Certificate of Analysis that no conclusion can be reached is appropriate. This opinion requires explanation of the limiting factors in the Certificate of Analysis.

9.12. References:

INDIANA STATE POLICE
FORENSIC DOCUMENT UNIT
TEST METHODS

ASTM International D1968: Terminology Relating to Paper and Paper Products

ASTM International E444: Standard Guide for Scope of Work of Forensic Document Examiners

ASTM International E1732: Standard Terminology Relating to Forensic Science

ASTM International E2195: Terminology Relating to the Examination of Questioned Documents

ASTM International E2291: Standard Guide for Indentation Examinations

ASTM International E2325: Standard Guide for Non-destructive Examinations of Paper

ASTM International E2331: Guide for Examination of Altered Documents

ASTM International E2389-05: Standard Guide for Examination of Documents Produced with Liquid Ink Jet Technology

ASTM International F221: Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom

ASTM International F909: Terminology Relating to Printers

ASTM International F1457: Terminology Relating to Laser Printers

ASTM International F1857: Terminology Relating to Ink Jet Printers and Images Made Therefrom

10. Conventional Printing Process Identifications

10.1. Scope: This test method is for conducting examinations of printed documents as requested by the customer or determined to be appropriate by the examiner. This test method includes both visual and instrumental examinations. The term "printed" is applicable to a wide range of printing processes. The major types of conventional printing processes include letterpress printing, offset lithography, engraving (e.g., gravure or intaglio processes) and screen printing.

10.2. Precautions/Limitations: Printing process identification examinations may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

10.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

10.2.1.1. Chemical processing may contribute to the deterioration of the printing on a document.

10.2.2. The generation of the document(s), limited quantity, or comparability may restrict examinations.

10.2.3. Consideration should be given to the possibility that various forms of manipulation and duplication of printed document(s) may be generated by computer, scanner, digital camera, graphic pad, or other means.

10.2.4. Care should be taken in the evaluation of characteristics as some may be caused by factors external to the print device (e.g., artifacts from or manipulation of the source computer file) or characteristics common to a particular model of machine.

10.3. Related Information:

10.3.1. Appendix 1 Worksheets

10.3.2. Appendix 2 Abbreviations

10.3.3. Appendix 3 Definitions

10.3.4. Appendix 6 Performance Check Procedures

10.3.5. Appendix 8 Forensic Document Unit Reference Collections

10.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

10.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

10.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

10.4.3. Video Spectral Comparator (VSC).

10.4.4. Electrostatic Detection Device (EDD) with associated supplies and materials.

10.4.5. Rulers.

10.4.6. Typewriter measuring grids or desktop publishing units.

10.4.7. Magnetic viewers.

10.4.8. Imaging or other equipment for recording observations.

10.5. Reagents/Materials: Not applicable.

10.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

10.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

10.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

10.7. Reference Materials/Controls/Calibration Checks:

10.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

10.7.1.1. Results of the performance check shall be recorded in the case notes.

10.7.2. A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD.

10.7.2.1. Results of the reference material shall be recorded in the case notes.

10.7.3. A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

10.7.3.1. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

10.8. Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

10.8.1. At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

10.8.2. Determine whether the examination is a comparison of a questioned document(s) to a known document(s), a comparison of a questioned document(s) to a questioned document(s), or is another type of examination of a questioned document(s) (e.g., to determine date limitations or class of machine).

10.8.3. Determine whether the document(s) is suitable for examination, comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

10.8.4. If no known document(s), printing material(s), or device(s) were submitted, go to 10.8.8.

10.8.5. If a known document(s) is submitted, determine whether the known document(s) is suitable for examination, or comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, and condition of the document.

10.8.6. If the original is not submitted, evaluate the quality of the best available reproduction to determine whether significant details have been reproduced with sufficient clarity for comparison purposes and proceed to the extent possible. If the reproduction is not of sufficient clarity for comparison purposes, discontinue these procedures and report accordingly.

10.8.7. If printing material(s) or a device(s) are submitted, the condition should be recorded in the case notes. Service records should be requested.

10.8.7.1. Consult with a qualified technician when appropriate.

10.8.7.2. Prepare appropriate exemplars, taking into consideration the features of the printing material or device.

10.8.7.3. If the exemplars are not suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

10.8.8. Examine the questioned document(s), or the questioned and known document(s).

10.8.8.1. When appropriate, use the VSC to examine the document(s) with various filters and light sources (e.g., visible light, ultraviolet (UV) light, reflected infrared (RIR), and infrared luminescence (IRL)) to provide additional information, such as security features or stains.

10.8.8.1.1. Security features may include micro-line printing, wet, or dry seals, fibers, rainbow printing, holograms, latent images, watermarks, and planchettes.

10.8.8.2. Examine the document(s) for indented impressions using side lighting and the EDD by following the procedures in Test Method 3: Indented Impression Examinations.

10.8.8.2.1. Attempt to transcribe any decipherable indented impressions and record in case notes.

10.8.8.2.2. Examination(s) for indentations may be performed for the purpose of visualizing indented writing or physical characteristics such as marks from the paper transport mechanism.

10.8.8.3. Examination(s) for alterations may be performed by following the procedures in Test Method 6: Alteration, Obliteration, and Erasure Examinations.

10.8.8.4. Identification of the typestyle(s) may provide useful information (e.g., dating information).

10.8.8.5. Examine the document to establish if more than one printing process was used.

10.8.8.6. Attempt to identify or classify the type of printing process(s) present on the document(s) by the characteristics present and the comparison with authentic standards. Refer to Appendix 8 Forensic Document Unit Reference Collections.

10.8.8.6.1. Characteristics of the printing to evaluate include, but are not limited to:

10.8.8.6.1.1. Relationship of the image to the substrate (e.g., raised, embossed, flat),

10.8.8.6.1.2. Image edge (e.g., smooth, squeegee effect, serrated),

10.8.8.6.1.3. Printing ink,

10.8.8.6.1.4. Ink color (e.g., monochromatic or multicolor),

10.8.8.6.1.5. And image formation and pattern (e.g., halftone).

10.8.8.6.2. It is important to note that the appearance of a particular printing process may vary depending on factors, such as the substrate, protective laminate, print quality, and ink formulation.

10.8.8.6.3. When identifying a manufacturer of a questioned document(s), refer to laboratory and published industry resources. If necessary, contact the device manufacturer or distributor for further information.

10.8.8.7. Conduct a side-by-side comparison of multiple questioned documents to determine whether or not they were printed by a common source. Examine the printing on each microscopically for any possible defects that may be in common.

10.8.9. Conduct a side-by-side comparison of the questioned document(s) to known standards from a particular source to determine if the documents share a manufacturing process or post-manufacturer source (consumer or user level).

10.8.9.1. If printing plates are submitted for comparison, microscopically examine the plate(s) and the printed area(s) of the document. Identify and evaluate the significance of any similarities or differences. Defects in printing plates and negatives may be represented in the printed area on a document and may be used for associating a document(s) to a particular source.

10.8.10. Compare class characteristics (e.g., paper type, paper supply system, ink type, marks caused by mechanics, color capability, image edge, printing medium, medium color(s), and image formation and pattern). If significant unexplainable differences exist, discontinue and report accordingly.

10.8.11. Compare individualizing characteristics such as wear and damage defects, misalignments, reproducible marks, banding voids, and improper or extraneous ink transfer. Take measurements of individualizing characteristics and record in case notes when appropriate.

10.9. Records: Record in the case record all notes, data and observations.

10.10. Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

10.11. Report Writing: The examiner shall report the results, opinions, and interpretations to conform to one of the following:

10.11.1. *Identification*— If there is agreement in all individualizing characteristics and there are no significant, inexplicable differences between two or more documents, then an identification is appropriate.

10.11.2. *Elimination*— If there are significant differences between two or more documents at any level of the analyses, then an elimination is appropriate. Similarities may be present.

10.11.3. *Qualified Opinions*— If there are similarities and/or differences of limited significance between two or more documents and there are limiting factors, then the use of qualified opinions is appropriate. Qualified opinions require explanation of the limiting factors in the Certificate of Analysis.

10.11.4. *Classification*— If there are a sufficient number of printing characteristics observed to classify the method(s) of production then the printing process used to produce the questioned item(s) may be reported.

10.11.5. *No Conclusion*— If there are no significant similarities or significant differences and there are significant limiting factors, then a Certificate of Analysis that no conclusion can be reached is appropriate. This opinion requires an explanation of the limiting factors in the Certificate of Analysis.

10.12. References:

Adams, J. M., Faux, D. D., Rieber, L. J., *Printing Technology*, Delmar Publishers, 1996

ASTM *International*, Standard Guide for Classification of Conventional Printing Processes, Draft

Kelly, J.S. and B. Lindblom, *Scientific Examination of Questioned Documents Second Edition*, CRC Press, Boca Raton, FL, 2006

New Zealand Police Department Examination Section; Printing Processes Manual

Pocket Pal: A Graphics Arts Production Handbook 15th Edition, International Paper Company, Memphis, Tennessee, 1992

11. Authorized Document Examinations

11.1 **Scope:** This test method shall be used by the examiner to determine whether or not a financial, identification, or other authorized document was produced in a manner consistent with the issuing authority. This test method includes both visual and instrumental examinations.

11.2 **Precautions/Limitations:** Authorized document examinations may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes

11.2.1 The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

11.2.1.1 Chemical processing may contribute to the deterioration of the printing on a document.

11.2.2 This test method is limited to examination of physical properties of the documents and does not address whether a document was legitimately obtained from an issuing authority.

11.2.3 The authenticity and accuracy of the information printed on the document are generally outside the scope of the comparative examination.

11.2.4 Reference literature can be incomplete, or include incorrect information, or both. Use of reference literature might not allow for a complete and thorough evaluation of the physical properties of a standard.

11.2.5 Some documents contain security features (covert, or proprietary, or both) that are neither disclosed to the public nor appear in most professional literature.

11.2.6 Because issuing authorities of genuine documents periodically change the method of production, standards and reference materials might not be current. Therefore, it is important to verify that all relevant reference material and standards are up-to-date.

11.3 **Related Information:**

11.3.1 Appendix 1 Worksheets

11.3.2 Appendix 2 Abbreviations

11.3.3 Appendix 3 Definitions

11.3.4 Appendix 8 Forensic Document Unit Reference Collections

11.4 **Instruments:** The following equipment may be used as deemed appropriate by the examiner:

11.4.1 Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

11.4.2 Optical magnifiers sufficient to allow fine detail to be distinguished.

11.4.3 Video Spectral Comparator (VSC).

11.4.4 Electrostatic Detection Device (EDD) with associated supplies and materials.

11.4.5 Rulers.

11.4.6 Magnetic viewers.

11.4.7 Imaging and other equipment for recording observations.

11.5 Reagents/Materials: Not applicable.

11.6 Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

11.6.1 Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

11.6.2 Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

11.7 Reference Materials/Controls/Calibration Checks:

11.7.1 Appropriate standard(s), reference material, reference literature, or all three should be used in the comparison process. Contact with the issuing authority may be necessary. The Authentic Document Reference Collection may also be utilized; refer to Appendix 8 Forensic Document Unit Reference Collections.

11.7.2 A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

11.7.2.1 Results of the performance check shall be recorded in the case notes.

11.7.3 A performance check of the EDD shall be tested using a reference material prepared by the examiner and run with each document processed on the EDD.

11.7.3.1 Results of the reference material shall be recorded in the case notes.

11.7.4 A performance check shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures.

11.7.4.1 Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

11.8 **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

11.8.1 At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

11.8.2 Analyze the printing process(es), substrate(s), and security feature(s) used in the production of the questioned document(s). Analysis at this level should include macroscopic, microscopic, and non-destructive instrumental analysis such as using the VSC. Among the features that should be considered are:

11.8.2.1 Physical characteristics (e.g., dimensions, opacity, color);

11.8.2.2 Security and other significant features within the following:

11.8.2.2.1 Ink (e.g., color shifting, luminescent, fugitive);

11.8.2.2.2 Optically variable devices (e.g., holograms);

11.8.2.2.3 Substrata: paper (e.g., watermarks, planchettes, security fibers); polyethylene (e.g., polyester film inserts) and other thermoplastic polymers (e.g., polyvinyl chloride, polycarbonate, polyolefin-based materials); etc.

11.8.2.3 Printing (e.g., micro-line printing, latent images, rainbow printing);

11.8.2.4 Printing processes (e.g., offset lithography, letterpress, intaglio);

11.8.2.5 Print quality;

11.8.2.5.1 Differences in print quality may be a result of variation in the normal production process.

11.8.2.6 Electronic media (e.g. magnetic stripes, radio frequency identification, bar codes, smart chips) which can be read and compared to information on the document.

11.8.3 Obtain appropriate standard(s), reference material, reference literature, or all three. Refer to Appendix 8 Forensic Document Unit Reference Collections or contact the issuing authority.

11.8.3.1 If standards exist but cannot be obtained, limited examinations may be conducted utilizing reliable reference materials.

11.8.3.2 If standards do not exist for the questioned document, such as a fictitious instrument, discontinue these procedures and report accordingly.

11.8.4 Compare the questioned document(s) to the standard(s), reference material, or reference literature and evaluate the significance of any similarities or differences.

11.8.5 Evaluate the nature and reproducibility of each security and other significant feature observed, individually and in combination, including the potential for simulation using commercially available supplies and equipment.

11.8.5.1 Questioned documents can contain a combination of genuine and non-genuine materials.

11.8.6 Further examination(s) for indented impressions and alteration(s) may be conducted by following the procedures in Test Method 3: Indented Impression Examinations and Test Method 6: Alteration, Obliteration, and Erasure Examinations.

11.9 **Records:** Record in the case record all notes, data and observations.

11.10 **Interpretations of Results:** The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

11.11 **Report Writing:** The examiner shall report the results, opinions, and interpretations to conform to one of the following:

11.11.1 *Genuine*— When the features on the questioned document are in agreement with the standard(s) and there are no *inexplicable* differences, a determination that the document is genuine is appropriate. The examiner is certain, based on all of the evidence, that the document is genuine.

11.11.2 *Not Genuine*— When the features on the questioned document are not in agreement with the standard(s), and these differences cannot be reconciled, then a determination that the document is not genuine is appropriate. The examiner is certain, based on all of the evidence, that the document is not genuine.

11.11.3 *Qualified Opinions*— If there are similarities and/or differences of limited significance and there are limiting factors, then the use of qualified opinions is appropriate. Qualified opinions require explanation of the limiting factors in the Certificate of Analysis

11.11.4 *No Conclusion*— When there is a significant limiting factor(s), a report that no conclusion can be reached is appropriate. This opinion requires explanation of the limiting factors in the Certificate of Analysis.

11.12 **References:**

Browning, B.L., *Analysis of Paper,* Marcel Dekker, Inc., New York and Basel, 1977

Brunelle, Richard L. and Robert W. Reed, *Forensic Examination of Ink and Paper,* Charles C. Thomas, Springfield, IL, 1984

The Mead Corporation, *Paper Knowledge,* 1999

Saferstein, Richard, *Forensic Science Handbook,* Regents/Prentice Hall, Englewood Cliffs, NJ, 1982

SWGDOC (Scientific Working Group for Forensic Document Examination) Standard for the Examination of Financial, Identification, and Other Authorized Documents, Draft

12. Typewriters and Typewritten Documents

12.1 **Scope:** This test method shall be used by the examiner to examine typewritten documents, typewriters, type elements, and ribbons. The test method can be used for the following:

12.1.1 Examination and classification of typewriting in an attempt to determine the typestyle, the manufacturer of the typestyle, and/or the possible make and model of typewriter(s) by comparison with a typestyle library.

12.1.1.2 This classification pertains to documents prepared on typewriters. Some or all of these classifying features and procedures might also be applicable to examinations of documents prepared on other impact and non-impact printing devices (e.g., dot matrix, laser, and inkjet printers or printing devices using a thermal imaging transfer ribbon).

12.1.2 Examinations and comparisons of typewritten documents to determine whether or not they are from a common source.

12.1.3 Examinations and comparisons of a typewritten document(s) with a typewriter (or particular part(s) of a typewriter) or type element to determine whether or not a document was prepared with that equipment.

12.1.4 Examinations and comparisons of a typewritten document(s) with typewritten documents of known date to determine whether or not a document was prepared on or about the date indicated.

12.1.5 Examinations of typewritten document to determine whether or not a document was typed in a single, continuous operation.

12.1.6 Examinations of typewriter ribbons or correction media (lift-off and cover-up), or both, to determine the content or the source of the material typed on them or corrected with them, respectively.

12.1.7 This test method may also be applicable to examinations of carbon paper and carbon copies or of documents produced with certain non-impact printing devices (e.g., printing devices using a thermal imaging transfer ribbon).

12.2 **Precautions/Limitations:** The examinations of typewriters and typewritten documents may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

12.2.1 The results of earlier storage, handling, testing, or chemical processing (e.g. latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

12.2.1.2 Chemical processing may contribute to the deterioration of the typewriting on a document.

12.2.2 It is possible that various forms of simulations, imitations, and duplications of typewriting can be generated by computer and other means.

12.2.3 Limitations can be due to submission of non-original documents, limited quantity or comparability, or condition of the items submitted for examination.

12.2.4 Classification of a typestyle is based on the examination of an original typewritten document containing a full sample of the typestyle. Limited quantity of text (especially the absence of key classifying characters) can limit the opinion rendered.

12.2.5 The nature of the paper can affect the quality and quantity of fiber impression(s) as well as ink transfer and retention.

12.3 Related Information:

12.3.1 Appendix 1 Worksheets

12.3.2 Appendix 2 Abbreviations

12.3.3 Appendix 3 Definitions

12.3.4 Appendix 8 Forensic Document Unit Reference Collections

12.4 Instruments: The following equipment may be used as deemed appropriate by the examiner:

12.4.1 Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

12.4.2 Optical magnifiers sufficient to allow fine detail to be distinguished.

12.4.3 Typewriter measuring grids, desktop publishing units, rulers, and other measuring devices.

12.4.4 Imaging and other equipment for recording observations.

12.5 Reagents/Materials: Not applicable.

12.6 Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

12.6.1 Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

12.6.2 Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

12.7 Reference Materials/Controls/Calibration Checks:

12.7.1 Typestyle library and relevant reference materials, such as the ASQDE "HAAS Typewriter Atlas and Catalog" and the Interpol Typewriter Classification System. Refer to Appendix 8 Forensic Document Unit Reference Collections.

12.7.1.2 Typestyle classification scheme(s) can aid in searching for a particular typestyle.

12.8 **Procedures/Instructions:** All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

12.8.1 At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

12.8.2 Assess each item to determine if it includes original and/or non-original typed text.

12.8.3 Examination of the original is always preferable. If original(s) is not submitted, the examiner should request the original(s).

12.8.3.1 If the original(s) is not made available for examination, evaluate the best available reproduction to assess the quality of the significant details.

12.8.3.2 If the significant details have been reproduced with sufficient clarity for examination purposes, continue with the applicable procedures to the extent possible.

12.8.3.3 If the non-original typed text has not been reproduced with sufficient clarity for examination purposes, discontinue these procedures. Document the reason(s) for such a decision in the case notes and on the Certificate of Analysis.

12.8.4 Determine the suitability of each typewritten document for examination.

12.8.4.1 If a questioned document is unsuitable for examination, discontinue these procedures, document reason(s) in case notes and report accordingly.

12.8.4.2 If a questioned document is suitable for a limited examination, proceed to the extent possible.

12.8.4.3 If the known typewritten document(s) submitted for examination is unsuitable for examination, request appropriate known documents. If a typewriter is submitted, it might be possible to obtain exemplars from this machine as described in 12.8.10.6.

12.8.4.4 It can be useful for the examiner to obtain, if possible, any available information about the typewriter's usage (e.g., office/ legal correspondence; home/casual; school/reports) and date of purchase, as well as service and repair history. It can also be helpful if the submitter can locate other elements, ribbons,

correction media, and other accessories that might have been used with the typewriter.

12.8.4.5 If the known typewritten document(s) available for examination is not suitable and no others are obtained, discontinue these procedures at the appropriate point and report accordingly.

12.8.4.6 If the known typewritten document(s) available for examination is suitable for a limited examination, proceed to the extent possible.

12.8.5 Examine the typed text for the following characteristics:

12.8.5.1 The kind of typewriting mechanism (e.g., typebar, single element using a ball element, a thimble element, or a printwheel element; manual, electric, or electronic).

12.8.5.2 Horizontal character spacing(s) (character pitch) and vertical line spacing(s), fixed pitch or proportional spacing, dual pitch or multiple spacing.

12.8.5.3 The length of the longest typewritten line and the maximum width of the paper in the typing direction, which can be indicative of the typing line length (line-of-write length) and paper width capacity required for the typewriter(s) used to produce the typed text being examined.

12.8.5.4 Family(s) of type (e.g., monotone, elite, courier, prestige).

12.8.5.5 Size of characters (e.g., pica, elite, micro).

12.8.5.6 The presence of operator controllable features (e.g., bold type, centered text, justified right margin).

12.8.5.7 Type of ribbon (e.g., fabric, single-strike paper or film, permanent or lift-off correctable film, multi-strike film).

12.8.5.8 The presence and the method of any correction(s) (e.g., abrasive erasure, strike-over, cover-up, lift-off).

12.8.6 Evaluate the consistency of typewriting throughout the document for any possible interlineations according to the procedures in 12.8.13. When multiple pages are involved, each page should be examined to determine consistency with the other pages.

12.8.7 Classify the typestyle(s).

12.8.7.1 Each typewritten text has various characteristics that can be used separately and in combination to classify the text. Some of the criteria below relate directly to the design features of the typestyle, while others are based on characteristics related to the typewriter that produced the typewritten text. Initially evaluate each characteristic separately, and then evaluate them in combination.

12.8.7.1.1 Overall typestyle design,

12.8.7.1.1.1 Overall typestyle design is determined by comparison with reference samples in the typestyle library.

12.8.7.1.2 Character design variants,

12.8.7.1.2.1 Evaluate the forms of individual characters in accordance with the instructions of the typestyle classification scheme being used.

12.8.7.1.3 Spacing,

12.8.7.1.3.1 Spacing is most easily determined with specially ruled grids or gauges, appropriate rulers, or other measuring devices.

12.8.7.1.4 Typewriting mechanism,

12.8.7.1.4.1 Typewriting mechanism can be determined by examination of the individual character impressions.

12.8.7.1.5 Ribbon and correction method,

12.8.7.1.5.1 Ribbon and correction method can often be determined by examination of the typewritten impression.

12.8.7.1.6 Shift,

12.8.7.1.6.1 Shift direction, number of shifts, and shift motion can often be determined on those occasions when portions of two characters on a type slug are printed simultaneously, one over or under the other.

12.8.7.1.7 Character set and keyboard arrangement, and

12.8.7.1.7.1 Character set and keyboard arrangement can sometimes be determined by examination of the typed text for the presence of particular characters.

12.8.7.1.8 Other characteristics.

12.8.7.1.8.1 Examine the document and text for other characteristics (e.g., paper width capacity, maximum length of machine's writing line, and automatic right margin justification).

12.8.7.2 Search typestyle library to determine, if possible, the typestyle, the manufacturer of the typestyle, and the possible make and model of typewriter(s) using that typestyle and having the characteristics noted in 12.8.7. Refer to Appendix 8 Forensic Document Unit Reference Collections.

12.8.7.2.1 When available, a typestyle classification scheme(s) should be used to facilitate the search.

12.8.7.3 If it is suspected that the document was prepared on a single element typewriter, consider the interchangeability of elements between compatible machines (including different makes and models).

12.8.7.4 Different typestyles can be used on the same single element typewriter. Consider the make(s) and model(s) of typewriter(s) that can use that class of element and the other typestyles available on compatible elements.

12.8.8 Examine the typed text for those characteristics that, if present, can enable the examiner to determine the actual machine, element, or machine/element system used to prepare the document. Comparison with appropriate type-style reference samples, strike-ups, or other reference material can aid in this phase of the examination. Refer to Appendix 8 Forensic Document Unit Reference Collections. Examine the typed text for the following characteristics:

12.8.8.1 Character alignment or misalignment. Alignment defects can be horizontal (left/right), vertical (high/low), rotational (clockwise/counterclockwise), or a combination of these. Misalignment can also affect the uniformity of the impression (off-foot). Motion defects on typebar typewriters can affect the baseline alignment of shifted characters (e.g., upper case) relative to unshifted characters (e.g., lower case). Tilt and rotate defects on single element ball machines can affect horizontal and vertical alignment of specific groups of characters to each other.

12.8.8.2 Defects, or abnormalities, or both in individual typed characters can take the form of damage to the typeface, extraneous marks from unremoved flashing or bead defects, rebounding, improper ribbon operation affecting the printed impression, irregularities or variation in the spacing between letters or lines, paper slippage, or defective operation of margin. Dirty typefaces and worn fabric ribbons can also introduce transitory defects. (See references for other examples.)

12.8.8.3 Some features in typewriting examinations can be both class and individual depending upon the particular make/model of typewriter and the nature of the misalignment, defect, or abnormality. Defects found in typewritten documents can be fixed, transient, or progressive and can also exhibit variation in successive impressions.

12.8.9 Conduct a side-by-side comparison of the questioned typed text(s) to other questioned typed text or to known typed text(s), the typewriter(s), or element(s), or both.

12.8.10 When a typewriter(s) has been submitted for examination:

12.8.10.1 Determine whether the typewriter is electronic. If it is electronic, it can be important for the examiner to become familiar with its operation so that any data stored in the machine will not be lost.

12.8.10.2 The examiner should, if possible, document the physical condition of the typewriter and associated items, including:

12.8.10.2.1 Manufacturer, make, model, and serial number of the typewriter.

12.8.10.2.2 Any damage to mechanical components.

12.8.10.2.3 Settings on the typewriter (e.g., margins, tabulator stops, vertical spacing setting, pressure settings, ribbon switch (bichrome) setting; on a multi-spacing machine note the horizontal spacing setting and other possible settings).

12.8.10.2.4 Whether the typewriter is in new, used, or abused condition.

12.8.10.2.5 Any information, installation records, or service records that are with the typewriter.

12.8.10.3 Remove and examine the ribbon and correction media, if present. Note any significant impressions prior to removal. (See also 12.8.12.6 and 12.8.14.)

12.8.10.4 Examine the typewriter typefaces for defects, if any, with magnification and appropriate illumination.

12.8.10.4.1 For single element typewriters, the element should be removed for examination. Note any unusual features about the seating of the element prior to removal. On metal coated elements, examine for plating defects (e.g., beads, loss of plating).

12.8.10.5 Examine the typewriter platen for typewritten impressions or defects (e.g., scratches, pitting, or extraneous matter). This can require examination with various light sources.

12.8.10.6 These steps should be followed when taking typewriter exemplars:

12.8.10.6.1 If possible, do not use the ribbon that was in the typewriter when it was submitted. Use a ribbon of the same kind (e.g., fabric, single strike) appropriate for the machine. A sheet of carbon paper may be substituted when the appropriate ribbon cannot be used.

12.8.10.6.1.1 If it is necessary to use the ribbon in the typewriter when submitted, mark the exposed portion of the ribbon to serve as a “start line” that separates

the samples from the pre-existing typing on the ribbon.

12.8.10.6.2 On each exemplar, note the manufacturer, make, model, and serial number of the typewriter, the name of the person taking the exemplars, the date, and the location.

12.8.10.6.3 Initial samples should be taken using the settings on the typewriter when received.

12.8.10.6.4 Take multiple strike-ups of the entire keyboard, upper case and lower case (that is, with the shift key engaged and with the shift key not engaged).

12.8.10.6.5 Take multiple strike-ups with different settings as appropriate to the features of the machine (e.g., pitch, line spacing, impact, margins). On manual typewriters, use varying amounts of force in striking the keys such as obtaining strike-ups with heavy, medium, and light pressure.

12.8.10.6.6 To the extent possible, take multiple strike-ups that duplicate the questioned text using the same machine settings (e.g., if a single element machine, pitch, line spacing, typestyle).

12.8.10.6.7 On fabric ribbon machines, it is helpful to take exemplars with the ribbon set to “stencil” (ribbon disengaged). Exemplars can be taken both with and without a sheet of carbon paper in contact with a clean sheet of paper.

12.8.10.6.8 For typebar machines, type the whole keyboard (upper and lower case) using the lower case n or h to space the letters (e.g., nanbncnd…hahbhchd…). Type the key-board again using the upper case N or H (e.g., NANBNCND…HAHBHCHD…). For keyboard arrangements where these letters are not at or near the center of the type basket, substitute a suitably located character with a vertical element.

12.8.10.6.9 It can be useful to take strike-ups using different paper stock, including paper similar to the questioned document.

12.8.10.6.10 If the typewriter is inoperable or has a malfunction that interferes with taking appropriate exemplars, the examiner may have the malfunction(s) corrected, if possible, noting their cause(s) and the steps (repairs) necessary to correct them.

12.8.10.7 Whenever possible, also obtain original normal course of business correspondence or other materials produced on the machine contemporaneous to the purported date on the questioned material. Where the typewriter is not available, these can be the only exemplars.

12.8.11 Dating Typewritten Text:

12.8.11.1 The date of introduction of a typestyle or typestyle variant, typewriter mechanism, feature (e.g., type of ribbons, dual/multiple escapements, bold type, and margin justification), or date of production of a particular typewriter (based on the serial number) can establish the earliest possible date for the production of the document.

12.8.11.2 The gradual development of typewriting individuality plus ribbon condition and typeface cleanliness can be used to establish a date or period of time when a document was prepared by comparing questioned typed text to appropriate known documents.

12.8.12 Typewriter Ribbon Examinations:

12.8.12.1 The ribbon should be handled with appropriate care to avoid damaging the ink coating and compromising the potential for reading the text or for comparing fracture patterns or paper fiber impressions.

12.8.12.2 Single-strike film ribbons, single-strike paper ribbons, and correction media can be read and potentially compared to typed text. Determine the type of ribbon used to prepare the typed text on the document.

12.8.12.2.1 If fabric or multi-strike film ribbon, discontinue these procedures and report accordingly.

12.8.12.3 Determine, if possible, whether the ribbon type is consistent with the original typed text (e.g., lift-off compatible or permanent).

12.8.12.4 Determine if the type style on the document is present on the ribbon. A ribbon can contain more than one style of type.

12.8.12.5 Determine whether the text on the document is present on the ribbon. This can be determined by visual inspection or by the use of an automated ribbon reading device or system.

12.8.12.6 Determine whether the text on the ribbon and the text on the document are consistent in details, including errors and corrections.

12.8.12.7 Determine whether the fracture pattern of characters on the ribbon is consistent to corresponding characters on the document.

12.8.12.8 Determine whether there are areas of untransferred ink within the void area of a character on the ribbon that are consistent with a void within the outline of the corresponding character on the document.

12.8.12.8.1 When untransferred ink is missing from the film substrate and the text is difficult to read, viewing the ribbon between crossed polars or different angles of lighting can help in the visualization of the typed text in the substrate film.

12.8.12.9 Determine whether there are impression(s) of paper fibers within the void area of a character on the ribbon are consistent with paper fibers within the inked area of a corresponding character on the document. Viewing the ribbon between polarizing filters or different angles of lighting can help in visualization of the paper fiber impressions in the substrate film.

12.8.12.10 Text on fabric ribbons can sometimes be deciphered on new ribbons or those with limited usage. Dual color ribbons can sometimes be associated with typewritten text.

12.8.12.11 The thread count of a woven fabric ribbon can be determined at the level of class characteristics, but is generally more useful for differentiation of ribbons.

12.8.12.12 Evaluate the corresponding fracture patterns and paper fiber impressions and discrepancies, and any limitations. Determine their significance individually and in combination.

12.8.13 Alteration and Interlineation of Typewriting: Examine typewritten text for continuity and note any irregularities. The examination should include evaluating:

12.8.13.1 Consistency of alignment and spacing (measured with typewriter grids or equivalent). Typebar typewriters should maintain a constant escapement. Margins, tabulator stops, and line spacing settings can be changed by the operator. Single element typewriters usually have greater latitude in changing escapement and other spacings.

12.8.13.2 Consistency of typestyle. Typebar typewriters maintain a constant typestyle throughout a page. Single element typewriters utilizing interchangeable elements allow for the changing of typestyles on documents without having to remove paper from the typewriter.

12.8.13.3 Consistency of ribbon type, thread count, and ink density.

12.8.13.4 Formatting features should also be considered (e.g., margins, paragraph indentation).

12.8.13.5 Examine both sides of the document for chemical or physical/mechanical erasures by following the procedures in

Test Method 6: Alteration, Obliteration, and Erasure Examinations.

12.8.14 Analyze, compare, and evaluate the individualizing characteristics and other potentially significant features present in the comparable portions of the typed texts.

12.9 **Records:** Record in the case record all notes, data and observations.

12.10 **Interpretations of Results:** The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

12.11 **Report Writing:** The examiner shall report the results, opinions, and interpretations to conform to one of the following:

12.11.1 *Identification*— If there is agreement in all individualizing characteristics and there are no significant, inexplicable differences, then an identification is appropriate.

12.11.2 *Elimination*— If there are significant differences at any level of the analysis, then an elimination is appropriate. Similarities may be present.

12.11.3 *Qualified Opinions*— If there are similarities and/or differences of limited significance and there are limiting factors, then the use of qualified opinions is appropriate. Qualified opinions require explanation of the limiting factors in the Certificate of Analysis.

12.11.4 *Classification*— If there are a sufficient number of characteristics present on the typewritten document to classify the typestyle then the possible typestyle used to produce the questioned item(s) may be reported.

12.11.5 *No Conclusion*— If there are no significant similarities or significant differences and there are significant limiting factors, then a Certificate of Analysis that no conclusion can be reached is appropriate. This opinion requires explanation of the limiting factors in the Certificate of Analysis.

12.12 **References:**

ASTM *International* E2287 Standard Guide for Examination of Fracture Pattern and Paper Fiber Impression on Single-Strike Film Ribbons and Typed Text

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13. Examination of Mechanical Impressions on Documents

13.1 Scope: This test method shall be used for examinations and comparisons involving mechanical checkwriters, dry seal devices, or rubber stamps and their impressions. By following these procedures, the examiner can reliably reach an opinion concerning whether two or more impressions are from a common source or were created by specific mechanical checkwriter, dry seal device, or rubber stamp.

13.2 Precautions/Limitations: The examination of mechanical devices and impressions may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

13.2.1 The results of earlier storage, handling, testing, or chemical processing (e.g. latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

13.2.1.2 Chemical processing may contribute to the deterioration of the impression on a document.

13.2.1.3 Excessive handling or rubbing of the document surface may flatten the embossment or impression.

13.2.2 Limitations can be due to the submission of non-original documents, limited quantity or comparability, or condition of the items submitted for examination (e.g., impressions made with over-inked or inadequately inked checkwriters or rubber stamps, distorted impressions, partially imprinted impressions, or variations in surface texture).

13.2.2.2 Limited sufficiency and comparability of known impressions can be a restrictive factor in an examination and its conclusions but does not necessarily require the discontinuation of the examination.

13.2.3 Consideration should be given to the way an individual holds the rubber stamp or dry seal device when producing an impression can introduce variation in quality and appearance between impressions.

13.2.4 Consideration should be given to the possibility that a dry seal device or rubber stamp can be manufactured which duplicates the impressions of another dry seal or stamp.

13.2.5 Various forms of simulations, imitations, and duplicates of rubber stamps or rubber stamp impressions can be generated by computer and other means.

13.2.6 This test method does not cover examinations and comparisons involving computer generated checkwriter impressions.

13.3 Related Information:

13.3.1 Appendix 1 Worksheets

13.3.2 Appendix 2 Abbreviations

13.3.3 Appendix 3 Definitions

13.4 Instruments: The following equipment may be used as deemed appropriate by the examiner:

13.4.1 Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

13.4.2 Optical magnifiers sufficient to allow fine detail to be distinguished.

13.4.3 Imaging and other equipment for recording observations.

13.5 Reagents/Materials: Not applicable.

13.6 Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

13.6.1 Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

13.6.2 Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

13.7 Reference Materials/Controls/Calibration Checks:

13.7.1 Checkwriter classification reference materials can aid in the determination of a manufacturer.

13.8 Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

13.8.1 At various points in these procedures, a determination that a particular feature is not present or that a document is lacking in quality or comparability, may cause the examiner to discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

13.8.2 Determine whether the submitted questioned impression(s) were produced by a checkwriter, dry seal device or rubber stamp. If not a checkwriter, dry seal device or rubber stamp impression (original or copy), discontinue examination and report accordingly.

13.8.3 Determine whether the examination is a comparison of questioned impressions; a comparison of a questioned impression(s) with a known impression(s); or a comparison of a questioned impression(s) with a checkwriter(s), a dry seal device(s) or a rubber stamp(s).

13.8.4 Determine whether the submitted questioned impression(s) is suitable for comparison. If it is not suitable for comparison, discontinue the procedure and

report accordingly. Factors that affect the suitability include clarity, detail, degree of inking or embossing, or condition of the document.

13.8.4.1 Examination of the original is preferred. The examiner should try to obtain the original, if not submitted.

13.8.5 If a known document(s) is submitted, determine whether the known document(s) is suitable for examination, or comparison, or both. If it is not suitable, discontinue the procedure and report accordingly. Factors that affect the suitability include clarity, detail, or condition of the document.

13.8.6 If the original(s) is not submitted, evaluate the quality of the best available reproduction to determine whether significant details have been reproduced with sufficient clarity for comparison purposes and proceed to the extent possible. If the reproduction is not of sufficient clarity for comparison purposes, discontinue these procedures and report accordingly.

13.8.7 Checkwriter(s)

13.8.7.1 If no known impressions or checkwriter(s) are available, go to 13.8.7.5.

13.8.7.2 If a checkwriter(s) is submitted, its condition should be documented.

13.8.7.3 Determine if the known checkwriter impression(s) are suitable for comparison.

13.8.7.4 If the known impressions are not suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

13.8.7.5 Conduct a side-by-side comparison of the questioned impressions, or the questioned impression to the known impressions and/or to the checkwriter(s).

13.8.7.5.1 Compare class characteristics, such as the impression format, typeface design and size, printing element characters, prefix, payee perforator, platen impressions and inking system. If different, discontinue and report accordingly.

13.8.7.5.1.1 Prefixes may be removed and replaced in certain machines. Payee perforator may be inactivated. These factors should be considered in any evaluation of characteristics. Prefixes may be customized and manufacturers may also have records of the original purchaser of a certain prefix.

13.8.7.5.2 Compare individualizing characteristics, such as wear and damage defects, perforation patterns, misalignments, reproducible blemishes, ribbon shift,

impression voids, improper inking, extraneous inking, and individual prefix features.

13.8.8 Dry Seal Device(s)

13.8.8.1 If no known impressions or dry seal device(s) are available, go to 13.8.8.5.

13.8.8.2 If a dry seal device(s) is submitted, its condition should be documented (e.g., clean, dirty, worn, or damaged).

13.8.8.2.1 Note, when applicable, class characteristics (e.g., typeface design and size).

13.8.8.3 Prepare appropriate known impressions, as needed.Determine if the known impressions are suitable for comparison.

13.8.8.4 If none of the known impressions are suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

13.8.8.5 Conduct a side-by-side comparison of the questioned impressions, or the questioned impression to the known impressions and/or to the dry seal device(s).

13.8.8.5.1 Compare class characteristics, such as impression format, typeface design, other present designs and relative sizes. If different, discontinue and report accordingly.

13.8.8.5.2 Compare individualizing characteristics, such as wear and damage defects, embossment variation patterns.

13.8.9 Rubber Stamp(s)

13.8.9.1 Examine the questioned impression(s).

13.8.9.1.1 Attempt to identify or classify the type of manufacturing process, the material used for the stamp, and type of ink.

13.8.9.1.2 Attempt to identify and determine the source of defects or anomalies.

13.8.9.2 If no known impressions or rubber stamps(s) are available, go to 13.8.9.5.

13.8.9.3 If a rubber stamp(s) is submitted, its condition should be documented (e.g., clean, dirty, inked, worn, or damaged).

13.8.9.3.1 Note, when applicable, class characteristics (e.g., type of material used for the stamp, typeface design and size).

13.8.9.3.2 Attempt to identify and determine the source of defects or anomalies.

13.8.9.4 Prepare appropriate known impressions, as needed.Determine if the known impressions are suitable for comparison.

13.8.9.5 If none of the known impressions are suitable for comparison and no others are obtained, discontinue these procedures and report accordingly.

13.8.9.6 Conduct a side-by-side comparison of the questioned impressions, or the questioned impression to the known impressions and/or to the rubber stamp(s).

13.8.9.6.1 Compare class characteristics, such as size, type style, text, and shape. If different, discontinue and report accordingly.

13.8.9.6.2 Compare individualizing characteristics, such as wear and damage defects, reproducible blemishes, impression voids, improper and extraneous inking, or coincidental peripheral printing.

13.9 Records: Record in the case record all notes, data and observations.

13.10 Interpretations of Results: The examiner shall evaluate the similarities, differences, and limitations involved in the examination and shall determine their significance individually and in combination.

13.11 Report Writing: The examiner shall report the results, opinions, and interpretations to conform to one of the following:

13.11.1 *Identification*— If there is agreement in all individualizing characteristics and there are no significant, inexplicable differences, an identification is appropriate (that is, the examination revealed significant individual defects in common; there are no significant, inexplicable differences; and no limitations associated with absent characteristics; and the possibility of a duplicate dry seal or rubber stamp can be eliminated).

13.11.2 *Elimination*— If significant, inexplicable differences between two or more items are found at any level of the analyses, an elimination is appropriate (that is, the impressions contain substantial significant differences). There may be similarities present.

13.11.2.1 For checkwriters, there may be limitations associated with absent characters or individualizing characteristics.

13.11.3 *Qualified Opinions*— When there are limiting factors and the examination reveals similarities or differences of limited significance between two or more items, the use of qualified opinions can be appropriate (that is, the impressions or observed features contain limited similarities or differences; or limitations associated with absent characters, individualizing characteristics, or distorted impressions are present; or a combination of these). Qualified opinions require explanation of the limiting factors in the Certificate of Analysis.

13.11.3.1 There may be limitations associated with the possibility of the existence of a duplicate dry seal device or rubber stamp.

13.11.4 *No Conclusion*— When there are significant limiting factors, and the examination reveals no significant similarities or significant differences, a report that no conclusion can be reached is appropriate. This opinion requires explanation of the limiting factors in the Certificate of Analysis.

13.12 References:

ASTM *International* E2285, Standard Guide for Examination of Mechanical Checkwriter Impressions

ASTM *International* E2286, Standard Guide for Examination of Dry Seal Impressions

ASTM *International* E2289, Standard Guide for Examination of Rubber Stamp Impressions

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14. Preservation of Charred and Water Soaked Documents

14.1 Scope: This test method shall be used by the examiner to preserve charred or liquid soaked documents.

14.2 Precautions/Limitations: Documents submitted for examination may have inherent limitations that can interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

14.2.1 The results of earlier storage, handling, testing, or chemical processing (e.g. latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

14.2.2 This test method does not cover all procedures to preserve charred or liquid soaked documents. Consultation with a document conservationist, archivist, or related material expert, as well as reference materials, may be necessary.

14.2.3 Charred documents are extremely fragile and care should be taken to minimize the degradation of the documents during the handling process.

14.2.4 Necessary precautions should be taken to prevent disturbance of the charred documents by air circulation in the examination area.

14.2.5 Liquid soaked documents should be frozen or otherwise immobilized as soon as possible to stabilize their condition prior to submission and/or preservation.

14.3 Related Information:

14.3.1 Appendix 1 Worksheets

14.3.2 Appendix 2 Abbreviations

14.3.3 Appendix 3 Definitions

14.4 Instruments: The following equipment may be used as deemed appropriate by the examiner:

14.4.1 Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

14.4.2 Optical magnifiers sufficient to allow fine detail to be distinguished.

14.4.3 Imaging and other equipment for recording observations.

14.4.4 Picks, such as dental picks, probes, and tweezers.

14.4.5 Atomizer.

14.4.6 Trays, tanks, and pliable screening.

14.4.7 Bone folder or similar device.

14.4.8 Polyester film or other encapsulation material.

14.4.9 Cotton batting or newsprint-lined boxes.

14.4.10 Plate glass stock.

14.4.11 Humidity chamber.

14.4.12 Laboratory oven.

14.4.13 Freeze dryer.

14.4.14 Book press or other suitable press.

14.5 Reagents/Materials: Not applicable.

14.6 Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

14.6.1 Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

14.6.2 Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

14.7 Reference Materials/Controls/Calibration Checks: Not applicable.

14.8 Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

14.8.1 At various points in these procedures, it is at the discretion of the examiner to discontinue or limit the procedures outlined in this test method when further processing is no longer practical or appropriate. The examiner should either discontinue the procedure and report accordingly, or continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

14.8.2 Images shall be made to document the initial condition of the evidence and subsequently as needed.

14.8.3 Charred Document(s)

14.8.3.1 Evaluate the charred document(s) for the following:

14.8.3.1.1 The nature and components of the document(s).

14.8.3.1.2 The condition and extent of charring.

14.8.3.1.2.1 If the document(s) is wet, refer to 14.8.5.

14.8.3.2 Determine the appropriate procedures to optimize preservation of the document(s).

14.8.3.2.1 For a single page document, flatten if necessary.

14.8.3.2.2 For a multiple page document or a charred mass of documents:

14.8.3.2.2.1 Attempt to separate and flatten the pages using appropriate equipment, such as bone folders, picks, probes, and tweezers. It may be necessary to humidify, submerge, or otherwise stabilize the documents. Various methods, such as humidifying, atomizing, submersing, or fuming, may be used to apply water or other appropriate solvents or binders.

14.8.3.3 Encapsulation or other stabilization process, such as with polyester film or glass, or other procedures, such as parylene processing, may be advisable.

14.8.4 Liquid Soaked Document(s)

14.8.4.1 Evaluate the document(s) for the following:

14.8.4.1.1 The nature and condition of the document(s).

14.8.4.1.2 The nature of the liquid(s).

14.8.4.1.3 The extent of the effect from the liquid(s).

14.8.4.2 Determine the appropriate procedures to optimize preservation of the document(s).

14.8.4.2.1 For wet, single page document(s):

14.8.4.2.1.1 Select a suitable method, such as submersion or drying, to unfold the document(s), if necessary.

14.8.4.2.1.2 Select a suitable method, such as air drying, freeze drying, or pressing, and dry the document(s).

14.8.4.2.2 For wet, multipage document(s):

14.8.4.2.2.1 Determine if the wet pages can be separated or unfolded without additional damage. This can be accomplished by submerging the document(s) in an appropriate liquid, such as water or mineral spirits. If the pages cannot be separated or unfolded, select a suitable drying process, such as air drying, freeze drying, or pressing.

14.8.4.2.3 For dried document(s):

14.8.4.2.3.1 Attempt to separate, if necessary, and flatten the pages using appropriate equipment, such as bone folders, picks, probes, and tweezers.

Prior to or during the attempt to separate and flatten the document(s), it may be necessary to rehumidify or resubmerge the document(s). Rehumidification with appropriate fluids may be accomplished with an atomizer, humidity chamber, or both. When resubmerging the document(s), an appropriate container and screen should be utilized.

14.8.4.2.4 For document(s) received frozen:

14.8.4.2.4.1 Freeze dry the document(s) and refer to 14.8.4.2.3.1. If not possible, thaw the document(s) and treat as wet document(s).

14.8.4.3 Encapsulation of the document(s) upon completion, such as with polyester film or glass, or other procedures, such as parylene processing, may be advisable.

14.8.5 Other forensic examinations may be conducted as required, such as an attempt to decipher any original information on the submitted documents.

14.9 Records: Record in the case record all notes, data and observations.

14.10 Interpretations of Results: Not applicable.

14.11 Report Writing: The examiner shall report the results of these procedures in the Certificate of Analysis.

14.12 References:

ASTM *International* E2710, Standard Guide for Preservation of Charred Documents

ASTM *International* E2711, Standard Guide for Preservation of Liquid Soaked Documents

15. Imaging

15.1. Scope: This test method defines the procedures and techniques that shall be used to capture, store, and process images of observed or developed handwriting, hand printing, indented impressions, and other forms of documentary evidence encountered in the Forensic Document Unit (FDU). By using this test method, the examiner can use image capture technology reliably to document the item(s) submitted for examination, its condition upon receipt, and its condition at various points during the examination process; demonstrate the findings and basis for results, opinions, and interpretations; and visualize features and characteristics not readily perceptible in the evidence.

15.2. Precautions/Limitations: The imaging and enhancement of documents may have inherent limitations that may interfere with the procedures in this test method. Limitations shall be recorded in the case notes.

15.2.1. The results of earlier storage, handling, testing, or chemical processing (e.g., latent prints and DNA) may interfere with the document examination. When possible, document examinations should be conducted before chemical processing. Documents should be handled properly to avoid compromising subsequent examinations.

15.2.2. The general principles and procedures used are the same regardless of the format or media in which the images are captured. Therefore, in this test method the word *image* refers to any image captured or any media (e.g., conventional photographic, electronic, magnetic, or optical media).

15.2.3. Image processing software or features within that software that result in alterations to an original image or a copy of an original image which would allow for misinterpretation of that image, shall not be used. Only copies of original images shall be enhanced but not altered.

15.2.4. The technological evolution of hardware or software, or both, can impact subsequent ability to access archive images.

15.3. Related Information:

15.3.1. Appendix 1 Worksheets

15.3.2. Appendix 2 Abbreviations

15.3.3. Appendix 3 Definitions

15.3.4. Appendix 6 Performance Check Procedures

15.4. Instruments: The following equipment may be used as deemed appropriate by the examiner:

15.4.1. Appropriate light source(s) of sufficient intensity to allow fine details to be distinguished.

15.4.2. Optical magnifiers sufficient to allow fine detail to be distinguished.

15.4.3. Rulers.

15.4.4. Digital Imaging System:

15.4.4.1. Imaging capture device(s) capable of sufficient resolution to reliably record the desired detail, such as a digital camera, scanner, or Video Spectral Comparator (VSC).

15.4.4.2. Computer hardware and storage media.

15.4.4.3. Image output device(s) for display or hardcopy production, such as monitors and printers.

15.4.4.4. Image Processing Software to include, but not limited to, Mideo Caseworks®/Workspace® and Adobe Photoshop®.

15.4.5. Other apparatus and software as appropriate.

15.5. Reagents/Materials: Not applicable.

15.6. Hazards/Safety: The examiner shall be aware of the possibility of contamination from biological substances that may be on the evidence. Precautions should include personal protective equipment (PPE) and ventilation, when appropriate.

15.6.1. Forensic document examinations involve materials, procedures, and equipment that may be hazardous. This test method does not purport to address all safety problems associated with its use. It is the responsibility of the examiner to adhere to appropriate safety and health practices.

15.6.2. Proper caution, to include adherence to Universal Precautions and the Blood Borne Pathogen Plan, shall be exercised.

15.7. Reference Materials/Controls/Calibration Checks:

15.7.1. A performance check of the VSC shall be tested using the reference material provided by the manufacturer each day of use prior to utilizing the instruments in an examination. Refer to Appendix 6 for the Performance Check Procedures.

15.7.1.1. Results of the performance check shall be recorded in the case notes.

15.7.1.2. A performance check of the VSC shall also be conducted after any maintenance is performed on these instruments. Refer to Appendix 6 for the Performance Check Procedures

15.7.1.3. Results of the performance checks and information regarding any maintenance performed on the instruments shall be recorded in the maintenance log of the respective instrument.

15.7.2. To ensure proper functioning of the Digital Imaging System, an initial assessment by visual inspection of the images captured should be conducted to ensure that the resulting image(s) accurately represent the item and its fine detail. This check does not need to be documented.

15.7.2.1. When a problem is noted with a particular piece of the Digital Imaging System, the equipment shall be taken offline and labeled “out of service”. The Unit Supervisor and all users shall be notified.

15.7.2.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.

15.7.2.3. Actions taken to repair or correct the problem shall be documented in the Digital Imaging System Maintenance log.

15.8. Procedures/Instructions: All procedures shall be performed where applicable. These procedures need not be performed in the order given. The procedures performed shall be contemporaneously documented in sufficient detail to allow for an independent review and assessment by another examiner.

15.8.1. Capturing Images

15.8.1.1. Images of document(s) submitted for examination shall be captured, when appropriate. This should be done prior to examination(s) and comparison(s).

15.8.1.2. At various points in these procedures, a determination that an image or document is lacking in quality can indicate that the procedure involving imaging technology should be discontinued or limited. It is at the discretion of the examiner to discontinue the procedure at any point and report accordingly, or to continue with the applicable procedures to the extent possible. Reasons for these decisions shall be documented in case notes.

15.8.1.3. Determine the appropriate image capture device to be used based upon size and shape of the document(s), the required resolution and the field of view, and any specialized lighting requirement(s).

15.8.1.3.1. Flatbed scanners can be used for image capture with flat documents, such as sheets of paper and three-dimensional objects with a shallow depth of field.

15.8.1.3.2. Three-dimensional objects needing special lighting require a camera, such as rubber stamps and typewriter keys.

15.8.1.3.3. Infrared and ultra violet imaging require specialized equipment, such as the Video Spectral Comparator (VSC).

15.8.1.4. Capture images that are accurate representations of the document(s) and that record the desired detail.

15.8.1.5. A scale (ruler) shall also be included in each image. When it is not possible to include a scale in an image, as it interferes with the quality of the image, an image shall be captured at the same settings with a scale and without a scale.

15.8.1.6. Capture images at an optical resolution and pixel depth necessary to reproduce the desired detail of interest on the output device(s) used for evaluation or observation. It may be necessary to use various light sources and filters, such as those found in the VSC.

15.8.1.6.1. Images captured with various light sources and filters may also be enhanced with other techniques, such as using Adobe Photoshop.

15.8.1.7. For digital technology:

15.8.1.7.1. Capture images with a minimum resolution of 300 dots per inch and 8-bit grayscale. Some documents can require higher resolution or the use of color (24-bit minimum). Higher desired reproduction ratios generally require higher pixel density.

15.8.1.7.2. Save all original images in their native file format without processing.

15.8.1.7.3. The native file format should be RAW, TIFF, or BMP, which are uncompressed or lossless compression. Lossy compression file formats are not recommended, which includes JPEG. It should be noted that some technology only capture images in JPEG format, therefore these images can be used during the analysis process.

15.8.1.7.4. Interpolation shall not be used to achieve desired resolution. Interpolation is a method of image processing whereby one pixel, block, or frame is created, used or stored, based on the differences between the previous and subsequent pixel, block, or frame of information.

15.8.1.8. Perform necessary initial processing and storage procedures to the captured image to accurately represent the document and its fine detail and to preserve the image.

15.8.1.9. Captured images shall be saved, and the file named in accordance with Indiana State Police Laboratory Policy General #037 Image Storage.

15.8.2. Image Storage

15.8.2.1. All digital images (or files) submitted and images captured by the examiner, shall be uploaded to Mideo Caseworks prior to digital enhancement.

15.8.2.1.1. Mideo Caseworks automatically authenticates the original images.

15.8.2.2. Verify by visual inspection that all images captured or submitted were uploaded to Mideo and that the captured image accurately represents the document and its fine detail. If not, return to 15.8.1. or document the image quality in the case record.

15.8.2.3. A thumbnail image of all images contained in Mideo Caseworks shall be stored in the Imaging Module of Laboratory Information

Management System (LIMS) to indicate the presence of an original image being stored in Mideo Caseworks.

15.8.3. Image Processing

15.8.3.1. Image processing and enhancement shall be done in Mideo Caseworks, using either the Mideo Workspace or Adobe Photoshop, which records the history log of the captured image.

15.8.3.1.1. Mideo Caseworks maintains all original images. Any processing conducted on the image through Mideo Caseworks does not alter the original image.

15.8.3.1.2. The history log in Mideo shall contain an image processing log, recording information relevant to the enhancement of the image in sufficient detail to allow meaningful review and assessment of the results and permit replication of the processing by another examiner.

15.8.3.2. A wide variety of tools, imaging techniques, filters and palettes are available in Mideo Workspace and Adobe Photoshop to aid the examiner in generating the best possible quality of the image. Those that will best aid in the processing of an image shall be determined by the examiner at the time of the examination as long as they follow the best practices in imaging forensics by archiving the original image, working only on copies of the original file, using only valid forensic image processing procedures, and ensuring that all processes are repeatable and verifiable. Basic image enhancement can take the form of traditional enhancement techniques, such as positive to negative inversion; image rotation/inversion; conversion to grayscale; white balance adjustment (color balancing, color correction, or density and contrast adjustments); basic imaging sharpening and blurring (pixel averaging); and file format conversion.

15.8.3.3. Advanced image enhancement can take the form of image averaging; deblur; noise reduction; image restoration; color channel selection and subtraction; perspective control, geometric correction, or both; and advanced sharpening tools, such as unsharp mask.

15.8.4. The final enhancement shall be saved in a lossless format, where possible, in the respective folder in Mideo Caseworks.

15.9. Records:

15.9.1. Once an image is uploaded into Mideo Caseworks, it is considered part of the case record maintained by the Indiana State Police Laboratory.

15.9.2. All images in Mideo Caseworks shall be stored on a secure server, which can only be accessed through a password protected Indiana State Police Laboratory computer that has Mideo Caseworks installed.

15.9.3. The history log within Mideo Caseworks serves as the case record documentation of the image by recording the name, date, and time when an image is accessed, and it records any changes made to that image.

15.10. Interpretations of Results: Images need only be processed to the point where the examiner determines that the best possible quality of the image has been reached.

15.11. Report Wording: It shall be noted in the Certificate of Analysis that images of items examined are being retained by the Forensic Document Unit.

15.12. References:

ASCLD/LAB-*International* (American Society of Crime Laboratory Directors/Laboratory Accreditation Board) Supplemental Requirements, 2006

ASTM *International* E2765, Standard Practice for Use of Image Capture and Storage Technology in Forensic Document Examination

ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories, International Organization for Standardization, Geneva, Switzerland, 2005

Mideo Systems Inc, Indiana State Police Reference Material

SWGIT Documents (Scientific Working Group on Imaging Technology) http://www.theiai.org/guidelines/swgit/index.php

APPENDICES

Appendix 1: Worksheets

Appendix 2: Abbreviations

Appendix 3: Definitions

Appendix 4: Flow Chart for Q to K Handwriting Comparisons

Appendix 5: Flow Chart for Q to Q Handwriting Comparisons

Appendix 6: Performance Check Procedures

Appendix 7: FDU Maintenance Plan

Appendix 8: Forensic Document Unit Reference Collections

APPENDIX 1 WORKSHEETS

1. Laboratory worksheets serve several purposes including documenting the work done, guiding the examination, and serving as an archive for future reference.

2. The design of worksheets is at the discretion of the examiner.

3. A search for additional known writing may be conducted of suspects or subjects of the existing file to other names in Laboratory Information Management System (LIMS), the card file maintained in the Forensic Document Unit (FDU), or other sources. If a similar name is found, an inquiry shall be made to ascertain whether it is the same individual and whether or not documents may have been previously submitted from these subjects. If they have been submitted and if images have been retained, contact shall be made and documented with the customer of the older case and the customer of the current case to see if documents may be shared between the two cases.

4. Case notes shall include an inventory of the evidence, observations, conclusions reached, and limitations that impacted the examination.

- **4.1.** Record in case notes whether the documents submitted are original or reproduction copies.
  - **4.1.1.** Limitations shall be recorded in the case notes such as a lack of comparable writing styles, lack of a sufficient quantity of known material, lack of a sufficient quantity of questioned material, lack of individuality, lack of clarity of detail in reproduction copies, and any factors that may have caused a deterioration of the documents being examined.
- **4.2.** The case notes may be electronic or handwritten. If handwritten, case notes shall be in ink except for drawings. Drawings and notations in close proximity to those drawings may be in pencil or other type of non-permanent media.
- **4.3.** Documents submitted for examination shall be scanned at a minimum of 300 dpi and the images shall be uploaded to the appropriate network drive.
- **4.4.** All files shall be uploaded to the appropriate network drive in PDF or TIFF format and use the file naming protocol outlined in Indiana State Police Laboratory Policy General #037. Additional descriptive information may be utilized when appropriate as follows:
  - **4.4.1.** VSC for images from the examination with a Video Spectral Comparator.
  - **4.4.2.** EDD for images of the lifts from the indented impression examination using the Electrostatic Detection Device, specific run number.
  - **4.4.3.** WriteOn for images from the WriteOn program.
  - **4.4.4.** Additional descriptors when appropriate (QD-1, PG#, etc.).

APPENDIX 2 ABBREVIATIONS

1. The Indiana State Police Forensic Document Unit may use abbreviations to streamline the note taking process. Other abbreviations may be used and if it is not among the abbreviations or associated terms below, when they are first used, an explanation of the coding or abbreviation shall be provided in the case notes.

Note: Upper and lower case usage of letters does not alter the meaning of the abbreviation. Use of color may indicate an observation, variation, difference, or similarity.

#/Amt	Numerical Amount
~	Approximate
∠	Angular
?	Question, Don't Know, Unsure
√	Check
≠	Different or Not Equal
“	Inches
+	significant similarity
-	significant difference or not present
X	feature not present or not discriminating
A	Aerosol
BK	Back
BL	Baseline
Blk	Black
BP	Ballpoint
BR	Break/Broken
C	Cascade
CNEI	Cannot Eliminate or Identify
Diff	Different, Difference
Disg	Disguised
Dist	Distorted
DS	Drag Stroke
EDD	Electrostatic Detection Device
ESDA	Electrostatic Detection Apparatus
Elim	Elimination, Eliminate
F, FR	Front
HW	Handwriting
HP	Hand printing; Highly probable
ID	Identification
I	Item
II	Indented Impression Exam
IND	Indications
IR/UV	Infra-Red/ Ultraviolet Exam
K	Known
L/C	Lower Case
L/Q	Line Quality
L or (L)	Left
Min	minutes
Mult	Multiple
N	Normal, Natural
N/C	Not Comparable
NBP	Non-ballpoint
Ø	Negative, None, Not
OW	Overwriting, Retracing
PQC	Poor Quality/Clarity
Pg, P	Page
Prob	Probable
Pt	Point
Q	Questioned
R or (R)	Right; Reverse
Rev	Reverse (of a sheet of paper)
Red Marker	Difference
Rt	Right
S	Slow
Sim	Similar
Similar (also **green** or **blue** ink/pencil)	
T, TAD	Toner Application Device
TW	Typewritten
UC	Upper Case
Var	Variation
Variation (also **black** ink/pencil)	

APPENDIX 3 DEFINITIONS

This appendix provides some definitions used in the discipline of forensic documents, forensic science and the accreditation process.

References:

ASTM *International* E444, Standard Guide for Scope of Work of Forensic Document Examiners
ASTM *International* E1422, Standard Guide for Test Methods for Forensic Writing Ink Comparison
ASTM *International* E1658, Standard Terminology for Expressing Conclusions of Forensic Document Examiners
ASTM *International* E1732, Standard Terminology Relating to Forensic Science
ASTM *International* E1789, Standard Guide for Writing Ink Identification
ASTM *International* E2195, Standard Terminology Relating to the Examination of Questioned Documents
ASTM *International* E2285, Standard Guide for Examination of Mechanical Checkwriter Impressions
ASTM *International* E2286, Standard Guide for Examination of Dry Seal Impressions
ASTM *International* E2287, Standard Guide for Examination of Fracture Patterns and Paper Fiber Impressions on Single-Strike Film Ribbons and Typed Text
ASTM *International* E2288, Standard Guide for Physical Match of Paper Cuts, Tears, and Perforations in Forensic Document Examinations
ASTM *International* E2289, Standard Guide for Examination of Rubber Stamp Impressions
ASTM *International* E2290, Standard Guide for Examination of Handwritten Items
ASTM *International* E2291, Standard Guide for Indentation Examinations
ASTM *International* E2325, Standard Guide for Non-destructive Examination of Paper
ASTM *International* E2331, Standard Guide for Examination of Altered Documents
ASTM *International* E2388, Standard Guide for Minimum Training Requirements for Forensic Document Examiners
ASTM *International* E2389, Standard Guide for Examination of Documents Produced with Liquid Ink Jet Technology
ASTM *International* E2390, Standard Guide for Examination of Documents Produced with Toner Technology
ASTM *International* E2494, Standard Guide for Examination of Typewritten Items
ASTM *International* E2710, Standard Guide for Preservation of Charred Documents
ASTM *International* E2711, Standard Guide for Preservation of Liquid Soaked Documents
ASTM *International* E2765, Standard Practice for Use of Image Capture and Storage Technology in Forensic Document Examination
ASTM *International*, Standard Guide for Classification of Conventional Printing Processes, Draft
SWGDOC (Scientific Working Group for Forensic Document Examination), Standard Classification for Typewritten Text, Draft
SWGDOC, Standard for the Examination of Financial, Identification, and Other Authorized Documents, Draft

Definitions:

absent character—a character or character combination which is present in one body of writing but is not present (e.g., does not have a corresponding character) in another body of writing. **ASTM E2290**

accreditation—procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks. **ASTM E1732**

accrediting body—governmental or non-governmental body that conducts and administers a laboratory accreditation system, and grants accreditation. **ASTM E1732**

administrative documentation—records such as case related case related conversations, test item (evidence) receipts, description of evidence packaging and seals, incident reports, service request documentation, correspondence received/sent, and other pertinent information. **ASCLD/LAB-*International* Supplemental**

administrative review—a procedure used to check case file documentation and case reports for consistency with laboratory policy and editorial correctness. **ASCLD/LAB-*International* Supplemental**

aliasing—see ***pixilation***. **ASTM E2390**

alignment—the adjustment of various mechanisms of a typewriter to ensure the even printing of the characters and their proper positioning relative to the baseline and to the other characters. **ASTM E2494**

alignment defect—a deviation from the intended appearance or position of a character relative to another character. (See **impression defect, motion defect**.) Alignment defects are usually categorized as vertical misalignment (character too high or low relative to the baseline established by the other characters), horizontal misalignment (character too far to the left or right relative to other characters), and twisted or leaning (character leans to the left or to the right); because they are corrected in the alignment process, impression defects are considered as alignment defects. **ASTM E2494**

alteration—a modification made to a document by physical, chemical or mechanical means including, but not limited to, obliterations, additions, over writings, or erasures. **ASTM E2331**

altered document—a document that purports to be genuine but is not, because it has been falsely altered, completed, signed, or endorsed, or contains a false addition thereto or insertion therein, or is a combination of parts of two or more genuine documents. **SWGDOC (Counterfeit Guide Draft)**

analyst—an individual who conducts and/or directs the analysis of forensic casework samples, interprets data and reaches conclusion. **ASCLD/LAB-*International* Supplemental**

apex—the uppermost point of a character. **ASTM E2195**

approved test provider—a proficiency test provider who has complied with the test manufacturing guidelines established by the Proficiency Review Committees (PRC). **ASCLD/LAB-*International* Supplemental**

archive copy—a copy of data placed on media suitable for long-term storage, from which subsequent working copies can be produced. **ASTM E2765**

archive image—any image placed on media that is suitable for long-term storage. **ASTM E2765**

archiving—the process of storing data in a manner suitable for long-term availability and retrieval. **ASTM E2765**

ascender—a stroke that rises above the height of the body of the letter formation. **ASTM E2195**

assisted hand signature—a signature executed by a writer while the writer's hand, arm, or writing instrument is steadied or stabilized by another. **ASTM E2195**

associative evidence—that evidence which tends to link a person, place, or thing with another person, place, or thing. **ASTM E1732**

audit—a review conducted to compare the various aspects of the laboratory's performance with a standard for that performance. **ASCLD/LAB-*International* Supplemental**

authorized document—a document made or issued by or under the authority of a governmental or private organization or an individual. **SWGDOC (Counterfeit Guide Draft)**

awkward hand—see ***unaccustomed hand***. **ASTM E2195**

ball element—an element used in a single element typewriter in which the fully formed characters are located on the outer surface of a sphere-like device. Frequently called *golf-ball element*. **ASTM E2494**

ball terminal—the end of a stroke (*terminal*), usually a curved stroke, with a prominent sphere or ball. **SWGDOC (Typewritten Text Classification Draft)**

ballpoint pen ink—writing or marking media intended for use in a ball point pen. Typically, a thick, high viscosity ink with an oil, glycol, or rubber base. **ASTM E1422**

banding—uniform density variations or voids in a given color which appear in the direction that the print head travels. **ASTM E2389**

baseline—the ruled or imaginary line upon which writing or typewriting appears to rest. **ASTM E2195** and **ASTM E2494**

batch to batch variation—*within an ink formulation,* difference in the concentration of a component of an ink formula due to deviations during production that are within the manufacturer's tolerance limit. **ASTM E1422**

bead defect—inked or un-inked impression or hole in the paper caused by a contaminant particle encased in plating material located on or adjacent to the printing area of the typeface on a metal coated element. **ASTM E2494**

black write—process in electrostatic printing in which the photoconductive element is charged with a charge of the same sign as that of the toner. A light beam, used like a "stylus" is used to discharge only those areas that are to receive toner to form the image. In the development process, the charged background areas repel the like charged toner to the discharged areas on the photoconductor. **ASTM E2390**

bleed—ink feathering of one color into an adjacent color over time. **ASTM E2389**

blemish—a small extraneous spot found near inked regions of check writer impressions that is characteristic of machines that use ribbons as their ink source. **ASTM E2285**

bone folder—a piece of shaped bone or other material, such as plastic or Teflon, typically used by bookbinders to crease paper and to separate pieces of paper that are stuck together. **ASTM E2710** and **ASTM E2711**

bowl—a curved portion of a character that completely or partially encloses an area (see *counter*). **SWGDOC (Typewritten Text Classification Draft)**

bridging—clumping of toner that causes a hollow area in the toner supply that prevents the free flow of toner to the dispenser auger. **ASTM E2390**

cap height—the height of a capital letter from the baseline to the top of the letter. **SWGDOC (Typewritten Text Classification Draft)**

calibration—the set of operations that establishes, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system or values represented by a material, and the corresponding known values of measurement. **ASTM E1732**

capture—the process of recording data, such as an image, video sequence, or audio stream. **ASTM E2765**

capturing device—a device used in the recording of data. **ASTM E2765**

carbon paper—a sheet composed of a supporting substrate on one or both sides of which is a coating containing a transferable (usually colored) material. The coating is of such nature that it will transfer in part or entirely to a copy sheet at the point of pressure contact. **ASTM E2494**

case record—files containing administrative and examination documentation generated or received by a laboratory pertaining to a particular case. **ASCLD/LAB-*International* Supplemental**

CD/DVD *(compact disc/digital versatile disc)*—optical disc technology formats designed to function as digital storage media. **ASTM E2765**

certification body—a body that conducts certifications of conformity. **ASTM E1732**

certification of conformity—document issued under the rules of a certification system indicating that adequate confidence is provided that a duly identified product, process, or service is in conformity with a specific standard or other normative document. **ASTM E1732**

certified reference material (CRM)—a reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure that establishes traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence. **ASTM E1732**

chain of custody—procedures and documents that account for the possession of a sample by tracking its handling and storage from its point of collection to its final disposition. **ASTM E1732**

character—any language symbol (e.g., letter, numeral, punctuation mark, or other sign), other symbol, or ornament. **ASTM E2195, ASTM E2290** and **ASTM E2494**

character pitch—the number of characters that can be printed in a horizontal 1 in. (25.4 mm). **ASTM E2494**

character spacing—the width allotted to each character in a fixed pitch (mono-spacing) typewriter or to the basic unit in a proportional spacing typewriter; usually expressed in millimeters or as a fraction of an inch. (Synonym for **horizontal escapement**.) **ASTM E2494**

characteristic—a feature, quality, attribute, or property of writing. **ASTM E2290**

charred documents—documents damaged by heat or fire. **ASTM E2710**

checkwriter—a device manually or electrically powered or computer generated, designed to ink, emboss, print, perforate, or shred a monetary value, along with other peripheral information, onto a document. **ASTM E2285**

chromatography—a method of separating substances that is widely used in analytical and preparative chemistry. It involves the flow of a liquid or gas mobile phase over a solid or liquid stationary phase. As the mobile phase flows past the stationary phase, a solute will undergo repeated adsorption and desorption and move along at a rate depending, among other factors, on its ratio of distribution between two phases. If their distribution ratios are sufficiently different, components of a mixture will migrate at different rates and produce a characteristic pattern (chromatogram). **ASTM E1422**

circularity—ratio of a single ink dot height divided by its width with 1.0 being a perfect circle. **ASTM E2389**

class—a group, set, or kind marked by common attributes or a common attribute. **ASTM E1732**

class characteristic(s)—the attribute(s) that establish membership in a class. **ASTM E1732**

classification—the systematic arrangement of persons or objects into categories (groups or classes) based on shared traits or characteristics. **ASTM E1732**

coalescence—puddling or pooling of adjacent ink drops on the substrate before they can be dried or absorbed resulting in non-uniformity of color density. **ASTM E2389**

cockle—*of paper*, a defective, puckered condition of a paper sheet as a result of non-uniform hygro-expansion which can be related to any non-uniformity in the sheet, including mass distribution and drying stresses. **ASTM E2389**

coincidental peripheral printing—printing resulting from an impression of unintended printing areas, often on the periphery, of a stamp. This may be due to the manufacturing process or the stamping technique. **ASTM E2289**

color-shifting ink—an ink that reflects various wavelengths of white light differently, depending on the angle of incidence to the surface. **SWGDOC (Counterfeit Guide Draft)**

comparable—pertaining to handwritten items that contain the same type(s) of writing and similar characters, words, and combinations. Contemporaneousness and writing instruments may also be factors. **ASTM E2290**

competency test—the evaluation of a person's ability to perform work in any functional area prior to the performance of independent case work. **ASCLD/LAB-*International* Supplemental**

competent—possessing the requisite knowledge, skills and abilities to perform a job. **ASCLD/LAB-*International* Supplemental**

compression—the process of reducing the size of a data file; also see lossless compression and lossy compression. **ASTM E2765**

computer systems—a complete, working computer to include any software and peripheral devices. **ASCLD/LAB-*International* Supplemental**

connecting stroke—a line joining two adjacent characters. **ASTM E2195**

continuous spray—ink jet technology where drops are generated at a regular unbroken rate. Images are then generated by deflections of the ink droplets after they are charged so they are either intercepted by a catcher and not permitted to impact the substrate or deflected to intercept the substrate at specific locations. **ASTM E2389**

control—material of established origin that is used to evaluate the performance of a test or comparison. **ASTM E1732**

control (control sample)—a test performed in parallel with experimental samples and designed to demonstrate that a procedure worked correctly; a standard of comparison for verifying or checking the finding of an experiment. **ASCLD/LAB-*International* Supplemental**

conventional printing—a group of processes that utilize printing plates and fall into four categories including planographic, relief, intaglio, and screen printing methods. **ASTM (Printing Process Draft)**

copy—an accurate reproduction of information. **ASTM E2765**

corona—device used to place a uniform electrical charge on the surface of a xerographic photoreceptor. **ASTM E2390**

correctable ribbon—a ribbon that produces an image that is designed to be completely removed from the substrate by means of lift-off. **ASTM E2494**

correction media—ribbons, tapes, and sheets designed to be struck by the typeface to cover-up or lift-off typed text. **ASTM E2494**

could not be identify to nor eliminate from— the evidence contained in the handwriting has minimal significant similarities or significant differences and there are limiting factors. This is the zero point of the confidence scale, and the examiner does not have a leaning one way or another.

counter—the area within a bowl. There is a difference between a *closed counter,* such as the completely enclosed area within the letter *o* and an *open counter,* such as the partially enclosed area of the *u* or *z*. **SWGDOC (Typewritten Text Classification Draft)**

counterfeit document—a document that purports to be genuine but is not, because it has been falsely made or manufactured in its entirety. **SWGDOC (Counterfeit Guide Draft)**

cover-up—the obliteration of one or more images by means of an opaque material similar in color to the substrate. **ASTM E2494**

cover-up correction—see **overprint correction**. **ASTM E2287**

cracking—condition in which ink that has been absorbed into a substrate causes the coating to shrink to a state much smaller than the original coating dimension causing fractures in the image area. **ASTM E2389**

crime/forensic laboratory—a laboratory (with at least one full-time scientist) which examines physical evidence in criminal matters and provides opinion testimony with respect to such physical evidence in a court of law. **ASCLD/LAB-*International* Supplemental**

crime scene—an area, object or person, external to a laboratory facility, from which evidence is identified, documented, collected, and/or interpreted. **ASCLD/LAB-*International* Supplemental**

cross stroke—a stroke that crosses another portion of the character and is not attached at either end. **ASTM E2195**

crossbar—a stroke that intersects other portions of the character at both ends. (cf. arm and cross stroke). **ASTM E2195**

crystallization—condition in which ink evaporates and forms crystals. **ASTM E2389**

cursive—a type of writing in which the letters are joined and the writing instrument is not lifted after most strokes. **ASTM E2195**

daisy wheel element (print wheel)—an element used in a typewriter in which the fully formed characters are contained on the ends of finger-like projections radiating out from the center of a disk. **ASTM E2494**

data—information in analog or digital form that can be transmitted, stored, or acted upon. **ASTM E2765**

descender—a stroke that extends below the baseline of the body of the letter formation. **ASTM E2195**

dichroic filter—a filter with two transmission bands. These bands are usually widely separated, and can be of significantly different size. **ASTM E1422**

dielectric printing process—nonimpact printing technique in which specially treated paper consisting of a conductive base layer coated with a nonconductive thermoplastic material is used to hold an electric charge usually applied directly by a set of electrode styli. The electric charge corresponds to the latent image of the original. Following the charging step, the paper is imaged by a toner system similar to that of electrostatic copying devices. This technique is sometimes called electrographic, and is currently used on general purpose non impact printers, plotting and facsimile devices. **ASTM E2390**

digital image—an image that is represented by discrete numerical values organized in a two-dimensional array; when viewed on a monitor, projected image or printed on paper, it appears similar to a photograph. **ASTM E2765**

digital image processing—any activity that transforms a digital image. **ASTM E2331**

direct contact—two sheets of paper, one on top of the other, with no intervening sheets. **ASTM E2291**

discipline—a major area of casework for which a laboratory may seek accreditation. **ASCLD/LAB-*International* Supplemental**

distorted writing—writing that does not appear to be, but may be natural. This appearance can be due to either voluntary factors (e.g., disguise, simulation) or involuntary factors (e.g., physical condition of the writer, writing conditions). **ASTM E2290**

document—any surface on which there are signs, symbols, or markings, that may or may not be readily visible, and convey a meaning to someone.

drag stroke—a stroke resulting from incomplete lifting of the pen. **ASTM E2195**

drop on demand (DOD)—ink jet technology where drops are generated as needed to create an image. **ASTM E2389**

dry seal—a non-inked mechanical device which embosses a design on paper. **ASTM E2286**

dry toner—material in a dry developer system which when deposited on a substrate by the field of an electrostatic charge pattern, becomes the visible record. **ASTM E2390**

dual-component development—mixture of dry toner and iron oxide developer that is used for developing electrostatic images in copiers. **ASTM E2390**

electric typewriter—a typewriter in which an electromechanical device causes the type element to be activated when the keys are struck. **ASTM E2494**

electronic typewriter—an electric typewriter in which the keyboard input is received by an electronic processor built into the typewriter. This unit then controls the print head and other features to produce the typing action. **ASTM E2494**

electrophotographic printer—nonimpact printing technique that is similar to the technology used in a typical office copier, which forms a copy by attracting toner particles to a static charge on the surface of a photoconductor, then transferring the toner image to the surface of a sheet of paper. In the normal office copier, the charged image (latent image) of the original document is formed on the photoconductor simply through exposure of the photoconductor to reflected light from the document. In an electrophotographic printer, the image is formed by a light source (laser, LED, LCS, laser diode, or other controlled light source) that erases or discharges a static image charge on the photoconductor according to information being supplied through the input data stream. Each bit of data can be related to a character shape in the memory of the printing system, and in most cases, characters are formed by a dot matrix method similar in concept to that of the matrix printer. Paper can be sheet or roll-fed or continuous form. **ASTM E2390**

electrostatic detection device (EDD)—an instrument used to visualize paper fiber disturbances (e.g., indentations, erasures, typewritten material/lift off). **ASTM E2291** and **ASTM E2331**

element—the interchangeable typeface carrier of a single element typewriter. See **ball element, daisy wheel element, thimble element**. **ASTM E2494**

elimination—the evidence contained in the handwriting has significant differences between the questioned and known writings, therefore the writings do not have common authorship.

embossment variation—non-uniformity of the dry seal impression on the paper stock. It can be caused by the manner of application or by defects in the dry seal. **ASTM E2286**

environmental conditions—any characteristic of a laboratory facility that could reasonably be expected to impact the quality of the laboratory's work product (e.g., lighting, heating, air conditioning, ventilation, plumbing, wiring, adequacy of exhaust hoods/bi-safety cabinets, etc.). **ASCLD/LAB-*International* Supplemental**

erasure—the area where material has been removed from a document by chemical, abrasive, or other means. **ASTM E2331**

evidence—equivalent to "test item" as described in ISO/IEC 17025/Section 5.8. **ASCLD/LAB-*International* Supplemental**

examination—equivalent to a "test" as described in ISO/IEC 17025/Section 5.4. **ASCLD/LAB-*International* Supplemental**

examination documentation (also see ***notes***)—includes reference to procedures followed, test conducted, standards and controls used, diagram, printouts, audioradiograms, photographs, observations and results of examinations. **ASCLD/LAB-*International* Supplemental**

exemplar—a specimen of physical evidence of known origin. **ASTM E1732** (e.g., known handwriting of an individual, normally from the individual and written at the direction of an investigator)

external proficiency test—a test provided by a source external to the laboratory. **ASCLD/LAB-*International* Supplemental**

fabric ribbon—an inked ribbon wherein the substrate is a woven cloth material, such as nylon, cotton, silk, etc. **ASTM E2494**

facsimile devices-*a machine that is capable of sending and receiving printed pages or images over telephone lines by converting them to and from electronic signals.*

family (of type)—a class of type designs sharing basic qualities of style and artistic expression that differentiate it from other similar designs. **ASTM E2494**

feathering—the migration of ink along paper fibers; ink spread over substrate causing fuzzy edges, spidery lines and poor print quality. **ASTM E2389**

fictitious instrument—a document that purports to have been issued by an authority which does not issue a document of that particular type, or that authority does not itself exist, and therefore no genuine counterpart exists. **SWGDOC (Counterfeit Guide Draft)**

financial document—an obligation, security, or other representative of value made or issued by or under the authority of a governmental or private organization. **SWGDOC (Counterfeit Guide Draft)**

fixed pitch—describes a character set in which all character cells are of equal width. (See **proportional spacing**.) **ASTM E2494** and **SWGDOC (Typewritten Text Classification Draft)**

fixing film—clear plastic sheet with a pressure sensitive adhesive layer used to preserve developed indentations when applied to the imaging film. **ASTM E2291**

flashing—excess material from the molding process. **ASTM E2494**

flexography—a form of relief printing like letterpress, but using a flexible rubber or resilient photopolymer relief plate(s). **ASTM (Printing Process Draft)**

fluorescence—a process by which radiant flux of certain wavelengths is absorbed and reradiated non-thermally at other, usually longer, wavelengths. **ASTM E1422**, **ASTM E2325** and **ASTM E2331**

forged document—see altered document. **SWGDOC (Counterfeit Guide Draft)**

fracture pattern—the spatial arrangement of each complementary edge formation created when a single object is separated into two or more fragments. **ASTM E2287**

fugitive ink—an ink that will run and/or stain when it comes in contact with water or any aqueous type of solution. **SWGDOC (Counterfeit Guide Draft)**

full-color copiers (ink jet)—*of ink jet technology*, copiers that can reproduce color originals containing gradations of color. They have a minimum of three colored inks (cyan, magenta and yellow). **ASTM E2389**

full-color copiers (toner)—copiers that can reproduce color originals containing gradations of color. Full-color copiers may have up to four individual color developing units containing four different color toners. These colors are frequently cyan, magenta, yellow, and black. The original is scanned by means of an analog system using a series of color filters or by means of a digital scanning process. The full-color copier may require up to four scans to read the original. The copier individually applies one or more color toners to a transfer drum/belt or photoconductor, or both, which is in turn deposited on the paper. **ASTM E2390**

fuser roll—heated roller that contacts the paper and toner directly and is part of the fuser unit. **ASTM E2390**

gel pen ink—writing or marking media intended for use in a “gel-type” roller pen. Gel pen inks constitute a unique class of non-ballpoint pen inks. Typically, gel pen ink is an aqueous ink of high viscosity, capable of maintaining a stable dispersed or dissolved state of the coloring material even after a prolonged period and exhibiting high fluidity under a shearing force. The ink contains a coloring material (pigment or dyes), acid-modified heteropolysaccharide and aqueous medium (water and water-soluble organic solvent), in which water constitutes at least 50 % by weight. Due to the incorporation of pigments into these formulations, the procedures outlined in this guide for TLC evaluations will be of limited value. **ASTM E1422**

genuine document—a document actually produced by the appropriate source. **SWGDOC (Counterfeit Guide Draft)**

glitch—print defect that displaces the laser scan line so that it appears to start and stop late. **ASTM E2390**

Gradient®—a device with a milled aluminum plate, a Delrin® slider with a knarled adjustment screw which houses a brass cylinder with a ballpoint pen tip which allows for the drawing of a line with consistent pressure on a reference.

gravure—an intaglio printing process in which the image area of the printing plate consists of cells or wells rather than recessed lines. **ASTM (Printing Process Draft)**

gripper bar—metal bars used in delivery systems to grasp individual sheets, directing them through the system in a toner device. **ASTM E2390**

guided signature—a signature executed by a writer while a writer's hand arm, or writing instrument is influenced or controlled by another. **ASTM E2195**

half-tone—process in which a series of dots of variable diameter and (regular) interdot spacing is used to print photographs and full drawings. **ASTM (Printing Process Draft)**

hand printing—a style of writing in which the letters are not joined and the writing instrument is lifted after most strokes. **ASTM E2195**

handwritten item—an item bearing something written by hand (e.g., cursive writing, hand printing, signatures). As used in this procedure "handwriting" and "handwritten" are generic terms. Writing is generally, but not invariably, produced using the hand, and may be the result of some other form of direct manipulation of a writing or marking instrument by an individual. **ASTM E2290**

hesitation—a pause in the writing without the instrument being lifted. **ASTM E2195**

highly probable—the evidence contained in the handwriting is very persuasive, yet some critical feature or quality is missing so that an identification is not in order. However, the examiner is virtually certain that the questioned and known writings were written by the same individual.

highly probable not— the evidence contained in the handwriting is very persuasive, yet some critical feature or quality is missing so that an elimination is not in order. However, the examiner is virtually certain that the questioned and known writings were not written by the same individual.

identification—the evidence contained in the handwriting is in agreement in the individualizing characteristics and there are no significant, inexplicable differences between the questioned and known writings, therefore the writings have common authorship.

identification document—a document made or issued by or under the authority of a governmental or private organization which, when completed with information concerning a particular individual, is of a type intended or commonly accepted for the purpose of identification of individuals. **SWGDOC (Counterfeit Guide Draft)**

image—optical counterpart of an object produced by means of an image producing device; a visually observable counterpart of an object produced by means of image technology; to produce a digital or analog observable counterpart of an object by means of imaging technology. **ASTM E2389**, **ASTM E2390** and **ASTM E2765**

image area (ink jet)—area on a page occupied by all the printed information. **ASTM E2389**

image area (toner)—that portion of the page that is printed, including the space between letters and lines. (See *percent coverage* and *maximum image area*.) **ASTM E2390**

image averaging—the process of averaging similar images, such as sequential video frames, to reduce noise in stationary scenes. **ASTM E2765**

image density—contrast between image and background as measured by densitometer. **ASTM E2389** and **ASTM E2390**

imaging drum—photoreceptive drum coated with a charge-sensitive material used in the image transfer systems of toner devices. **ASTM E2390**

image edge—the margin between the printing and non-printing areas of an image. **ASTM (Printing Process Draft)**

image enhancement—any process intended to improve the visual appearance of an image or specific features within an image. **ASTM E2765**

imaging film—thin transparent plastic material that covers the document during an examination using an EDD upon which surface the latent indentation becomes visible. **ASTM E2291**

image formation—the elements that comprise an image to include, but not limited, to continuous inked areas, halftone patterns, and dot characteristics. **ASTM (Printing Process Draft)**

image output—the means by which an image is presented for examination or observation. **ASTM E2765**

image processing—any activity that transforms an input image into an output image. **ASTM E2765**

image processing log—a record of the steps used in the processing of an image. **ASTM E2765**

imaging technology—any system (or method) used to capture, store, process, analyze, transmit, or produce an image; such systems include film, electronic sensors, camera, video devices, scanners, printers, computers, etc. **ASTM E2765**

impact printer—a printer in which printing is the result of mechanical impacts. **ASTM E2287** and **ASTM E2494**

impression (checkwriters)—an image formed by pressure on the document. **ASTM E2285**

impression (dry seals & paper fiber)—an image formed by pressure. **ASTM E2286** and **ASTM E2287**

impression defect—a deviation from the intended evenness in appearance of a character over the entire impression of the character or relative to the impression of another character. *See* **off-foot**. **ASTM E2494**

impression format—the manner in which the paper is embossed or shredded. **ASTM E2285**

indentations—latent or visible impressions in paper or other media. **ASTM E2195** and **ASTM E2291**

indications—the evidence contained in the handwriting has a few features which are of significance for handwriting comparison purposes. However, there are some similarities between the questioned and known writings, but the evidence is far from conclusive.

indications not— the evidence contained in the handwriting has few features which are of significance for handwriting comparison purposes. However, there are some dissimilarities between the questioned and known writings, but the evidence is far from conclusive.

indirect contact—two sheets of paper, one on top of the other, with one or more intervening sheets. **ASTM E2291**

individual characteristic database sample—a specimen of known origin from which individual characteristic information originates (e.g., Interpol typewriter files). **ASCLD/LAB-*International* Supplemental**

individual prefix—a prefix especially designed for a particular customer. **ASTM E2285**

individualizing characteristic(s)—marks or properties that serve to uniquely characterize writing. Both class characteristics (marks or properties that associate individuals as members of a group) and individual characteristics (marks or properties that differentiate the individual members in a group) are individualizing characteristics. **ASTM E2195**, **ASTM E2290** and **ASTM E2494**

infrared (IR)—referring to radiant flux having wavelengths longer than the wavelengths of light, usually wavelengths from about 760 nm to about 3 mm. **ASTM E1422, ASTM E2325** and **ASTM E2331**

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. **ASTM E1422, ASTM E2325** and **ASTM E2331**

ink formula—a precise recipe or set of ingredients and their quantities that the manufacturer specifies for the final ink product. These ingredients are colorants (dyes and pigments) and vehicle components (volatile solvents, resins, etc.). **ASTM E1422**

ink jet printer—nonimpact printer in which the characters are formed by projecting droplets of ink onto a substrate. **ASTM E2389**

ink library—an organized collection of reference samples of inks and related materials. **ASTM E1789**

inked ribbon—a ribbon composed of a supporting substrate of film, fabric, or paper and a coating or impregnation of a coloring material. The coloring material is of such nature that it will transfer in part or entirely to a copy sheet at the point of pressure contact. **ASTM E2494**

intaglio printing—a method of printing in which the image areas are below the non-image areas of the printing plate. **ASTM (Printing Process Draft)**

intermediate storage—any media or device on which data is temporarily stored for transfer to permanent or archival storage. **ASTM E2765**

interpolation—a method of image processing whereby one pixel, block, or frame is created, used or stored, based on the differences between the previous and subsequent pixel, block, or frame of information. This is often done to increase the apparent clarity of an image. **ASTM E2765**

item—an object or quantity of material on which a set of observations can be made. **ASTM E2290**

known—of established origin associated with the matter under investigation. **ASTM E1732** and **ASTM E2290**

laboratory director—the highest ranking manager in an individual laboratory. **ASCLD/LAB-*International* Supplemental**

landscape mode—printer output orientation in which printed lines run parallel to the direction of movement of the paper. **ASTM E2389** and **ASTM E2390**

laser printer—nonimpact printer that uses a laser light source driven by digital signals to create images on a photoconductor. (See *electrophotographic printer*.) **ASTM E2390**

layering—deposits such as graphite, wax, or carbon that do not saturate the writing surface (e.g., crayons, pencils).

letterpress—a relief method of printing that can print from cast metal type, molded duplicate plates, or photo polymer plates on which the image or printing areas are raised above the non-printing areas. **ASTM (Printing Process Draft)**

lift—the product of an EDD examination; a self adhesive plastic sheet adhering to a film that preserves the results of an EDD examination. **ASTM E2291**

lift-off correction—the removal of a typed character by re-striking with the same character while interposing an adhesive coated tape or sheet, thereby causing the imprinted character to adhere to the coating and be stripped from the record-medium. **ASTM E2287**

lift-off—the removal of one or more images of copy from the substrate by transferring to an intermediate member. **ASTM E2494**

light—electromagnetic radiant energy that is visually detectable by the normal human observer, radiant energy having wavelengths from about 380 nm to about 780 nm. **ASTM E1422**

line pairs per millimeter *(LP/mm)* —a measurement of the spatial resolution of an image conversion device. **ASTM E2765**

line quality—the sum total of the attributes of the writing movement (e.g., speed, pressure, and skill). **ASTM E2195**

line spacing—the distance between successive lines of text, usually measured from baseline to baseline, and usually expressed in millimeters or as lines per inch for typewritten text. (Synonym for **vertical escapement**.) **ASTM E2494**

liquid ink jet device—device in which the ink supply is in fluid (e.g., solvent or aqueous) form. **ASTM E2389**

liquid toner—toner material composed of carbon particles or colorants suspended in a liquid carrier. **ASTM E2390**

lithography—the process of printing from a plane surface on which the image to be printed is ink receptive and water repellent and the non-image area is ink repellent and water receptive. **ASTM (Printing Process Draft)**

loop—a formation that curves and crosses itself. **ASTM E2195**

lossless compression—compression in which no data is lost and all data can be retrieved in its original form. **ASTM E2765**

lossy compression—compression in which data is lost and cannot be retrieved in its original form. **ASTM E2765**

luminescence—the emission of radiant energy during a transition from an excited electronic state of an atom, molecule or ion to a lower electronic state. **ASTM E1422** and **ASTM E2325**

management system—the organizational structure, responsibilities, procedures, processes and resources for implementing quality management; includes all activities which contribute to quality, directly or indirectly. **ASCLD/LAB-*International* Supplemental**

manager—a person with the responsibility for directing and controlling an organizational unit or program. **ASCLD/LAB-*International* Supplemental**

manual typewriter—a typewriter whose operation depends solely upon the mechanical action powered by the operator. **ASTM E2494**

manuscript—see ***hand printing*****. ASTM E2195**

maximum image area—portion on a page that can be printed. (See *percentage coverage* and *image area*.) **ASTM E2390**

maximum print position—rightmost point at which the printer can mark the paper. **ASTM E2389** and **ASTM E2390**

media—objects upon which electronic data can be stored. **ASCLD/LAB-*International* Supplemental**

metadata—data, frequently embedded within a file, that describes a file or directory, and which can include the locations where the content is stored, dates and times, application specific information, and permissions. **ASTM E2765**

metamers—specimens differing in spectral reflectance but having colors that match in light of one spectral composition, when viewed by one observer, but may not match in light of other spectral compositions, or when viewed by another observer. **ASTM E1422**

method—the course of action or technique followed in conducting a specific analysis or comparison leading to an analytical result. **ASCLD/LAB-*International* Supplemental**

model signature—a signature that is used as a prototype for a simulation or copy, by manual electronic or other means.

monocomponent development—single component dry toner used for developing electrostatic images in copiers. **ASTM E2390**

mono-spacing—see **fixed pitch**. **ASTM E2494**

motion (as related to typebar typewriters)—the distance traveled by the mechanism for case shifting (usually by the typebar segment or the carriage) and the corresponding separation of the characters on the type slug. **ASTM E2494**

motion defect (as related to typebar typewriters)—a deviation from the intended evenness in appearance of the baseline alignment of un-shifted characters relative to shifted characters. **ASTM E2494**

mottling—non-uniformity of image density which follows patterns in the substrate or by non-uniform ink substrate interaction. **ASTM E2389**

multi-strike film ribbon—a ribbon wherein the substrate film such as polyester is coated or impregnated with an ink which allows several different imprints to be made from multiple overstrikes on the same location on the ribbon, and still result in full characters being printed. **ASTM E2287** and **ASTM E2494**

native file format—the original form of a file; a file created with one application can often be read by others, but a file's native format remains the format it was given by the application that created it. **ASTM E2765**

natural writing—any specimen of writing executed without an attempt to control or alter its usual quality of execution. **ASTM E2290**

nib markings—twin, parallel tracks characteristic of a split nib writing instrument.

no conclusion— the evidence contained in the handwriting possesses significant limiting factors that hinder analysis.

noise—variations and disturbances in brightness or color information in an image that do not arise from the scene; sources of noise include film grain, electronic variations in the input device sensor and circuitry, and stray electromagnetic fields in the signal pathway; it frequently refers to visible artifacts in an image. **ASTM E2765**

non-ballpoint pen ink—writing or marking media intended for use in a writing or marking instrument other than a ballpoint pen, including a dip or fountain pen, porous point pen, roller pen, marking instrument, etc. Typically, a thin, low viscosity ink with a water or solvent base. **ASTM E1422**

non-impact printer—printer in which image formation is not the result of mechanical impacts. Examples are thermal printers, electrostatic printers, electrophotographic printers, and inkjet printers. **ASTM E2389**, **ASTM E2390** and **ASTM E2494**

non-recirculating system—fuser oil application system in which none of the fuser oil that has been removed from the reservoir is returned. **ASTM E2390**

notes—(see also ***examination documentation***)—the documentation of procedures, standards, controls and instruments used, observations made, results of tests performed, charts, graphs, photos, and other documents generated which are used to support the analyst's conclusions. **ASCLD/LAB-*International* Supplemental**

objective—a measurable, definable accomplishment which furthers the goals of the organization. **ASCLD/LAB-*International* Supplemental**

off-foot—the lack of desired and optimum uniformity of contact between the typeface and the substrate. While the on-feet adjustment of the typewriter evens the impression of the upper and lower portions of all the characters, this term is also applied to uneven impressions that are heavier or lighter on the sides or corners (usually due to misalignment or distortion of individual typebars). **ASTM E2494**

offset (ink transfer)—unintentional transfer of ink (as from a freshly printed substrate). **ASTM E2389**

offset (printing process)—press design in which an image is transferred from a plate to a rubber blanket that moves the image to the press sheet; offset principle allows plates to be right reading and generally gives a better-quality image than do direct transfers. **ASTM (Printing Process Draft)**

on-feet—the desired and optimum uniformity of contact between the typeface and the substrate. **ASTM E2494**

on-feet adjustment—the positioning and setting of various mechanisms of a typewriter to ensure the even printing of the upper and lower portions of the characters. **ASTM E2494**

opacity—the property of paper that prevents the transmission of light. **ASTM E2325**

original image—an accurate and complete replica of a primary image, irrespective of media; for film and analog video, the primary image is the original image. **ASTM E2765**

original typed text (fracture pattern)—typed text imprinted onto the surface of a record-medium as the result of the impact of a type-face striking directly or through a ribbon. **ASTM E2287**

original typed text (typewriter)—typed text imprinted onto the surface of a substrate as the result of the impact of a typeface. **ASTM E2494**

overprint correction—the removal of a typed character from the text by re-striking with the same character while interposing a tape or sheet coated with an opaque coating material, thereby causing the imprinted character to be covered by the coating. **ASTM E2287**

overtoning—any of the conditions occurring in the developing unit when the toner concentration is too high. **ASTM E2390**

paper fiber impression—the imprint of a paper fiber in the ribbon substrate. **ASTM E2287**

parylene processing—the deposition of a clear polymer coating on a document(s) within a vacuum chamber to strengthen and stabilize the document(s). **ASTM E2710** and **ASTM E2711**

patching—retouching a portion of a written stroke. **ASTM E2195**

payee perforator—an optional device on a checkwriter that perforates or shreds a pattern above the numeric impression region for the purpose of protecting the payee entry from alteration. **ASTM E2285**

pen lift—an interruption in a stroke caused by removing the writing document from the writing surface. **ASTM E2195**

pen position—the relationship between the writing instrument and the writing surface. **ASTM E2195**

pen pressure—the force with which the writing instrument contacts the paper. **ASTM E2195**

percent coverage—ratio of the area actually covered by the ink (or print material) to the area of the page times one hundred. (See *image area* and *maximum image area*.) **ASTM E2390**

perforation—penetration through the document. **ASTM E2285**

photocopier-a machine that makes copies of documents and other visual images.

picker bar—metal bars used in the delivery system to remove individual sheets of paper from the photoconductive drum in a toner device. **ASTM E2390**

piezoelectric—ink jet technology where the electrically stimulated deformation of a crystal causes the expulsion of the droplets from the ink chamber. **ASTM E2389**

pitting—small defects in the surface of the photoreceptor that produce spots or voids on the printout. **ASTM E2390**

pixelation—stair stepped or jagged effect resulting from analog to digital conversion. **ASTM E2389** and **ASTM E2390**

planchettes—small discs randomly distributed within the fibers or on the surface of security paper during the paper manufacturing process. **SWGDOC (Counterfeit Guide Draft)**

planographic printing—a method of printing in which the image and non-image areas of the printing plate are in the same plane. **ASTM (Printing Process Draft)**

platen (checkwriter)—a bar-shaped object that pushes the paper stock against the typeface and provides the pressure necessary to obtain an impression. **ASTM E2285**

platen (ink jet & toner)—flat plate or roller used as a support for printing or copying a document. **ASTM E2389** and **ASTM E2390**

policy—a guiding principle, operating practice or plan of action governing decisions made on behalf of an organization. **ASCLD/LAB-*International* Supplemental**

polyester film encapsulation—a process whereby a document is sealed between two sheets of polyester film to preserve, stabilize, and facilitate handling. **ASTM E2710** and **ASTM E2711**

porous printing—see screen printing. **ASTM (Printing Process Draft)**

portrait mode—printer output orientation in which print lines run perpendicular to the direction of movement of the paper. **ASTM E2389** and **ASTM E2390**

prefix—the portion of the checkwriter impression located immediately to the left of the numeric value. **ASTM E2285**

primary image—refers to the first instance in which an image is recorded onto any media that is a separate, identifiable object (e.g., a digital image recorded on a flash media). **ASTM E2765**

primary indentations—impressions caused by the act of writing or other dynamic actions; also referred to as primary impressions. **ASTM E2291**

printer—output unit that produces durable hardcopy record of data in the form of a sequence of discrete graphic characters belonging to a predetermined character set. **ASTM E2390** and **ASTM E2494**

printing element—the parts of the total checkwriter impression that are not parts of the prefix which may encompass the currency type, decimal points, and commas. **ASTM E2285**

printing medium—a substance used to create an image such as printing ink. **ASTM (Printing Process Draft)**

printing module—those components in the laser printer that together drive the laser scanner, create the image on the page, deliver the page to the stacker. **ASTM E2390**

printer output area—maximum area on the page to which the printer will print. **ASTM E2389** and **ASTM E2390**

printhead—printing device of an ink jet printing system. **ASTM E2389**

probably— the evidence contained in the handwriting points rather strongly toward the questioned and known writings having been written by the same individual. However, it falls short of the “virtually certain” degree of confidence.

probably not— the evidence contained in the handwriting points rather strongly against the questioned and known writings having been written by the same individual. However, it falls short of the “virtually certain” degree of confidence.

procedure—the manner in which an operation is performed; a set of directions for performing an examination or analysis-the actual parameters of the methods employed.
ASCLD/LAB-*International* Supplemental

processed image—any image that has undergone enhancement, restoration, or other operation. **ASTM E2765**

proficiency review committee (PRC)—a committed appointed by the Board of ASCLD/LAB, whose role is to evaluate the performance of accredited laboratories in proficiency tests. **ASCLD/LAB-*International* Supplemental**

proficiency test—a test to evaluate the continuing capability of analysts, technical support personnel and the performance of a laboratory; in open tests, the analysts and technical support personnel are aware that they are being tested; in blind tests, they are not aware. **ASCLD/LAB-*International* Supplemental**

proficiency testing—determination of laboratory testing performance by means of inter-laboratory test comparisons. **ASTM E1732**

proper seal—a seal that prevents loss, cross-transfer or contamination while ensuring that attempted entry into the container is detectable. A compliant seal may include a heat seal, tape seal or lock with the initials of the person creating the seal being placed on the seal or across the seal onto the container when possible. **ASCLD/LAB-*International* Supplemental**

proportional spacing—a system of printing where the character spacing is set in accordance with the character width. See **fixed pitch**. **ASTM E2494** and **SWGDOC (Typewritten Classification Draft)**

proprietary file format—any file format that is unique to a specific manufacturer or product. **ASTM E2765**

quality assurance—all the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfill requirements for quality. **ASTM E1732**

quality assurance—those planned and systematic actions necessary to provide sufficient confidence that a laboratory's product or service will satisfy given requirements for quality. **ASCLD/LAB-*International* Supplemental**

quality audit—systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives. **ASTM E1732**

quality control—internal activities, or activities conducted according to externally established standards, used to monitor the quality of analytical data and to ensure that it satisfies specified criteria. **ASCLD/LAB-*International* Supplemental**

quality management—all activities of the overall management function that determine the quality policy objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system. **ASTM E1732**

quality manager (however titled)—an individual designated by top management who, irrespective of other responsibilities, has the defined authority and obligation to ensure that the

quality requirements of the management system are implemented and maintained. **ASCLD/LAB-*International* Supplemental**

quality manual—a document stating the quality policy, quality system and quality practices of an organization. **ASTM E1732**

questioned—associated with the matter under investigation about which there is some question, including, but not limited to, whether the questioned and known items have a common origin. **ASTM E1732** and **ASTM E2290**

questioned document—a document about which there is an inquiry as to its authenticity, originality, and/or background.

q*uestioned documents (forensic documents)*—examination of printed, typed or written material for the purpose of identifying the source, determining alterations or other means of gaining information about the item or the circumstances surrounding its production. **ASCLD/LAB-*International* Supplemental**

rainbow printing—A printing technique that combines different color inks to produce a subtle transition between colors. **SWGDOC (Counterfeit Guide Draft)**

range of variation—the accumulation of deviations among repetitions of respective handwriting characteristics that are demonstrated in the writing habits of an individual. **ASTM E2290**

raster output scanner—output peripheral, either stand alone or within a printer, that converts computer data into a bit mapped image, which is sent to the host for storage or a printer for output. **ASTM E2389** and **ASTM E2390**

reagent—a substance used because of its chemical or biological activity. **ASCLD/LAB-*International* Supplemental**

rebound—a double impression of a typed character, the second lighter and overlapping the first. **ASTM E2494**

record medium—a piece of material, usually paper, on which an image is recorded. **ASTM E2287**

reference material—a material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. **ASTM E1732**

relief printing—a method of printing in which the image areas are above the non-image areas of the printing plate. **ASTM (Printing Process Draft)**

reproducibility—the closeness of agreement between test results obtained under reproducibility conditions (that is, conditions under which test results are obtained with the same test method on identical material in different laboratories). **ASTM E1732**

resolution—the act, process, or capability of distinguishing between two separate but adjacent parts or stimuli, such as elements of detail in an image, or similar colors. **ASTM E2765**

retrace—a stroke written back over the preceding stroke in the reverse direction. **ASTM E2195**

ribbon shift—the movement of a multi-colored inking ribbon allowing for a change in color to manifest itself in an impressed character. **ASTM E2285**

rubber stamp—any of a wide variety of hand printing devices made of many materials not necessarily rubber. Syn.—hand stamp, cachet wet seal. **ASTM E2289**

sample—a group of items, test results or portions of material, taken from a large collection of items, test results or portions of material, which serves to provide information that may be used as a basis for making a decision concerning the larger collection. **ASTM E1732**

satellite—extraneous or undesirable ink droplets. (See also *spatter*, *spray*) **ASTM E2389**

screen printing—a method of printing in which the image areas are on a fine mesh screen through which ink penetrates and the non-image areas are a stencil over the screen. **ASTM (Printing Process Draft)**

scientist—a person who employs scientific methods in the examination of evidence in a forensic laboratory.

secondary impression(s)—fiber disturbances caused by contact with the embossed side of indentations and not caused by the act of writing. **ASTM E2291**

secure area—a locked space (e.g., cabinet, vault or room) with access restricted to personnel authorized by the laboratory manager. **ASCLD/LAB-*International* Supplemental**

segment—a single device on which is forged or attached a set of numerals or symbols which can be set by the operator in establishing an impression value. On some machines, a different segment is used for each digit. **ASTM E2285**

serif—the short stroke, usually perpendicular but also can be oblique, at the end of the unconnected or finishing stroke of a character; serifs can appear on either side or both sides of the stroke. Serifs that thicken where they join the stem are referred to as *bracketed* serifs, usually resulting in a curve that fills the interior angle at the join; serifs with an unfilled, sharp interior angle are referred to as unbracketed serifs. **SWGDOC (Typewritten Classification Draft)**

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 angle lighting***. **ASTM E2291** and **ASTM E2331**

significant difference—an individualizing characteristic that is structurally divergent between handwritten items, that is outside the range of variation of the writer, and that cannot be reasonably explained. **ASTM E2290**

significant similarity—an individualizing characteristic in common between two or more handwritten items. **ASTM E2290**

single element typewriter—a typewriter that generates text via interchangeable "elements" that each contain a full set of characters. **ASTM E2494**

single-strike film ribbon—an inked ribbon wherein the substrate is a plastic film material such as polyethylene, where each area of the ribbon is capable of producing only one image. **ASTM E2287** and **ASTM E2494**

single-strike paper ribbon—an inked ribbon wherein the substrate is paper, where each area of the ribbon is capable of producing only one image. **ASTM E2494**

slab serif—a non-tapering serif (sides essentially parallel) of line width approaching or equal to the width of the main stem. **SWGDOC (Typewritten Classification Draft)**

slit glass—alternate scanning surface found in some digital photocopiers used in conjunction with an automatic document feeder. **ASTM E2389** and **ASTM E2390**

smart chip—an embedded computer circuit that is either a memory chip or a microprocessor chip found in smart cards. **SWGDOC (Counterfeit Guide Draft)**

smudge—tendency of an image to smear or streak onto an adjacent area when rubbed; involves the re-deposition of abraded material. **ASTM E2389** and **ASTM E2390**

spatter—type of extraneous or undesirable ink droplet originating when a portion of an ink droplet strikes the intended area and is deflected to an unintended area. **ASTM E2389**

spray—type of extraneous or undesirable ink dot near the printed zones which originate from the print head. **ASTM E2389**

spectroscopy—in the most general sense spectroscopy is the study of the absorption or emission of electromagnetic energy by a chemical species as a function of the energy incident upon that species. **ASTM E1422**

source—an object that produces light or other radiant flux. **ASTM E1422**

standard—material of established origin with certified properties. **ASTM E1732** (e.g., known handwriting of an individual, normally collected from course-of business documents acknowledger or reliably attributed to the individual and not written at the direction of an investigator).

standard operating procedure (SOP)—written procedures that describe how to perform certain laboratory activities. **ASTM E1732**

storage media—any object on which data is preserved. **ASTM E2765**

striations—ink voids in some writing lines caused by the ball of the writing instruments, such as ball point pens and gel pens.

sub-discipline—a specific type of analysis within an accredited discipline of forensic science. **ASCLD/LAB-*International* Supplemental**

submersion—the placement of a document(s) into an appropriate liquid to facilitate cleaning, unfolding, or separation of the document(s). **ASTM E2710** and **ASTM E2711**

sufficient quantity—that amount of writing required to assess the writer's range of variation, based on the writing examined. **ASTM E2290**

supervisor—a person directly responsible for overseeing the work in an organizational unit. **ASCLD/LAB-*International* Supplemental**

summing—The alignment and stacking of EDD lifts in order to optimize legibility of indented impressions by an accumulation of images.

technical review—of notes, data and other supporting documents which form the basis for a scientific conclusion. **ASCLD/LAB-*International* Supplemental**

technical support personnel—a person who performs casework related duties within the laboratory at the direction of an analyst. **ASCLD/LAB-*International* Supplemental**

technical visit—travel for the purpose of obtaining information, knowledge, or training, including interaction with or demonstration by pertinent manufacturers, businesses, and laboratories. **ASTM E2388**

test—technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure. **ASTM E1732**

test method—defined technical procedure to determine one or more specified characteristics of a material or product. **ASTM E1732**

thermal imaging transfer ribbon—plastic film or other material, upon which a dye or pigmented coating is applied; imaging results when a thermal printhead transfers the coating onto a suitable substrate or receptor media. **ASTM E2287**

thermal impulse—ink jet technology where the rapid expansion of a bubble in the ink created by localized electrical heating expels the droplets from the ink chamber. **ASTM E2389**

thimble element—an element used in a typewriter in which the fully formed characters are located on the ends of finger-like devices that are similar to a daisy wheel except that the device is formed to produce a cup-like or thimble structure. **ASTM E2494**

thread count—the total number of warp and filling threads in one square inch of fabric. **ASTM E2494**

toner—a dry or liquid process used by photocopiers and other printing processes to place an image from one document onto another.

traceability—the ability to trace the history, application, or location of an item or activity and like items or activities by means of recorded identification. **ASTM E1732**

traditional enhancement techniques—digital image processing techniques that have direct counterparts in traditional photographic darkrooms; they include brightness and contrast adjustments, color balancing, cropping, and dodging and burning. **ASTM E2765**

transmitted light—illumination that passes through a document. **ASTM E2331**

trough—indented furrow resulting from pressure of the writing instrument during the writing act.

type element—see **element**. **ASTM E2494**

type of writing—refers to hand printing, cursive writing, numerals, symbols, or combinations thereof, and signatures. **ASTM E2290**

type slug—the block (usually metal) attached to the end of the typebar that bears the typeface. **ASTM E2494** and **SWGDOC (Typewritten Classification Draft)**

typebar—a bar, mounted on a typewriter, that holds a type slug(s). **ASTM E2494**

typeface—the portion of the element or type slug that projects from the body and contacts the surface of the substrate to form the character. **ASTM E2494**

typeface defect—deviation from the intended appearance of a character due to physical damage to the typeface or its malformation in manufacture. **ASTM E2494**

typestyle—a particular variant of a type design. **ASTM E2494** and **SWGDOC (Typewritten Classification Draft)**

typestyle classification scheme—a hierarchical taxonomic schematic, key, or computer database that can be used to determine the source of a particular typestyle. These schemes are only an aid for searching a typestyle library and are not a substitute for actual reference materials in the typestyle library. **ASTM E2494** and **SWGDOC (Typewritten Classification Draft)**

typestyle library—an organized collection of reference samples of typestyles and related materials. Reference materials can also include information such as typestyle catalogs, treatises relative to typography and the design of typestyles used on typewriters and other printing systems, typewriters, type slugs, type elements, actual strike-ups, and instruction and repair manuals. Available relevant data on each typestyle should be collected and maintained. **ASTM E2494** and **SWGDOC (Typewritten Classification Draft)**

typewriter—a self-contained machine for character-by-character direct writing by means of keyboard operated typefaces. **ASTM E2494**

ultraviolet (UV)—referring to radiant flux having wavelengths shorter than the wavelengths of light, usually wavelengths from about 10 nm to 380 nm. ***Long-wave UV*** usually refers to the spectral range of UV-A, with wavelengths from about 315 nm to 380 nm. ***Short wave UV*** usually refers to the spectral range of UV-C, with wavelengths from about 100 nm to 280 nm. **ASTM E1422** and **ASTM E2325**

validation—confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. **ASTM E1732**

validation—the process of performing a set of experiment which establish the efficacy and reliability of a technique or procedure or modification thereof. **ASCLD/LAB-*International* Supplemental**

variation (checkwriter)—imprecise duplication in multiple impressions from the same machine. **ASTM E2285**

variation (handwriting)—those deviations among repetitions of the same handwriting characteristic(s) that are normally demonstrated in the habits of each writer. **ASTM E2290**

verification—the process of confirming the accuracy of an item to its original. **ASTM E2765**

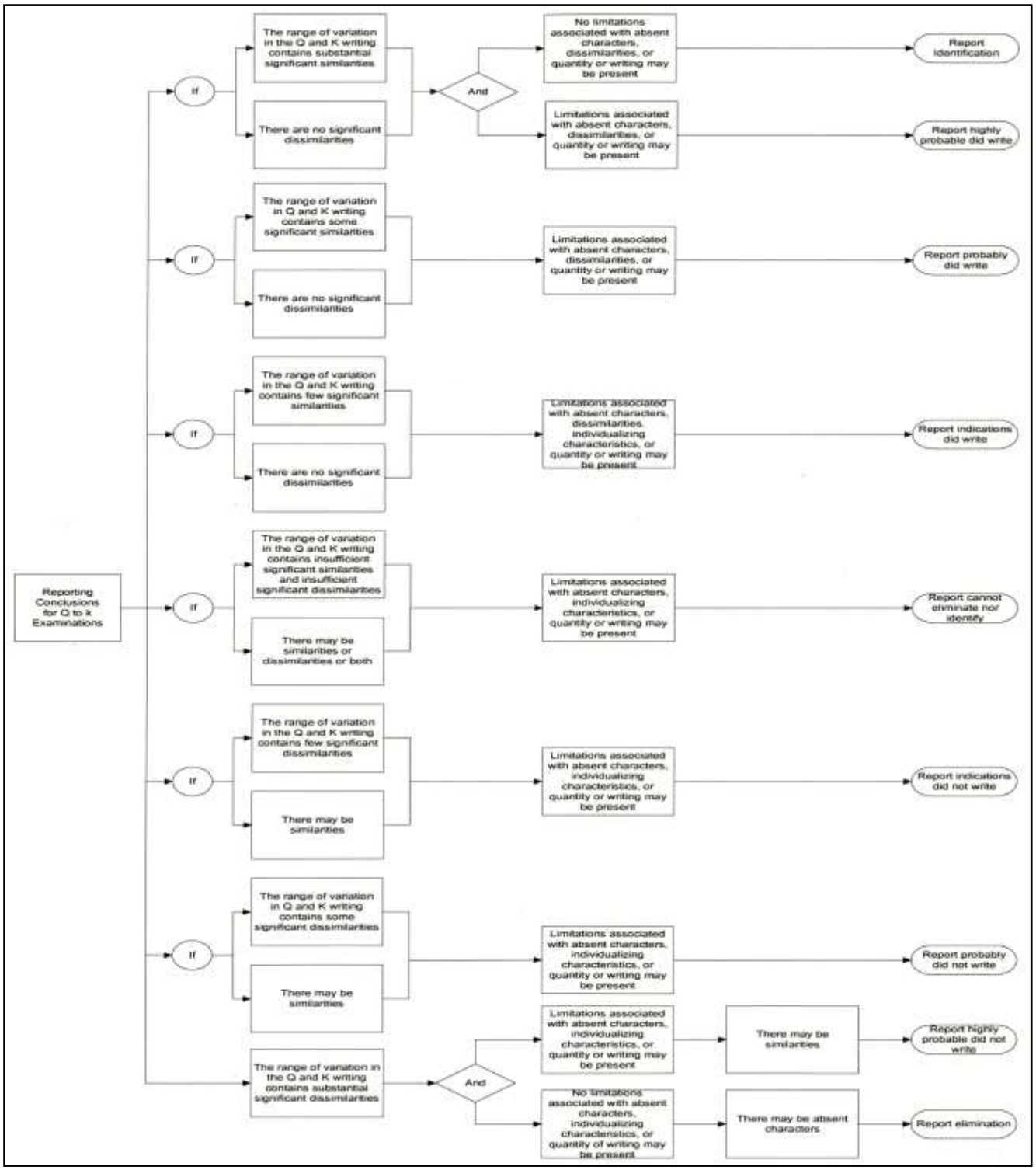
video—the electronic representation of a sequence of images, depicting either stationary or moving scenes; it may include audio. **ASTM E2765**

watermark—a localized modification of the formation and/or opacity of a sheet of paper so that a pattern, design, or word group can be seen in the dry sheet when viewed using side lighting or transmitted light. **ASTM E2325**

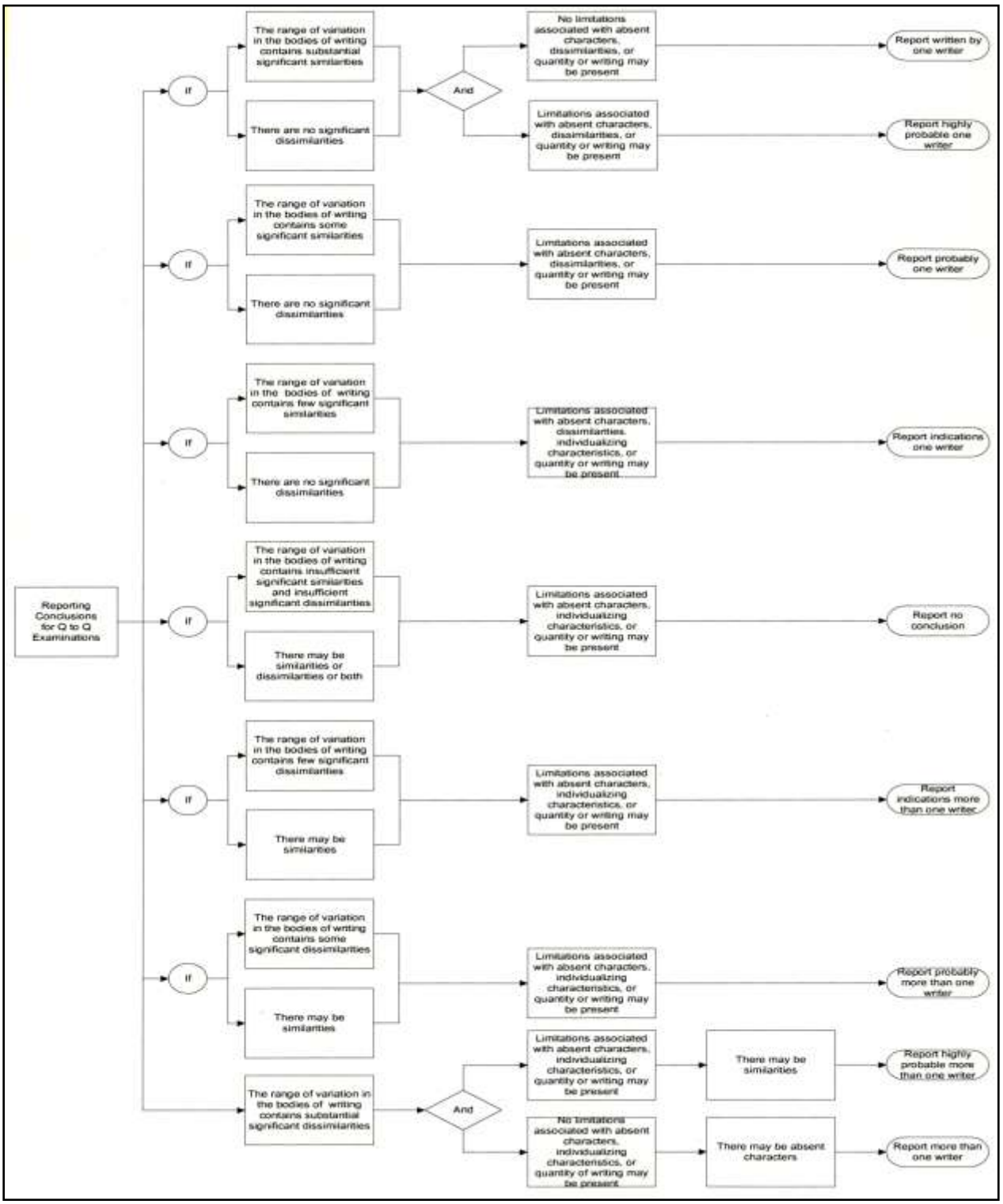
white write—a process in electrostatic printing where the photoconductive element is charged with a charge of the opposite sign as that of the toner. A light beam, acting like a “charge eraser” is used to discharge all areas of the photoconductor that are not to receive toner to form the image. The toner is attracted to the remaining charged areas of the photoconductor when the latent electrostatic image is developed. **ASTM E2390**

working copy—a copy (or duplicate) of a recording, or data, that can be used for subsequent processing or analysis. **ASTM E2765**

APPENDIX 4 FLOW CHART FOR Q TO K HANDWRITING COMPARISONS



APPENDIX 5 FLOW CHART FOR Q TO Q HANDWRITING COMPARISONS



APPENDIX 6
Performance Check Procedures

Performance Check for the Stereomicroscope

The stereomicroscope(s) shall be checked prior to use to ensure that it is functioning properly by observing an item under the microscope and utilizing past experience in determining if the instrument appears to be giving a true and accurate representation.

This check does not need to be documented.

Performance Check for the Digital Imaging System

To ensure proper functioning of the Digital Imaging System, an initial assessment by visual inspection of the images captured should be conducted to ensure that the resulting image(s) accurately represent the item and its fine detail. This check does not need to be documented.

When a problem is noted with a particular piece of the Digital Imaging System, the equipment shall be taken offline and labeled “out of service”. The Unit Supervisor and all users shall be notified.

If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.

Actions taken to repair or correct the problem shall be documented in the Digital Imaging System Maintenance log.

Performance Check for the Electrostatic Detection Device (EDD)

A reference material shall be prepared by cutting a thin strip of paper (e.g., 8 ½ inches X ½ inch), folding it in half, and using at least two different writing instruments to write (at a minimum) the laboratory case number, the date, and identification of the operator on one side of the folded strip. The reference material shall also contain an indented impression of a line created by the Gradient®, located in the room with the EDD.

The reference material should be unfolded, humidified (if conditions warrant), and shall be processed along with the document(s) in the same examination. The reference material shall be handled as little as possible prior to EDD examination to prevent contamination or alteration of the document(s) such as the addition of latent prints, biological materials, and additional indented impressions. The reference material shall become a part of the case notes.

If the indented impressions from the writing and the Gradient® develop clearly, this indicates the EDD is properly functioning. If not, the examiner should attempt to determine the cause and shall take measures to ensure the proper development of the reference. This may include humidifying the reference material, refreshing the beads, or refreshing the toner. If the reference material still fails to develop, evaluate if the EDD and/or aerosol hood require

maintenance or repair. The instrument shall be clearly labeled as being out of service until repaired. A performance check shall be completed and documented after maintenance or prior to placing the instrument back into service.

Performance Check for the Video Spectral Comparator

A performance check of the VSC shall be conducted using the front of the 5 Euro banknote provided by the manufacturer each day of use prior to utilizing the instrument in an examination. The front of the 5 Euro banknote is identified by the blue flag with yellow stars in the upper left corner. Results of the performance check shall be recorded in the case notes.

Saved images shall be used during the performance check for a comparison for consistency to live images in order to determine if the instrument is working properly. The VSC settings used to produce the images below are displayed above each image. These images are saved within the 'Cases' folders on the respective VSCs.

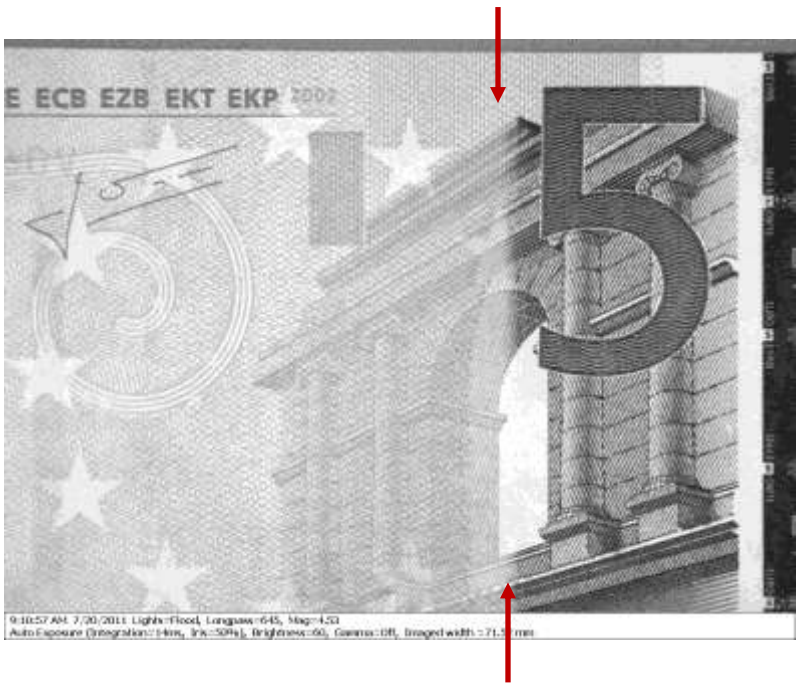
If the live image is not consistent with the saved image for the same VSC settings, the examiner shall attempt to determine the cause and evaluate if the VSC needs maintenance or repair. The VSC needing maintenance or repair shall be clearly labeled as being out of service until working properly. A performance check shall be completed and documented after maintenance or prior to placing the instrument back into service. Results of the maintenance related performance checks shall be recorded in the maintenance log of the respective VSC.

The 5 Euro banknote provided by the manufacturer shall be transported and stored in a protective sleeve. The Euro banknote shall be stored near the VSC. The examiner shall take measures to protect the 5 Euro banknote from loss, contamination or deleterious change during handling and use.

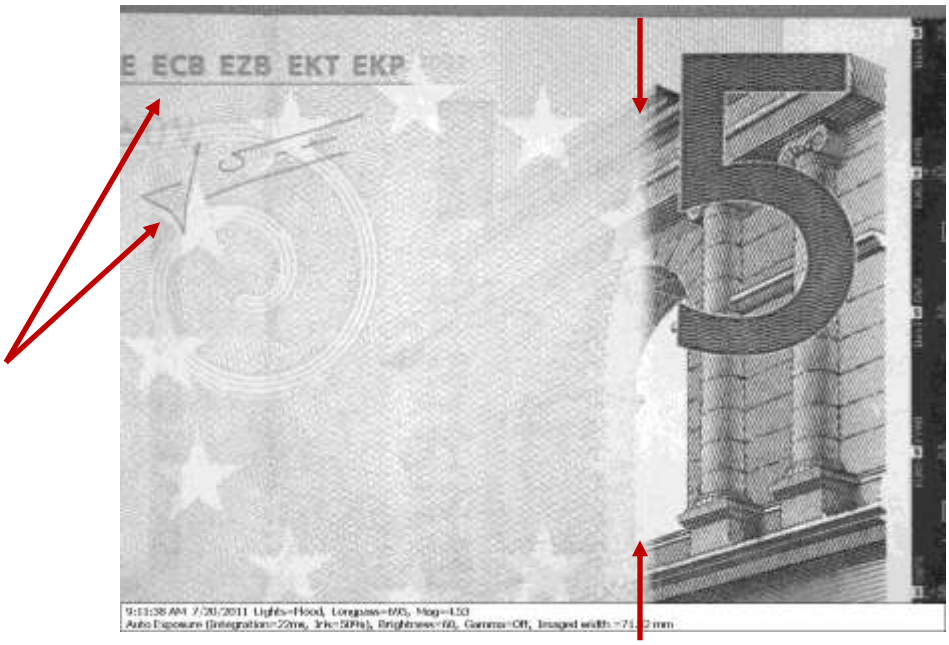
ABSORPTION/REFLECTANCE EXAMINATION:

Viewed with Flood Lighting: Move the banknote and zoom to focus onto the number '5' in upper right corner with building in background.

Viewed with Flood Lighting + 645 nm filter: Two different reactions should appear, divided by a vertical line approximately through the middle of the arch of the building. The right half of the building and the number '5' stay dark while the left half of the building and the background printing begins to fade or become transparent.



Viewed with Flood Lighting + 695 nm: The left of the building and background printing fade more when compared to the image viewed with 645 nm filter while the signature and letter sequence are still visible in dark grey.

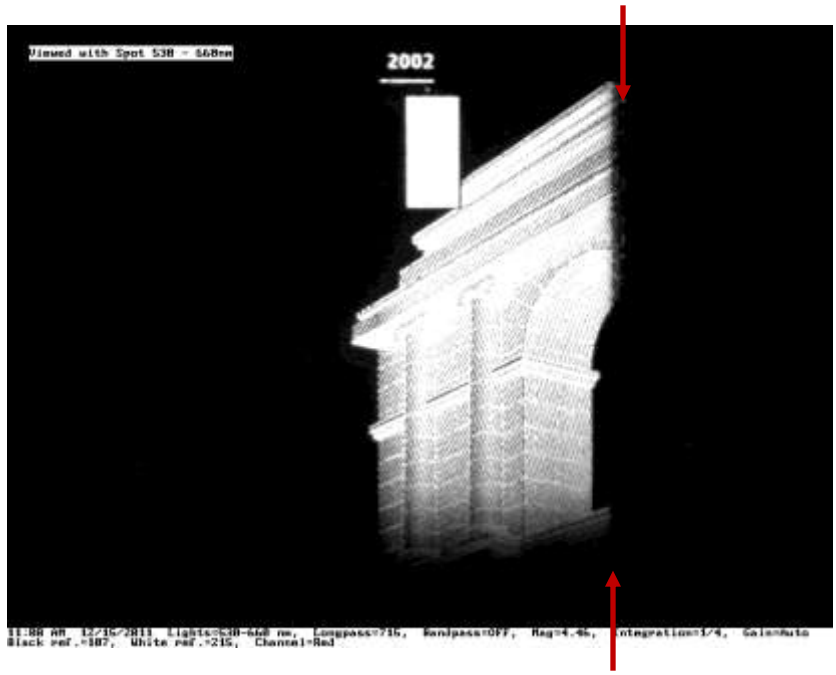


Viewed with Flood Lighting + 830 nm: The left half of the building, background stars, signature and letter sequence all become transparent while the right side stays visible.

SPOT FILTER EXAMINATION

On the VSC 6000, viewed with Spot 485 – 720 nm: The left side of the building luminesces while the remainder of the 5 Euro banknote appears dark.

On the VSC 2000, viewed with Spot 530 - 660 nm: The left side of the building luminesces while the remainder of the 5 Euro banknote appears dark.



BANDPASS FILTER EXAMINATION:

Viewed with Flood Lighting: Move banknote and zoom to focus on the number '5' in lower, left corner.

Viewed with Bandpass Filter set at 704 nm on the VSC 6000 and 705 nm for the VSC 2000: The lower half of the number '5' begins to fade or become transparent.

ULTRAVIOLET LIGHT EXAMINATION:

Viewed with Flood Lighting: Zoom out and focus on left half of the banknote.

Viewed with UV-365 nm (longwave) Lighting on VSC 6000: Fibers and portions of the printing emit luminescence

Viewed with UV (longwave) Lighting on VSC 2000: Fibers and portions of the printing luminesce.

The VSC 2000 does not have shortwave or mid-range UV light sources.

Viewed with UV-312 nm (mid-range) Lighting on VSC 6000: The red stars and dots are more prominent than with UV-365 nm.

Viewed with UV-254 nm (shortwave) Lighting on VSC 6000: The red stars and dots are more prominent than UV-365 nm but the green flag is less bright than UV-312 nm.

APPENDIX 7
Forensic Document Unit (FDU) Maintenance Plan

Performing Maintenance

It is necessary that all instruments/equipment be properly maintained. If at any time any instrumentation or equipment is found to be not working properly it shall be immediately taken out of service and labeled as such. When an instrument is taken out of service, the Unit Supervisor shall be notified.

After any maintenance is performed on instruments/equipment, a performance check shall be conducted. Refer to Appendix 6 for the Performance Check Procedures. Results of the performance checks and information regarding any maintenance performed on instruments/equipment shall be recorded in the maintenance log of the respective instrument/equipment.

The Video Spectral Comparator (VSC)

For specific maintenance instructions, refer to the *Installation and Instruction Manual* for the Foster & Freeman VSC2000/HR and the *Software and Hardware Help Manuals* for the Foster& Freeman VSC6000.

Servicing

Lamps shall be changed as needed or when they exceed the maximum hours of use, as designated within the VSC software. Filters shall be cleaned at least annually. Fuses shall be changed as needed.

All other maintenance of the VSC should be done by a qualified technician, unless otherwise directed by the company.

Care

The VSC shall be protected from damage and contamination. When not in use, the VSC should be stored under its protective cover. The VSC shall be handled with care not subjected to excessive mechanical shock nor dropped.

Cleaning

The VSC shall be cleaned at least annually. Dust and deposits on the external surfaces should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used on the external surfaces.

Water-based solutions should contain only a little liquid soap, detergent, or mild bleach. Alcohol-based cleaning agents may eventually degrade the surface of some types of plastic and should be used sparingly on the VSC. All surfaces shall be dry before resuming use.

Optical surfaces should not be cleaned, except the translight panel. Optical surfaces with dust particles should be wiped off only when necessary and with extreme caution. Refer to the VSC manual for the location of optical surfaces.

The Electrostatic Detection Device

The EDDs used by the FDU is the Electrostatic Detection Device (ESDA) from Foster & Freeman. For specific maintenance instructions, refer to the *User Manual* for the ESDA.

Servicing

Filters shall be changed when they blacken from debris or captured toner. Fuses shall be changed as needed.

All other maintenance of the ESDA shall be done by a qualified technician, unless otherwise directed by the manufacturer.

Care

The ESDA (including the platen and the corona) and the humidification chamber shall be protected from damage and contamination. The ESDA (including the platen and the corona) and the humidification chamber shall be handled with care not subjected to excessive mechanical shock nor dropped.

The platen is easily susceptible to damage and extra care should be taken to not mark, dent, or damage the platen. When not in use, a protective cover shall be placed over the platen.

The corona shall be placed on a flat surface.

When not required for use, water should not be stored in the humidification tray of the humidification chamber.

Cleaning

The platen shall not be cleaned with liquids. The removal of dust, glass beads, or toner particles from the platen shall be done with a soft dry cloth or paper towel.

The main unit of the ESDA and the humidification chamber shall be cleaned as needed or annually. Dust and toner deposits on the external surfaces should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used on the main unit of the ESDA and the humidification chamber.

Water-based solutions should contain only a little liquid soap, detergent, or mild bleach.

Alcohol-based cleaning agents may eventually degrade the surface of some types of plastic and should be used sparingly on the ESDA and the humidification chamber. All surfaces shall be dry before resuming use.

The ESDA Aerosol Hood

For specific maintenance instructions, refer to the *User's Guide* for the ESDA aerosol hood.

Servicing

Servicing of the ESDA aerosol hood shall be done by a qualified technician, unless otherwise directed by the manufacturer.

Care

The ESDA aerosol hood shall be protected from damage and contamination. The ESDA aerosol hood shall be handled with care not subjected to excessive mechanical shock nor dropped.

When not in use, the aerosol hood should be stored on a flat surface.

Foster & Freeman materials shall be used with the ESDA aerosol hood.

Cleaning

The ESDA aerosol hood shall be cleaned at least annually. Dust and deposits on the external surfaces should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used.

Water-based solutions should contain only a little liquid soap, detergent, or mild bleach. Alcohol-based cleaning agents may eventually degrade the surface of some types of plastic and should be used sparingly on the ESDA aerosol hood. All surfaces shall be dry before resuming use.

The Fume Hoods

For specific maintenance instructions, refer to the user manuals for the fume hood(s).

Servicing

Filters shall be changed when they blacken from debris or captured toner or the airflow within the fume hood diminishes.

Care

The fume hoods shall be handled with care not subjected to excessive mechanical shock nor dropped. The fume hoods shall be protected from damage and contamination.

When not in use, the fume hoods shall be turned off.

Cleaning

The fume hoods shall be cleaned at least annually. Dust and deposits on the external surfaces should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used. All surfaces shall be dry before resuming use.

The Stereomicroscopes

For specific maintenance instructions, refer to the *User Manual* for the stereomicroscopes.

Service

Stereomicroscopes shall be serviced by a qualified technician at least every three years.

Care

The stereomicroscopes shall be handled with care not subjected to excessive mechanical shock nor dropped. They shall be protected from damage, contamination, chemicals, oil, and grease.

The optical systems and mechanical parts of stereomicroscopes shall not be dismantled unless referencing the *User Manual*.

Cleaning

The external surfaces of stereomicroscopes shall be cleaned when needed. Dust and deposits on the external surfaces of the stereomicroscopes should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used on the external surfaces of the stereomicroscopes. All surfaces shall be dry before resuming use.

The internal surfaces of the stereomicroscopes shall be cleaned by a qualified technician at least three years.

The Digital Imaging System

For specific maintenance instructions, refer to the user manuals of the various components of the Digital Imaging System.

Service

The Digital Imaging System shall be serviced when needed.

Care

The Digital Imaging System shall be handled with care not subjected to excessive mechanical shock nor dropped. It shall be protected from damage, contamination, chemicals, oil, and grease.

Cleaning

The external surfaces of Digital Imaging System shall be cleaned when needed. Dust and deposits on the external surfaces should be removed by using a soft dry cloth or paper towel. When necessary, a soft cloth or paper towel with a mild cleaning solution may be used on the external surfaces. All surfaces shall be dry before resuming use.

APPENDIX 8
Forensic Document Unit (FDU) Reference Collections

The FDU maintains reference collections for identification, comparison, or interpretation purposes in casework. Each collection shall be labeled and stored in a binder or cabinet within the FDU to protect it from loss, contamination, or deleterious change. This may include storage in a room with limited access, protective covers when necessary or in a container/cabinet with adequate room and support for the documents.

When referring to a sample within a particular collection during casework, include a description of the sample (such as name, date, and/or other unique identifier) so that it can be distinguished from all other samples in the collection.

The Robbery Note Reference Collection

The Robbery Note Reference Collection contains images and case information of robbery notes encountered in casework since 2008.

These notes are identified by the case number in which they were submitted to the laboratory and item number. This collection shall be searched when a robbery note is submitted in an attempt to determine if the robbery note shares a common source with any notes in the collection. Images and case information of the submitted robbery note shall be added to the existing collection.

The Robbery Note Reference Collection is maintained in a binder in the FDU File Room.

The Authentic Document Reference Collection

The Authentic Document Reference Collection is a collection of sample documents, such as driver's licenses, identification cards, and vehicle titles, obtained from sources such as manufacturers or government entities.

The Authentic Document Reference Collection is maintained in a binder in the FDU File Room.

American Society of Questioned Document Examiners (ASQDE) "Fax Font Project – TTI Database"

The Fax Font Project – TTI Database is a compilation of sample Transmit Terminal Identifier (TTI) headers. TTIs are generated by the transmitting, not the receiving, fax machine. By searching this database, an examiner can attempt to find a possible make and model of a fax machine used to transmit a document.

The FDU currently uses Fax Font Project VI – TTI Database bearing the release date of July 23, 2009, which is maintained on a DVD stored in the FDU File Room.

The ASQDE "HAAS Typewriter Atlas and Catalog"

The Haas Typewriter Atlas and Catalog are used during the classification of typestyles present on typewritten documents.

The Haas Typewriter Atlas contains images of type font specimens, essentially organized by type manufacturer (the Pica Atlas) or by similar (Non Pica Atlas) typestyle (e.g., courier, elite, script, etc.). The Haas Catalog, which does not contain examples, is organized by typewriter model name and includes critical first dates of introduction, OEM and other pertinent information. The Haas Atlas and Catalog are cross referenced resources.

The FDU has the 2004 (06-04) Edition of the ASQDE Haas Typewriter Atlas and Catalog, it is maintained on a DVD, and stored in the FDU File Room when not in use. The FDU also has a paper version of the HAAS Atlas which is maintained in a filing cabinet within the FDU.

The Interpol Typewriter Classification System

The Interpol Typewriter Classification System is used to aid in the identification of the typestyle (make/model) used to generate a typed document or to provide a sample of a genuine typestyle for comparison purposes.

The Interpol Typewriter Classification System is maintained in a filing cabinet within the FDU.