

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Amido Black (Fisher 98)

Section 1

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Graduated cylinders (10 ml - 100 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Dipping trays (appropriate size for item being processed)
- Squirt bottles or spray bottles
- Fume hood (optional)
- Disposable gloves
- Lab coat
- Protective eyewear
- Paper towels
- 5-Sulfosalicylic acid
- Acetic acid
- Formic acid (concentrated)
- Naphthol blue black
- Kodak Photo Flo 600 Solution
- Sodium carbonate
- Distilled water
- Tap water

3 Standards and Controls

3.1 Amido Black Solution

Prepared in a 2 liter beaker on a magnetic stirring device by combining the ingredients in the order that they are listed below:

- 500 mL Distilled water
- 20 grams 5-Sulfosalicylic acid
- 3 grams Naphthol blue black
- 3 grams Sodium carbonate
- 50 mL Formic acid
- 50 mL Acetic acid
- 12.5 mL Kodak Photo Flo 600 Solution

3.2 Dilute the mixture to 1 liter using distilled water. Stir until the Amido Black is dissolved. While this mixture can be used immediately, the best results will be obtained if it is allowed to stand for several days prior to use. The solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a blue black color. A small area of the background of the object or surface being enhanced will be stained with the solution prior to application. If the background develops a significant color, the Amido Black solution may not be appropriate for enhancement of this item.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint room.

The Amido Black solution can be stored in dark bottles indefinitely.

4 Sampling

Not Applicable.

5 Procedure

5.1 The Amido Black solution may be applied by dipping the specimen(s) to be enhanced in a tray filled with the solution or by covering the stained area with a paper towel(s) and using a squirt bottle filled with the solution to saturate the stained area. Completely cover the target area and allow to develop for a minimum of thirty (30) seconds. Three (3) to five (5) minutes are preferred for maximum enhancement. The specimen(s) should be rinsed with tap water and allowed to air dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color and porosity of the background substrate must be tested prior to use of this solution. Amido Black will react with the protein present in blood to produce a blue black color. If the background substrate is similar in color to blue black or if the background substrate stains a blue black color, then it will obscure the chemically enhanced impression.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

FBI - Chemical Formulas and Processing Guide for Developing Latent Prints, Revised 2000

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added, "This document applies to examiners and analysts in the QDU" Deleted "4 Calibration Refer to the <i>QD Quality Assurance Manual, Maintenance, Calibration, and Performance for Equipment Verification</i> and re-numbered appropriately.

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Diaminobenzidine (DAB)

Section 2

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Graduated cylinders (10 ml - 100 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Dipping trays (appropriate size for item being processed)
- Squirt bottles or spray bottles
- Fume hood (optional)
- Disposable gloves
- Lab coat
- Protective eyewear
- Paper towels
- 5-Sulfosalicylic acid
- 3,3'-Diaminobenzidine Tetrahydrochloride (DAB)
- 1 M Phosphate Buffer (pH7.4)
- 30% Hydrogen Peroxide
- Distilled water

3 Standards and Controls

3.1 Fixer (Solution A)

In a 1 or 2 liter beaker on a magnetic stirring device, dissolve 20 grams of 5-Sulfosalicylic acid in 1 liter of distilled water. Solution A can be stored indefinitely in an amber bottle.

3.2 Developing Solution (Solution B)

In a 1 liter beaker on a magnetic stirring device, mix 100 ml of 1 M Phosphate buffer (pH7.4) with 800 ml of distilled water. Solution B can be stored indefinitely in an amber bottle.

3.3 Developing Solution (Solution C)

In a 250 ml beaker on a magnetic stirring device, dissolve 1 gram of DAB in 100 ml of distilled water. Solution C can be stored frozen for up to 6 months in an amber bottle.

3.4 Working Solution (Solution B + Solution C)

In a 2 liter beaker on a magnetic stirring device, mix 900 ml of Solution B with 100 ml of Solution C and add 5 ml of 30% Hydrogen Peroxide. This Working Solution should be mixed just prior to use. The Working Solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a dark brown color.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint examination room.

Distilled water should be used as the rinsing solution.

4 Sampling

Not Applicable.

5 Procedure

5.1 The solutions may be applied by dipping the specimen(s) to be enhanced in a tray filled with the solutions or by covering the stained area with a paper towel(s) and using a squirt bottle filled with the solutions to saturate the towel(s). Completely cover the target area. Remove the saturated paper towel(s) and apply a fresh one at each step in the procedure.

5.2 Immerse or saturate the stained area in Fixer (Solution A) for approximately 4 minutes. Remove and rinse well with distilled water. Immerse or saturate the stained area in the Working Solution (Solution B + Solution C) and allow to develop for approximately three (3) to five (5) minutes. Remove and rinse in distilled water. Allow to air dry.

5.3 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color of the background substrate may limit the use of this reagent. Diaminobenzidine is converted to a dark brown insoluble product in the presence of hydrogen peroxide. If the color of the background substrate is also dark in color, then it will obscure the chemically enhanced impression.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

FBI - Chemical Formulas and Processing Guide for Developing Latent Prints, Revised 2000

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added, "This document applies to examiners and analysts in the QDU" Deleted 4 Calibrations, Refer to the <i>QD Quality Assurance, Manual, Maintenance, Calibration and Performance for Equipment Verification</i> and appropriately re-numbered.

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Age Determination of Documents

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations to determine the approximate age of a document(s) or the approximate age of the entries contained on a specific document(s).

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- Reference materials
- Flatbed scanner or equivalent

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedure

5.1 Visually examine the document and/or its entries using lighting and magnification sufficient to allow fine detail to be distinguished for any physical characteristics that may assist in the determination of a manufacturing date.

5.2 Using transmitted light, analyze the document for watermarks. If no watermark is present, record the results in the case records. If a watermark is present refer to the *QDU Procedures for Conducting a Watermark Search*.

5.3 Using magnification and lighting, determine whether or not impressions are present on the document. If impressions are observed, refer to the *QDU Procedures for Conducting Checkwriter Examinations*, *QDU Procedures for Conducting Stamped Impressions/Dry Seal Examinations*, or *QDU Procedures for Conducting Typewriting Examinations*, as necessary.

5.3.1 If the impressions are typewritten, evaluate the typewritten impressions to establish the following parameters:

- Technology of typewriting (e.g., type bar, printwheel, single element).
- Style of type (e.g., Courier, Prestige).
- Ribbon/correction technology (e.g., type of ribbon, correction method, and/or opaquing fluid).

5.3.2 To determine possible dating parameters and how they relate to the age/purported age of a document in question, review reference materials to establish introduction dates for the items listed in 5.3.1. Refer to the *QDU Procedures for Conducting an Office Equipment File (OEF) Search*.

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5.5 Visually examine the document to determine if writing mediums were utilized. If writing inks, colored pencils, or other writing mediums (e.g., crayon, carbon, carbon paper) were used, refer to the *QDU Procedures for Conducting Writing Medium Examinations*. Use reference materials such as books, journals, and the internet **Redacted** the particular writing medium(s) in question.

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5.6 Visually examine the document to determine if any printing processes were utilized in the preparation of the document. If so, refer to the *QDU Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations*. Determine the specific printing process used and utilize reference materials such as books, journals, the internet, and the Office Equipment File to determine the introduction date of that particular printing technology. Refer to the *QDU Procedures for Conducting an Office Equipment File (OEF) Search*.

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5.7 The case records will include any copies of reference material, image files, printouts, photographs, or drawings/images of identifying and/or eliminating characteristics observed during the examination process that support the findings or conclusions.

5.8 Conclusions

- Whether the age of the document is consistent/not consistent with its purported date.
- A determination could be made as to the earliest date of manufacture.
- No determination could be made as to the earliest date of manufacture, due to limitations. This conclusion requires explanation of the limiting factors and may contain other observations.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- Redacted
- Redacted
- Lack of a sufficient quantity of questioned and/or known items.
- The completeness of information contained in the reference materials such as books, journals, the internet, and the Watermark and Office Equipment Files.
- Lack of features in the item(s) that would assist in age determination.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Standard Operating Procedures Manual

QDU Quality Assurance Manual

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

Gesell, Harold J. E., The Determination of Age of Documents, Conference of the Post Office Department Questioned Document Examiners, Washington, D.C., June 22, 1944. (QDRAC 2836)

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

Kelly, Jan Seaman; Lindblom, Brian S., *Scientific Examination of Questioned Documents, Second Edition*, Taylor & Francis Group, Boca Raton, FL., 2006

Moore, Winsor C., Age Determination of a Document, NSBJ, pp. 118-126. (QDRAC 1531)

Rev. #	Issue Date	History
5	03/01/18	Deleted ChemImage Hyperspectral Imager (HSI) Examiner 100 or comparable equipment and added Flatbed scanner or equivalent under Section 2 “Equipment/Materials/Reagents.” Added grammatical changes throughout the document. Section 5.8 Conclusions added “due to limitations” for the No determination bullet. 10 References added “Kelly, Jan Seaman; et. al <i>Scientific Examination of Questioned Documents, Second Edition</i> as a new reference.
6	09/26/19	Section 5.3.1 bulleted section, deleted “etc.”, added “e.g.” Section 5.7, added “image files” and “/images”. Section 5.8, third bullet, added “and may contain other observations.”

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 09/24/2019

Questioned Documents
Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Leucocrystal Violet (LCV)

Section 3

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Squirt bottles or spray bottles
- Fume hood (optional)
- Disposable gloves
- Lab coat
- Protective eyewear
- Dust/Mist mask
- 5-Sulfosalicylic acid
- 3% Hydrogen Peroxide
- Sodium Acetate
- Leucocrystal Violet
- Tap water

3 Standards and Controls

3.1 Leucocrystal Violet Solution

Prepared in a 1 liter beaker on a magnetic stirring device. Dissolve 10 grams of 5-Sulfosalicylic acid in 500 ml of 3% Hydrogen Peroxide. Add 3.7 grams of Sodium Acetate and 1 gram of Leucocrystal Violet. If the LCV crystals are yellow instead of white, then do not use. This is an indication that the reagent is old and the resulting solution will not be effective. The LCV solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a violet color.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint examination room.

The LCV solution can be stored in dark bottles for up to 30 days.

4 Sampling

Not Applicable.

5 Procedure

5.1 The LCV solution may be applied by spraying the item to be enhanced with an aerosol sprayer or cascading the liquid with a squeeze bottle. The color reaction should occur within 30 seconds. The enhanced impression should be rinsed with tap water after enhancement and allowed to dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color of the background substrate must be tested prior to use of this solution. LCV and hydrogen peroxide will react with blood to produce a violet color. If the background substrate is similar in color to violet, then it will obscure the chemically enhanced impression. If the enhancement occurs outdoors or in intense light, then the impression should be photographed as soon as possible since photo ionization of the dye may occur, creating a violet background. If the background also stains a violet color, then it will obscure the chemically enhanced impression.

9 Safety

- 9.1** Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.
- 9.2** Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.
- 9.3** When processing evidence in the laboratory, a fume hood will be used when the solution is sprayed with an aerosol sprayer. When the solution is being used as a search or enhancement reagent at a crime scene, a dust/mist mask should be worn.
- 9.4** Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.
- 9.5** Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

FBI - Chemical Formulas and Processing Guide for Developing Latent Prints, Revised 2000

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added, "This document applies to examiners and analysts in the QDU" Deleted 4 Calibrations, Refer to the <i>QD Quality Assurance, Manual, Maintenance, Calibration and Performance for Equipment Verification</i> and appropriately re-numbered.

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Patent Blue (Protein Dye)

Section 4

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Dipping trays (appropriate size for item being processed)
- Squirt bottles or spray bottles
- Lab coat
- Protective eyewear
- Disposable gloves
- 5-Sulfosalicylic acid
- Patent Blue Violet
- Distilled water
- Tap water

3 Standards and Controls

3.1 Patent Blue Solution

The Patent Blue solution is prepared in a 2 liter beaker on a magnetic stirring device. Dissolve 20 grams of Sulfosalicylic acid and 2 grams of Patent Blue Violet in 1 liter of distilled water. The Patent Blue solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a deep blue green color. A small area of the background of the object or surface being enhanced will be stained with the solution prior to application. If the background develops a significant color, the Patent Blue solution may not be appropriate for enhancement of this item.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint room.

The Patent Blue solution can be stored in clear or dark bottles indefinitely.

4 Sampling

Not Applicable.

5 Procedure

5.1 The Patent Blue solution may be applied by dipping the specimens to be enhanced in a tray filled with the solution or by using a squirt bottle filled with the solution to saturate the stained area. Completely cover the target area and allow to develop for approximately one minute. The specimen(s) should be rinsed with tap water and allowed to air dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color and porosity of the background substrate must be tested prior to use of this solution. Patent Blue will react with the protein present in blood to produce a deep blue green color. If the background substrate is similar in color to blue green or if the background substrate stains a blue green color, then it will obscure the chemically enhanced impression.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

Keith Barnett, Birmingham, UK - personal communication

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added "This documents applies to examiners and analysts in the QDU" Deleted 4 Calibrations Refer to the <i>QD Quality Assurance Manual, Maintenance, Calibration and Performance for Equipment Verification</i> " and appropriately re-numbered.

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Preserving Charred Documents

1 Scope

These procedures will be used by a forensic document examiner for the preservation of charred documents to facilitate subsequent examinations.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Humidity chamber
- Atomizer
- Deionized or distilled water
- Non-woven polyester sheets
- Blotter sheets large enough to cover the entire document
- Chamber vacuum sealer
- Commercial heat sealable vacuum bags
- Rigid clear polyethylene film
- Picks (e.g., dental) and tweezers and/or tongs
- Bone folder

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the item(s) using lighting and magnification sufficient to allow fine detail to be distinguished to determine the extent of the charring and whether the items are curled and/or brittle.

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5.2.2 If the document(s) has been submerged, dry between two non-woven polyester sheets and blotter paper. Apply an object heavy enough to flatten the document(s), such as a piece of plexiglass.

5.2.3 Once the document(s) is dry, encapsulation of the document(s) may be advisable. Encapsulate the item(s) using polyethylene film and/or heat sealable vacuum bags and the chamber vacuum sealer in accordance with the instructional CD, *Preservation of Charred Documents Using a Vacuum Sealer*.

5.3 If the document(s) is brittle Redacted support the charred debris between two pieces of rigid polyethylene film. Place the document(s) into a heat sealable vacuum bag. Place the bag inside the chamber vacuum sealer and seal in accordance with the instructional CD, *Preservation of Charred Documents Using a Vacuum Sealer*.

5.3.1 In lieu of vacuum sealing, glass slides may be used to encapsulate small pieces of charred debris Redacted

5.4 For multi-page documents, attempt to separate the pages using appropriate equipment such as picks, tweezers, and/or tongs.

5.5 Record images of the evidence using a camera, computer scanner, or photocopier with appropriate filters and light sources such as ultra violet or infra-red when necessary. The VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments), HSI (for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument), or comparable equipment may be utilized to recover information.

5.6 The case records will include any printouts, photographs or drawings of the items, pertinent observations, and/or characteristics observed during the preservation/examination process that support the findings or conclusions.

5.7 Conduct the examinations **Redacted** by the contributor, as well as any others that may be probative. Refer to the appropriate QDU procedures for the examination(s) being conducted.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the preservation process, results rendered, and may also inhibit further examinations:

- Poor condition of the items.
- **Redacted**
- Excessive discoloration.
- Destruction of physical characteristics due to excessive heat.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

Doud, Donald, "Charred Documents, Their Handling and Decipherment: A Summary of Available Methods for Treating Burnt Papers," *Journal of Police Science*, 43 (1952-53) pp.812-826.

Klinger, Jane E., Chief Conservator, Conservation Management Collections, United States Holocaust Memorial Museum.

Mokrzycki, Gregg M., *Preservation of Charred Documents Using a Vacuum Sealer*, Presented at Mid-Atlantic Association of Forensic Sciences Meeting, 2001.

Rev. #	Issue Date	History
4	03/03/15	Updated Header to read "QDU Standard Operating Procedures Manual". Section 2 changed "equivalent" to "comparable equipment" and "instrumentation" to "equipment". Added fifth bullet. Deleted Section 4 "Calibration" and renumbered accordingly. Section 5.1 changed "they" to "the items". Added Section 5.3.1. Section 5.5 added "images of" and ", HSI, or comparable equipment,". Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Reformatted bullets throughout document where necessary.
5	03/01/18	2 Equipment/Materials/Reagents, fifth bullet, changed 100 to "200" for HSI 5.5 added, (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)" "(for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument)"

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Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Questioned Documents
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Acid Fuchsin (Protein Dye)

Section 5

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Dipping trays (appropriate size for item being processed)
- Squirt bottles or spray bottles
- Lab coat
- Protective eyewear
- Disposable gloves
- 5-Sulfosalicylic acid
- Acid Fuchsin
- Distilled water
- Tap water

3 Standards and Controls

3.1 Acid Fuchsin Solution

Prepared in a 2 liter beaker on a magnetic stirring device. Dissolve 20 grams of 5-Sulfosalicylic acid and 2 grams of Acid Fuchsin in 1 liter of distilled water. The solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a deep magenta color. A small area of the background of the object or surface being enhanced should be stained with the solution prior to application. If the background develops a significant color, the Acid Fuchsin solution may not be appropriate for enhancement of this item.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint room.

The Acid Fuchsin solution can be stored in clear or dark bottles indefinitely.

4 Sampling

Not Applicable.

5 Procedure

5.1 The Acid Fuchsin solution may be applied by dipping the specimen to be enhanced in a tray filled with the solution or by using a squirt bottle filled with the solution to saturate the stained area. Completely cover the target area and allow to develop for approximately one minute. The specimen(s) should be rinsed with tap water and allowed to air dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color and porosity of the background substrate must be tested prior to use of this solution. Acid Fuchsin will react with the protein present in blood to produce a deep magenta color. If the background substrate is similar in color to deep magenta or if the background substrate stains a deep magenta color, then it will obscure the chemically enhanced impression.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

Keith Barnett, Birmingham, UK - personal communication

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
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1	03/01/18	1 Scope, added “this document applies to examiners and analysts in the QDU” Deleted 4 Calibrations Refer to the <i>QD Quality Assurance Manual, Maintenance, Calibration and Performance for Equipment Verification</i> ” and appropriately re-numbered

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Checkwriter Examinations

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations and comparisons of impressions from traditional mechanical checkwriters for purposes of classification or determination of origin.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Checkwriter standards and reference materials

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Examine original impression(s) using lighting and magnification sufficient to allow fine detail to be distinguished and determine whether the mechanical checkwriter utilizes liquid ink or a ribbon mechanism.

5.1.1 Characteristics of liquid ink mechanical checkwriter impressions include:

- Clear solid inking with well-defined edges when viewed microscopically.
- Excessive ink deposits may be present.
- Possible irregular inking of the impression.

5.1.2 Characteristics of ribbon mechanical checkwriter impressions include:

- Clearly displayed texture of the ribbon on the impression when viewed microscopically.

- Significantly less defined edges to the impression.
- Possible ribbon shift, impression voids, and blemishes.

5.2 Using lighting and magnification sufficient to allow fine detail to be distinguished, examine the prefix, printing element, slugs, payee perforator, and perforations utilized in the production of the checkwriter impression(s). Using photography or drawings to document preliminary notes, **Redacted**

5.3 For checkwriter classification purposes, evaluate the information obtained to determine the manufacturer of the machine/slugs that were used to create the impression(s) by comparing the impression(s) to checkwriter standards and reference materials.

5.4 For comparisons with other impressions (questioned or known) or a known machine, analyze the impression(s) and/or machine components and compare the class characteristics and individual characteristics.

5.4.1 Examples of class characteristics include:

- Impression format
- Printing element characters
- Inking system
- Payee perforator

Redacted

5.5 Evaluate similarities, differences, limitations, and their significance individually and in combination to determine if the impression(s) are of common origin and/or if the questioned impression(s) was made by the known machine.

5.6 Examination records must include any reference information, standards, photographs, printouts, drawings, or identifying characteristics that support your conclusions.

5.7 Conclusions

5.7.1 Conclusions when determining whether a particular checkwriter prepared a questioned document(s):

- **Identification** – A determination that the questioned impression(s) were prepared by a particular checkwriter, due to agreement in individual

characteristics. No differences that would preclude an identification were observed.

- **May Have Prepared** – A less than definitive determination that a particular checkwriter was used to prepare the questioned impression(s). The comparison between the checkwriter and the questioned impression(s) reveals no significant, reproducible, or inexplicable differences. There is significant agreement in all observable aspects of the results; however, limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** – No determination can be reached whether a particular checkwriter was or was not used to prepare the questioned impression(s). There may be correspondence in class characteristics, however, there are factors that significantly limit meaningful examinations. This opinion requires explanation of the limiting factors.
- **May Not Have Prepared** – A less than definitive determination that a particular checkwriter was not used to prepare the questioned impression(s). The comparison between the checkwriter and the questioned impression(s) reveals reproducible and inexplicable variations. Inconsistencies are observed, but limitations are present. This opinion requires explanation of the limiting factors.
- **Elimination** – A determination that a particular checkwriter was not used to prepare the questioned impression(s) due to sufficient disagreement in class and/or individual characteristics. Differences are observed.

5.7.2 Conclusions when determining whether two or more document(s) share a common origin:

- **Share a Common Origin** – A determination that the items were prepared by the same checkwriter due to agreement in individual characteristics. No differences that would preclude a definite determination were observed.
- **May Share a Common Origin** – A less than definitive determination that two or more checkwriter impressions originated from a common source. The comparison of the impressions reveals no significant, reproducible, or inexplicable differences. There is significant agreement in all observable aspects of the results; however limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** – No determination can be reached whether the checkwriter impressions did or did not originate from a common source. There may be correspondence in class characteristics between the

items, however, there are factors that significantly limit meaningful examinations. This opinion requires explanation of the limiting factors.

- **May Not Share a Common Origin** – A less than definitive determination that two or more checkwriter impressions did not originate from a common source. The comparison of the impressions reveals reproducible and inexplicable variations. Inconsistencies are observed, but limitations are present. This opinion requires explanation of the limiting factors.
- **Do Not Share a Common Origin** – A determination that the items were not prepared by the same checkwriter due to sufficient disagreement in class and/or individual characteristics. Differences are observed.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

Redacted

- Lack of a sufficient quantity of questioned and known items.
- Prior destructive forensic examinations such as latent print processing.
- Lack of/limited individual characteristics

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

ASTM E 2285 "Standard Guide for Examination of Mechanical Checkwriter Impressions", *Annual Book of ASTM Standards*, Vol 14.02, Published April 2003.

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Rev. #	Issue Date	History
3	03/03/15	Updated Header to read "QDU Standard Operating Procedures Manual". Section 2 changed "equivalent" to "comparable equipment" and added fourth bullet. Deleted Section 4 "Calibration" and renumbered accordingly. Section 5.7.1 added. Section 5.7.2 added "Conclusions when determining whether two or more document(s) share a common origin:" and reworded conclusions. Sections 5.7.2 and 8 changed "identifying" and "individualizing" to "individual". Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Section 9 hyphenated "Nonoriginal" in first bullet and added "/limited" to last bullet.
4	03/01/18	Deleted "Keyence VHX-2000E Digital Microscope"

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Questioned Documents
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedure for Processing Evidence Using Tartrazine (Protein Dye)

Section 6

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 2000 ml)
- Magnetic stirrer
- Magnetic stirring bars
- Dipping trays (appropriate size for item being processed)
- Squirt bottles or spray bottles
- Lab coat
- Protective eyewear
- Disposable gloves
- 5-Sulfosalicylic acid
- Tartrazine
- Distilled water
- Tap water

3 Standards and Controls

The Tartrazine solution is prepared in a 2 liter beaker on a magnetic stirring device. Dissolve 20 grams of Sulfosalicylic acid and 2 grams of Tartrazine in 1 liter of distilled water. The Tartrazine solution will be tested on a positive control blood stain prior to use.

A positive reaction will produce a deep yellow color. A small area of the background of the object or surface being enhanced will be stained with the solution prior to application. If the background develops a significant color, the Tartrazine solution may not be appropriate for enhancement of this item.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint room.

The Tartrazine solution can be stored in clear or dark bottles indefinitely.

4 Sampling

Not Applicable.

5 Procedure

5.1 The Tartrazine solution may be applied by dipping the specimen(s) to be enhanced in a tray filled with the solution or by using a squirt bottle filled with the solution to saturate the stained area. Completely cover the target area and allow to develop for approximately one minute. The specimen(s) should be rinsed with tap water and allowed to air dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color and porosity of the background substrate must be tested prior to use of this solution. Tartrazine will react with the protein present in blood to produce a deep yellow color. If the background substrate is similar in color to deep yellow or if the background substrate stains a deep yellow color, then it will obscure the chemically enhanced impression.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

Keith Barnett, Birmingham, UK - personal communication

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added, "This document applies to examiners and analysts in the QDU" Deleted 4 Calibrations, Refer to the <i>QD Quality Assurance, Manual, Maintenance, Calibration and Performance for Equipment Verification</i> and appropriately re-numbered.

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedure for Processing Evidence Using Potassium Thiocyanate

Section 7

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of some patterned impressions created with dust or dirt.

2 Equipment/Materials/Reagents

- Balance
- Weighing pans
- Spatulas
- Beakers (10 ml - 200 ml)
- Graduated cylinders (10 ml)
- Glass stirring rod
- Magnetic stirrer
- Magnetic stirring bars
- Pipette
- Non-metallic spray bottles
- Fume hood
- Disposable gloves
- Lab coat
- Protective eyewear
- Potassium thiocyanate
- Methanol
- Sulfuric acid
- Distilled water

3 Standards and Controls

3.1 Sulfuric Acid Solution (Dilute)

In a small beaker, add 1ml of concentrated sulfuric acid to 9 ml of water. Mix with a glass stirring rod. Note: Make certain that you add the sulfuric acid to the water. The dilute Sulfuric acid solution must be mixed fresh.

3.2 Acetone/Water Solution

In a 200 ml beaker on a magnetic stirrer, mix 15 ml of water with 120 ml of acetone. Add 15 grams of Potassium Thiocyanate. The Acetone/Water Solution must be mixed fresh.

3.3 Potassium Thiocyanate Solution (Sulfuric Acid Solution (Dilute) + Acetone/Water Solution)

Slowly add 8.5 ml of the Sulfuric Acid Solution (dilute) to the Acetone/Water Solution. Note: Make certain that you add the sulfuric acid to the Acetone/Water Solution. The Potassium Thiocyanate solution must be mixed fresh.

3.4 Once the Sulfuric Acid Solution (dilute) is added to the Acetone/Water Solution, a milky mixture will result which will separate on standing. When the layers have separated, remove the top (clear) layer with a pipette and transfer it to a non-metal spray apparatus. This solution will be tested on a small portion of the dust or dirt impression prior to processing the entire item. A positive reaction will produce a reddish brown color. If the background develops a significant color, or the dust does not produce a reddish brown color, the Potassium Thiocyanate solution may not be appropriate for enhancement of this item. Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint examination room.

4 Sampling

Not Applicable.

5 Procedure

5.1 The solution may be placed in a non-metal spray apparatus and applied by lightly spraying the specimen under a fume hood. The specimen should be allowed to air dry.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The color and porosity of the background substrate must be tested prior to use of this reagent. The thiocyanate ion in an acid environment will react with iron ions in the soil to produce a reddish brown color. If there is no iron in the dust or dirt comprising the impression, there will be no color reaction.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

Bodziak, Footwear Impression Evidence, 2000.

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added, "This document applies to examiners and analysts in the QDU" Deleted 4 Calibrations. Refer to the <i>QD Quality Assurance Manual, Maintenance, Calibration, and Performance for Verification Equipment</i> and appropriately re-numbered

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations

1 Scope

These procedures will be used by a forensic document examiner when conducting graphic arts examinations. These procedures include the examination and comparison of various office printing technologies (e.g., ink jet and toner processes) and commercial technologies (e.g., lithography and relief processes). Further, these procedures apply to the examination of photocopies, facsimiles, and/or computer printed documents for determining generational order and/or origin.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Measuring Devices (e.g., Half-Tone Screen Determiner, Linen Tester, Ruler, Grids)
- Clear acetate sheets
- Magnetic Detector

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Using lighting and magnification sufficient to allow fine detail to be distinguished, visually examine the text and/or graphics to determine the printing technology(s) used in the preparation and printing of the submitted items. Determine the technology(s) by evaluating the printing medium, its adherence to the printing surface, and any specific technology class characteristics that may be observed such as hickeys, squeegee edges, over spray, pinholes, serrated edges, or embossing. Examples of printing process characteristics are found in Table 1. If the printing medium is determined to be typewriting, refer to the *QDU Procedures for Conducting Typewriting and Computer-Generated Text Examinations*.

Table 1: Print Process Characteristics

Impact Dot Matrix	Ribbon-inked/carbon Embossing Series of dots Stepped edges Paper fiber disturbance
Ink Jet	No ribbon Liquid medium No embossing Absorbs into paper Overspray around printed characters May have stepped edges
Laser	No ribbon (toner) No embossing Overspray over surface of paper Adheres to surface of paper Melted plastic Mounded toner beads May have stepped edges
Photocopy	No ribbon (toner) No embossing Overspray over the surface of the paper Adheres to surface of paper Edges may be smooth or serrated Toner may be magnetic Mounded toner beads Liquid (toner) Toner material suspended in a liquid carrier
Thermal	Heated wax carbon ribbon No embossing Adheres to surface of paper (can be peeled off) Serrated edges Coated paper, heat removes coating, dots

Table 1: Print Process Characteristics (continued)

Letterpress	Embossing Ring of ink (squeeze out effect)
Flexography	Little if any embossing Ring of ink (squeeze out effect)
Lithography	No embossing Even inking Smooth edges There may be hickeys
Gravure/Intaglio/Die Stamp	Serrated edges Cell pattern Raised ink surface effect
Screen	Serrated edges (sometimes) Raised effect
Thermography	Smooth edges Air bubbles/crystallization Raised (melted plastic)
Type Bar/Single Element	Ribbon carbon/fabric Embossing Smooth/round edges
Thermal Dye Diffusion	Fuzzy appearance Grid Pattern may be visible Normally coated paper substrate
Thermal Wax Transfer	Thick waxy ink creates raised texture Stepped appearance Peel-off appearance
Direct Thermal	Flat appearance Characters/Images have stepped edges Substrate thin Shiny paper Blank spots/lines possible if print head fails Discoloration Fading of substrate possible, if exposed to heat, light, scratched

5.1.1 To assist in technology determination, obtain authentic documents, or utilize standards or information that is available in the Office Equipment File for comparison purposes as necessary. Refer to the *QDU Procedures for Conducting an Office Equipment File (OEF) Search*.

5.2 Determining Common Origin

5.2.1 If the items being examined were generated using a printing technology commonly

associated with commercial technologies, visually examine the items using lighting and magnification sufficient for fine detail to be distinguished for class characteristics, as well as to determine whether identifying characteristics

Redacted

5.2.2 If the items being examined were generated using a printing technology commonly associated with photocopiers, facsimiles, or computer printers, visually examine the items using lighting and magnification sufficient for fine detail to be distinguished for class characteristics, as well as to determine whether identifying characteristics

Redacted

Redacted

5.2.3

Redacted

Record any such characteristics by photographing either with a digital camera or using the Forensic Imaging Unit, scanning, or by any other means.

Redacted

Redacted

5.2.4.2 If the machine is a printer:

- Print a test page.

Redacted

Redacted

5.2.4.3 If the machine is a multi-function machine, obtain exemplars from the different printing and copying modes, including facsimile mode, if applicable.

5.2.4.4 Record on each exemplar the date the exemplars were obtained, the name of the person who directed the exemplars, the laboratory number, if possible, and the location where the exemplars were made.

5.2.4.5 Record for your case notes the make, model, and serial number of the machine, information about the supplies and components, whether the paper supply is sheet or roll fed, and options such as color, reduction, enlargement, zoom, mask, trim, or editor board.

5.2.5 Visually compare the items using lighting and magnification of sufficient intensity to allow fine detail to be distinguished in order to evaluate the Redacted and other class and identifying characteristics for consistencies and inconsistencies.

5.2.5.1 An overlay plotting the trash marks and/or other print characteristics and their orientation on a clear acetate sheet is often helpful when conducting comparisons.

5.3 Determining Generational Order

Redacted

5.3.2 Visually examine the items Redacted using lighting and magnification sufficient for fine detail to be distinguished to determine, if possible, the generational order of the submitted document.

Redacted

Redacted

5.5 Documents requiring chemical **Redacted** examinations will be referred to the USSS to facilitate additional specialized examinations. Prior to these examinations, contact the latent print examiner to determine if preliminary latent fingerprint examinations should be conducted.

5.6 If the item is to be sent to the USSS for examination, the examiner will follow the procedures outlined in *QDU Facilitation of Document Examinations by Other Forensic Laboratories*.

5.7 Make notations in the examination records. Include any reference information, image files, printouts, photographs, overlays, or drawings of any identifying and/or eliminating characteristics observed during the examination process that will support your findings or conclusions.

5.8 Conclusions

5.8.1 Conclusions when determining whether a particular machine prepared a questioned document(s):

- **Identification** - A determination that the items were prepared by the same machine at some point in time (either directly or indirectly) due to agreement in identifying characteristics. No differences that would preclude an identification were observed. The possibility of a duplicate machine can be eliminated.
- **May Have Been Used in the Preparation and/or Printing** - A less than definite determination that a particular machine was used at some point in time (either directly or indirectly) in the preparation and/or printing of the questioned document(s). There is a correspondence in characteristics between the machine printouts and the questioned document(s); however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** - No determination can be reached as to whether a particular machine was or was not used at some point in time in the preparation and/or printing of the questioned document(s) due to significant limitations. This opinion requires explanation of the limiting factors.
- **May Not Have Been Used in the Preparation and/or Printing** - A less than definite determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly). There is a lack of correspondence in

characteristics between the machine printouts and questioned document(s) and some inconsistencies are noted; however, limitations are present. This opinion requires explanation of the limiting factors.

- **Elimination** - A determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.8.2 Conclusions when determining whether or not two or more documents share a common source:

- **Share a Common Source** – A determination that the items share a common source **Redacted** due to agreement in identifying characteristics. No differences that would preclude a definite determination were observed.
- **May Share a Common Source** - A less than definite determination that the items originated from a common source at some point in time. There is a correspondence in characteristics between the items; however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** - No determination can be reached as to whether the submitted items originated from a common source, due to significant limitations. This opinion requires explanation of the limiting factors.
- **May Not Share a Common Source** - A less than definite determination that the items did not originate from a common source at some point in time. There is a lack of correspondence in characteristics between the items and some inconsistencies noted; however, there are limitations. This opinion requires explanation of the limiting factors.
- **Do Not Share a Common Source** - A determination that the items do not share a common source due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.8.3 Information related to the generational order of an item.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

Redacted

- Lack of a sufficient quantity of submitted item(s).
- Prior destructive forensic examinations.

Redacted

- Lack of sufficient clarity and detail in the submitted items.
- Lack of/limited identifying characteristics.
- Transient characteristics

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Standard Operating Procedures Manual

QDU Quality Assurance Manual

ASTM E 2389, "Standard Guide for Examination of Documents Produced with Liquid Ink Jet Technology," *Annual Book of ASTM Standards*, Vol 14.02.

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Vastrick, T.W., "The Examination of Notary Seals," *Journal of Forensic Sciences*, JFSCA, Vol. 7, No. 4, Oct. 1982, p. 899-911.

"Rubber Stamps and Rubber Stamp Impressions as Evidence," Federal Bureau of Investigation.

Rev. #	Issue Date	History
5	03/01/18	Format/numbering adjustment. 2 Equipment/Materials/Reagents, sixth bullet, deleted “100”, added “200” for HSI.
6	09/26/19	Redacted

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 09/24/2019

Questioned Documents
Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Questioned Documents Unit (QDU)

Procedures for Processing Evidence Using Luminol

Section 8

1 Scope

This document applies to examiners and analysts in the QDU for the enhancement of patterned impressions in blood.

2 Equipment/Materials/Reagents

- Non-metallic spray bottle (200 ml - 8 oz) with a non-metallic spray apparatus
- Well ventilated darkened room
- Disposable gloves
- Lab coat
- Protective eyewear
- Dust/mist mask
- Luminol Kit - Bluestar Forensic
- Distilled water

3 Standards and Controls

3.1 Luminol Solution

In a non-metallic spray bottle (200 ml - 8 oz), add the contents of the Luminol Kit (two tablets) and 120 ml (4 oz) of distilled water. Stir gently to mix. Allow about 1 or 2 minutes for complete dissolution and mixing of the chemicals. Do not shake the bottle. The Luminol Solution will be tested in the dark on a positive control blood stain prior to use.

A positive reaction will produce a strong blue white luminescence.

Record the results of the control test in the *Chemical Enhancement and Control Logbook* located in the Shoeprint examination room.

The Luminol Kit can be stored unmixed for up to 3 years.

The Luminol Solution must be prepared fresh and used within 3 hours of mixing.

4 Sampling

Not Applicable.

5 Procedure

5.1 The item to be enhanced should be spread on a piece of brown paper on the floor of the designated room in the Photographic Operations & Imaging Services Unit (POISU). This room is a well ventilated room which can be darkened. The Luminol solution should be lightly sprayed as a fine mist on the item to be enhanced. When stains have been located they should be outlined with an appropriate marker and numbered for photography. The located stains should be photographed by POISU. Luminol spraying must continue during photography to maintain sufficient luminescence.

5.2 At the completion of chemical enhancement, refer to the *QDU Procedures for Conducting Footwear and Tire Tread Examinations*.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

Luminol reacts with the hemoglobin derivatives found in blood and produces light in a process known as chemiluminescence. In order to view an enhanced impression exhibiting chemiluminescence, the luminol enhancement process must be carried out in total darkness.

9 Safety

9.1 Adhere to the safety practices outlined in the *FBI Laboratory Safety Manual*.

9.2 Handle any specimens containing known or possible biohazards in accordance with FBI Laboratory health and safety practices.

9.3 Dispose of all chemicals according to the *Chemical Disposal Guidelines* on file in the Shoeprint examination room.

9.4 Safety information concerning each of the chemicals used in these procedures are available from the *Material Safety Data Sheets (MSDS)* on file in the Shoeprint examination room.

10 References

Kirk, Crime Investigations, New York, 1953.

Lytle, L.T. and Hedgecock, D.G., "Chemiluminescence in the Visualization of Forensic Bloodstains", Journal of Forensic Sciences, Vol. 23, No. 3, July 1978, pp. 550-562.

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FBI Laboratory Safety Manual

QDU Quality Assurance Manual

QDU Standard Operating Procedures Manual

Rev. #	Issue Date	History
0	07/03/06	Rev. for ASCLD/LAB-International (ISO 17025).
1	03/01/18	1 Scope, added "This document applies to examiners and analysts in the QDU" Deleted 4 Calibrations. Refer to the <i>QD Quality Assurance Manual, Maintenance, Calibration and Performance for Equipment Verification</i> " and appropriately re-numbered.

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Handwriting/Hand Printing Examinations

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations on items containing handwriting and/or hand printing, **Redacted** for the purpose of determining its origin and/or authenticity.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the questioned, and where applicable, known items using lighting and magnification sufficient to allow fine detail to be distinguished in order to determine whether the writing to be examined is original writing.

5.1.1 If the questioned writing is not original, determine the technology used to prepare the text, if not submitted as a copy by the contributor. Refer to the *QDU Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations* if needed. If the questioned writing was submitted as a copy of the original by the contributor, a technology determination is not necessary.

5.2 If the questioned and/or known writing is original, determine if all writing is freely and naturally prepared through visual and microscopic examination. **Redacted**

Redacted

5.3 If the questioned and/or known writing are freely and naturally prepared, analyze using lighting and magnification to determine if there is a sufficient quantity of writing of suitable quality for comparison purposes. Determine the skill level and range of variation exhibited in each item, if possible, and proceed.

5.4 Analyze the questioned and/or known writing to determine contemporaneousness and comparability between items, and use sufficient lighting and magnification to analyze the class and individual characteristics.

Redacted

5.4.1 Determine if there is more than one style of writing within the questioned and/or known writing. Note in the examination records if there are inconsistencies or unexplained handwriting characteristics present within the bodies of writing. It may be necessary to contact the contributor for authentication.

5.4.2 If the submitted known writing is not sufficiently comparable to the questioned writing, **Redacted** this procedure may be discontinued at the analysis stage. Ensure all other pertinent examinations (e.g., indented writing) have been completed and report accordingly.

5.4.2.1 Note: In the absence of exact wording between items, the same letter combinations and/or similar words are sufficient for comparison purposes. For example, if the questioned writing contains the word “there”, comparing this to the words “the” and “are” in the known writing is acceptable.

5.4.2.2 If comparability in wording or letter combinations is the limitation, request comparable known writing, providing adequate instructions.

5.5 Analyze the questioned writing, determining if sufficient unique and individualizing characteristics are present to continue examinations (e.g., the questioned handwriting is suitable for comparison).

5.5.1 If enough unique characteristics are present, continue to the comparison phase.

5.5.2 If a sufficient number of unique characteristics are not present, discontinue examinations and report accordingly.

5.6 Conduct a side-by-side comparison with exclusively questioned or questioned and known items using the following symbols in examiner work notes to record the various characteristics observed in the handwriting/hand printing that will be used in the formulation of examiner findings/opinions:

- ○→ - Indicating an unexplained characteristic, unexplained variation, inconsistency, or an accidental characteristic.
- → - Indicating a similarity, consistency, natural variation, or characteristics in common.
- +→ - Indicating a difference.

Assess the combination of individual and class characteristics observed in the questioned writing and attempt to account for those characteristics on the basis of the available known writing. It should be noted that it is possible that characteristics present in the known writing may not be observed in the questioned writing. This is acceptable, often expected and does not preclude an identification or elimination opinion. Determine if the variation and skill level in the questioned writing are within the limits set by the known writing.

5.7 Evaluate the similarities, differences, unexplained characteristics, and limitations to determine their significance individually and in combination. Form a conclusion based on results of the above analyses, comparisons, and evaluations.

5.8 Ensure all notes, data, and observations used to support the conclusions derived from the examination are recorded in the examination records. Include any reference information,

image files, printouts or photographs, overlays, drawings or images, or identifying/eliminating characteristics that support your findings or conclusions.

5.9 Conclusions

- **Identification** - The examiner's opinion that two or more samples of handwriting originated from the same writer(s) due to significant characteristics in agreement, both in quality and quantity, such that the examiner would not expect to see the same combination of characteristics repeated in a handwriting sample of another writer. There are no fundamental differences to suggest another writer and there are no significant limitations with the items examined. Unexplained characteristics are far outweighed by the combined effect of agreement in all other details.

Note - Due to the impossibility of examining all handwriting, an identification to the exclusion of all others can never be proven. However, an identification opinion is supported by research, which has shown that as more significant characteristics are found in agreement, it becomes less likely to find that same combination of characteristics in a handwriting sample from another writer.

- **May Have (Qualified Opinion)** - This opinion is based on the prevalence of characteristics in common between two or more bodies of writing; however, a limitation(s) exists which prevents an identification. This is a less than definitive opinion and requires an explanation of limiting factors.
- **No Conclusion** - The examiner cannot determine whether the items being compared were or were not prepared by the same writer(s), usually because of such factors as lack of comparability or lack of clarity and detail in the submitted items, which may significantly limit meaningful examinations. In instances when meaningful examinations can be conducted, the weight of the combination of characteristics observed in common is counterbalanced by the weight of the combination of inconsistencies or unexplained characteristics observed. This opinion requires an explanation of limiting factors.
- **May Not Have (Qualified Opinion)** - This opinion is based on the prevalence of dissimilarities between two or more bodies of writing; however, a limitation(s) exists which prevents an elimination. This is a less than definitive opinion and requires an explanation of limiting factors.
- **Elimination** - The examiner's opinion that two or more bodies of writing were not prepared by the same writer(s) due to disagreement in significant characteristics. Any similarities are far outweighed by the lack of agreement in all other details. No significant limitations are present.

5.9.1 If a qualified opinion is reached and it is determined that additional known writing

may be beneficial, provide instructions within the report on obtaining comparable known writing.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The factors that may affect the examination process and/or the results rendered include:

Redacted

Redacted

- Lack of/limited contemporaneous and/or comparable known writing for comparison.

Redacted

- Prior destructive forensic examinations such as latent print processing.
- Lack of sufficient suitable characteristics for comparison.

Redacted

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

QDU Standard Operating Procedures Manual

QDU FBI Approved Standards for Scientific Testimony and Report Language for Forensic Handwriting Comparisons

FBI Laboratory Safety Manual

ASTM, E 2290, "Standard Guide for Examination of Handwritten Items," Annual Book of ASTM Standards, Vol. 14.02

Bradford, Russell R., and Bradford, Ralph B., *Handwriting Examination and Identification*, Nelson-Hall Publishers, Chicago, IL. 1992.

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

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

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

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

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

Rev. #	Issue Date	History
7	03/01/18	<p>2 Equipment/Materials/Reagents, deleted “Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment”, “ChemImage Hyperspectral Imager (HIS) Examiner 100 QD, or comparable equipment” 5.1.1, added “if not submitted as a copy by the contributor.” “If the questioned writing was submitted as a copy of the original by the contributor, a technology determination is not necessary.” 5.2 added, “If the questioned and/or known writing is not original, attempt to ascertain if there are characteristics of free and natural preparation in the copied writing.” Added “5.4.2.1 Note: In the absence of exact wording between items, the same letter combinations and/or similar words are sufficient for comparison purposes. For example, if the questioned writing contains the word “three”, comparing this to the words “the” and “are” in the known writing is acceptable.” Original 5.4.2.1 changed to 5.4.2.2, added, “in wording or letter combinations” 5.5 changed to “Analyze the questioned writing, determining if sufficient unique and individualizing characteristics are present to continue examinations. Added, “5.5.1 If enough unique characteristics are present, continue to the comparison phase. Added “5.5.2 If a sufficient number of unique characteristics are not present, discontinue examinations and report accordingly.” New 5.6, added, “using the following symbols in their work notes to document the various characteristics observed in the handwriting/hand printing that will be used in the formulation of their findings/opinions: “symbols” Indicating an unexplained characteristic, unexplained variation, inconsistency, or an accidental characteristic. Indicating a similarity, consistency, natural variation, or characteristics in common. Indicating a difference. Added, Assess observed in the questioned writing and attempt to account for those characteristics on the basis of the available known writing. It should be noted that it is possible that characteristics present in the known writing may not be observed in the questioned writing. This is acceptable, often expected and does not preclude an identification or elimination opinion. New 5.7, to include “Evaluate the similarities, differences, unexplained characteristics, and limitations to determine their significance individually and in combination. Form a conclusion based on results of the above analyses, comparisons, and evaluations.” 5.6 changed to “5.8”, deleted “Record” “in the examination records” added, “are recorded in the examination records.” Deleted original 5.6.1 with “symbols” 5.7 Conclusions changed to 5.9 Conclusions, in “Note” section changed “arrangement” to “combination” 5.7.1 changed to “5.9.1” Under 8 Limitations, first bullet, deleted “often resulting in opinions that are less than conclusive/definite.”, added, “When the questioned writing is non-original, resulting opinions often are less</p>

8 09/26/19

than conclusive/definite. Non-original known writing may or may not be a limitation depending on the quality of the copy. In some instances, non-original known writing does not preclude an identification or elimination.” Fourth bullet, deleted “original and freely prepared” Eighth bullet, added “Writing which does not appear freely and naturally prepared (e.g., distorted writing).” 5.5 added “(e.g., the questioned handwriting is suitable for comparison.” 5.6, deleted “their” and added “examiner.” 5.8, deleted “and/or” “s” after “image” added “files,” or “images.” 5.9, bullets one, two, four, and five, added “or more.”

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 09/24/2019

Questioned Documents
Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Questioned Documents Unit (QDU)

Procedures for Conducting an Office Equipment File (OEF) Search

1 Scope

The Office Equipment File (OEF) is a repository of typewriting and printing standards and manufacturers' information used for determining the style of type, the manufacturer, and the brand-name of office machines and type used in the preparation of documents that later become evidentiary materials. This file is for official use in law enforcement related matters to provide investigative assistance or to conduct forensic comparisons. This document applies to the Examiners and Document Analysts assigned to the QDU.

2 Equipment/Materials/Reagents

- Microsoft Access, version 2002 or later
- Manufacturers' information (found in manuals, specification documents, consumer reports, and product comparison guides)
- Computer with specifications that support the necessary software

2.1 Databases and Resources

2.1.1 Typewriter Section - includes any hard type designs and is comprised of the following:

- Interpol Classification System
- Computerized Classification System (created by QDU)
- Haas Classification System
- Similar International Business Machines (IBM) Type Style Books (created by QDU based on general type style divisions used by IBM)
- Visible standards/notebooks (collected from actual machines)
- Subfile - contains administrative and miscellaneous related information from manufacturers and product comparison guides
- Typewriter elements

2.1.2 Photocopier Section - includes photocopiers and laser printer information and is comprised of the following:

- Standards - known samples from photocopiers and laser printers
- Subfile - contains administrative and miscellaneous related information from manufacturers and product comparison guides

2.1.3 Printer Section - includes impact dot matrix, thermal and ink jet information and is comprised of the following:

- Samples from machines using the dot matrix processes

- Subfile - contains administrative and miscellaneous related information from manufacturers and product comparison guides

2.1.4 Facsimile Section - includes processes used on facsimile machines and is comprised of the following:

- Samples from facsimile machines
- Subfile - contains administrative and miscellaneous related information from manufacturers and product comparison guides

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

An examiner may search the OEF or request the assigned analyst/technician to conduct the search. The request will be recorded in Forensic Advantage. For Legacy casework, written instructions will be given to the analyst.

5.1 Typewriter Standards File

5.1.1 Search of the Non-Computerized Sections

5.1.1.1 Interpol Section

- Refer to the Interpol classification information pamphlet for coding
- Once the typewriting to be searched is coded, conduct a visual comparison of it with the type style cards containing that code

5.1.1.2 Visible Section

- Determine the horizontal spacing and the size of type (e.g., Elite, Pica) and, if possible, the design of the type style (e.g., Conventional, Shaded, Italic, Slanted)
- Conduct a visual comparison of each type style card containing the same horizontal spacing, size of type, and design of type style

5.1.1.3 Type Style Books

- Determine the horizontal spacing and the size of type (e.g., Elite, Pica)
- Visually determine to which IBM style of type the typewriting in question

corresponds based on general design (e.g., characteristics such as shading, slant, presence of serifs, and individual shapes of letters)

- Conduct a visual comparison of each type style card contained in the IBM type style named section

5.1.2 Haas System

To search the Haas System refer to the instructions in the Haas Atlas.

5.2 Search on a Particular Style of Type, Process and/or Machine from the Typewriter Database (Computerized Sections)

5.2.1 If the computerized section of the OEF is searched by an assigned analyst/technician, the analyst will complete a *QDU-3 Typewriter Standards Computerized Search Slip* (Appendix A) and attach a printout of the search results as well as any pertinent classification information. The completed *QDU-3*, printout, and pertinent classification information will be retained as case records. If an examiner is conducting his/her own search, a *QDU-3* is not required.

5.2.2 Using the search result printout, the examiner or analyst will visually conduct a search of the reference material or type style sections.

5.3 Photocopier, Printer or Facsimile Sections

5.3.1 To locate administrative information concerning a particular printer, the examiner or analyst will search the brand name of machine in the appropriate section of the database.

5.3.1.1 If the search is conducted by an analyst, a printout of the search results and pertinent information will be provided to the examiner and retained in the case records.

5.3.1.2 Using the search result printout, the examiner or analyst will visually conduct a search of the appropriate reference material.

5.4 Machine Samples in these Sections

5.4.1 The examiner or analyst will visually search for the sample in the appropriate section. Samples are arranged by manufacturer in model number order.

5.5 For adding, maintaining, and searching specimens in the OEF databases, the examiner or analyst may refer to the computer and software manuals.

5.6 The case records will include any image files, printouts, copies of standards and/or reference materials, or descriptions of any observations made that support the conclusions.

5.7 Conclusions

Once examinations have been completed, reports may include one or more of the following types of conclusion(s), opinion(s), and other findings:

- The classification of the style of typewriting.
- The manufacturer of the style of typewriting.
- The make and model of machine used to produce the typewriting.
- Manufacturer, make, and model information for the photocopier, printer, or facsimile machine used to prepare the document.
- Other information about the machine used to prepare the document.
- **No Conclusion/No Determination** - No determination could be reached as to the classification of the style of typewriting, the manufacturer of the style of typewriting, the make and model of machine used to produce the typewriting, or the manufacturer, make, and model of the office machine used, usually due to limiting factors such as insufficient quantity of material or poor condition of the item. This conclusion requires an explanation of the limiting factor(s).

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- Search capabilities are limited to items and/or information contained in the OEF
Redacted
- Accuracy and quantity of information provided to the Laboratory

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

Haas Atlas, CD-ROM or DVD, American Society of Questioned Document Examiners, Long Beach, CA, 2004.

OEF computer and software manuals

Rev. #	Issue Date	History
6	03/01/18	1 Scope, added "This document applies to the Unit Chief, Examiners, and Document Analysts assigned to the QDU." 5 Procedures, deleted "documented on the <i>QDU-1</i> or <i>QDU -1 LIMS Case Processing Center Request Sheet</i> (Appendix A)" Added, "recorded in Forensic Advantage." "For Legacy casework, written instructions will be given to the CPC. 5.2.1 changed "B" to "Appendix A" Added <i>OEF computer and software manuals</i> to references.
7	09/26/19	1 Scope, deleted "Unit Chief." Section 5 added "assigned analyst/technician" and "analyst." Section 5.2.1 added "n" after "a", added "assigned" and "/technician." Section 5.6, added "image files."

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 09/24/2019

Questioned Documents
 Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Appendix -A: QDU-3 Typewriter Standards Computerized Search Slip

Redacted - Form on File

Questioned Documents Unit (QDU)

Procedures for Conducting Office Equipment Ribbon Examinations

1 Scope

These procedures will be used by a forensic document examiner or document analyst for examinations involving the transcription of carbon typewriter ribbons, facsimile ribbons, or other readable machine ribbons.

2 Equipment/Materials/Reagents

- Ribbon Analysis Workstation 3.9.85 (RAW II), or comparable equipment
- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Manual typewriter ribbon reader

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Readable Machine Ribbons

5.1.1 If the ribbon or cartridge submitted for transcription is a readable machine ribbon (e.g., facsimile machine ribbon, credit card machine ribbon), transfer the item(s) to the Forensic Imaging Unit for transcription.

5.1.1.1 If the ribbon contains limited text, the examiner may use backlighting and manually transcribe the text by recording what is visible on the ribbon.

5.1.1.2 The examiner does not need to keep copies of the machine transcriptions for routine transcription requests, but will advise the contributor that no copy is being retained upon return of the submission. If the examiner keeps a copy of the routine transcription, it must be maintained within the case records.

5.2 Typewriter Ribbons

5.2.1 If the ribbon or cartridge that is submitted for transcription is from a typewriter, visually inspect the ribbon to determine if the item is suitable for machine or manual transcription.

Redacted

If not machine suitable, transcribe manually or discontinue examinations.

5.2.1.1 If the item is suitable for machine transcription, ribbon analysis will be performed using the RAW II. The examiner must provide the following to the analyst responsible for operating the RAW II:

- A copy of the incoming communication.
- A copy of the Laboratory Worksheet (7-2), or equivalent in FA.
- The original ribbon in the ribbon cartridge.

5.3 Ribbon analysis using the RAW II with a pristine ribbon:

- Turn on RAW II ribbon reader.
- Turn on the RAW II computer.
- Select RAW icon which brings user to Main Menu.
- Select Case Management to add comments such as Lab number, File number, Redacted
- Go back to the Main Menu and select Spooling:
 - A. Take the ribbon out of the cartridge.
 - B. Position ribbon so that the carbon is facing down on the reel and tape tightly.
 - C. Select Slow, Medium, or Medium Fast buttons from the Spooling Mode based on the condition of the ribbon.
 - D. When spooling is complete, select Stop button.
 - E. Run the ribbon across the spindles so that the carbon side of the ribbon is facing the camera and tape tightly to the bottom reel.
 - F. Go back to Main Menu.
- Select Record/Playback button which will take you to the Record Playback Mode:
 - A. Select Motor Control which takes user to Motor Control Mode. Select start to move the ribbon from reel to reel while passing through the light box with text appearing on the monitor. Check to make sure that the light box window is open wide enough to pick up all characters in full. If not, the user will open light box windows until characters are in full view.
 - B. Once user is satisfied with the light box window setting, select Stop which will stop the motors.
 - C. Manually wind the ribbon back to the beginning.
 - D. Select Return to Record/Playback screen, then select Record to begin recording text. While recording, never select the Stop button. Use the

- Pause button to stop the recording if any adjustments need to be made.
- E. Select the Stop button when the ribbon is finished recording, and the encoding process immediately begins. The longer the ribbon, the longer it will take for the ribbon to encode. Encoding can take from 10 to 40 minutes.
 - F. After the ribbon has finished encoding, go back to the Main Menu.
 - Select the Text button from the Main Menu:
 - A. Select Parameter Setting, then select Learn 1. Set both the Define Windows and Ignores (lines) and Set Character Width (characters) parameters. The starting point (beginning of text on ribbon) is defaulted, unless you want to view or print a certain page or pages, then enter necessary numbers to move to that area of text on the ribbon and it will appear on the monitor.
 - B. Go to Learn 2 and select Continuous Display to view the spacing of the text on the ribbon. If alignment is off, go back to Learn 1 and reset the necessary parameters again. If text is running backwards, select Manual Settings from the Parameter Setting and change the Reserve field from whatever is currently showing (i.e., if Yes, change to No, if No, change to Yes). This will make the text go in the proper direction. If the letters are out of sequence, (i.e., a lot of misspelled words), go to Learn 2 Settings and make the necessary adjustments using Min Width, Max Split, Max Char Width, and Max Black. Return to Learn 2 and select Continuous Display to display the text.
 - C. Once satisfied with the parameter settings, go to the Text Mode Main Menu and select Print. The transcription of the text contained on the ribbon will be printed out.

5.4 The examiner does not need to keep copies of the RAW II transcriptions for routine transcription requests, but will advise the contributor that no copy is being retained upon return of the submission. If the examiner keeps a copy of the routine transcription, it must be maintained within the case records.

5.5 Damaged carbon ribbons should be manually read if the carbon is badly damaged throughout the ribbon. Damage to the ribbon includes but is not limited to the lack of carbon on the ribbon, misaligned text, and mangled ribbon.

5.5.1 If the ribbon is not suitable for machine transcription due to damage or other factors, or if the ribbon contains limited text, the examiner may manually transcribe the text by recording what is visible on the ribbon. To manually transcribe a ribbon, take the ribbon out of the cartridge and note in the case records any specific type of damage to the ribbon. Make sure the carbon side is facing downwards and tape end tightly to plastic reel. Place reel onto manual typewriter ribbon reader and wind to the beginning. Once user gets to the beginning of the ribbon, transcribe the ribbon manually by using backlighting as needed and recording character by character what is visible on the ribbon. If manually transcribed, the transcription must be maintained as part of the case notes.

5.6 If a request is made to determine if a particular text is contained on a submitted ribbon,

the examiner has the option of transcribing the entire ribbon using the RAW II, or manually searching the ribbon for the desired text.

5.6.1 If the requested text is searched for and located on the submitted ribbon, a copy of that portion of the transcription or a description of its location will be noted in the case records.

5.6.2 If a paper fiber impression transfer examination is to be conducted between the text located on the submitted ribbon and typewritten text on a document, refer to the *QDU Procedures for Conducting a Paper Fiber Impression Transfer Examination*.

5.7 The case records will include any printouts, manual transcriptions, or descriptions of any observations made during the examination process used to support your conclusions.

5.8 Conclusions

- The submitted ribbon was transcribed and a copy of the text is provided for investigative assistance.
- The submitted ribbon was transcribed and the text being searched was/was not located.
- The submitted ribbon was not transcribed **Redacted** This conclusion requires an explanation of the limiting factor(s).

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- **Redacted**

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials.

Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

Attenberger, David W., Kanaskie, W. Gary, "Examination of a Typewritten Document," *FBI Law Enforcement Bulletin*, June 1981. (57)

Casey, M.A., Purtell D.J., "IBM Correcting Selectric Typewriter: An Analysis of the Use of the Correctable Film Ribbon in Altering Typewritten Documents," American Academy of Forensic Sciences, February 1975. (29)

Gerhart, F. James, "Methods of Associating Typewriter Ribbons and Correcting Tapes with a Questioned Text," American Society of Questioned Document Examiners, September 1988. (234)

Grantham, Steven M., Identification of Indented Typewritten Entries with Characters Present on a Lift-Off Correction Ribbon, American Academy of Forensic Sciences February 1992. (263)

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

Rev. #	Issue Date	History
4	05/29/12	Section 6.3 capitalized "Fast". Section 6.6.2 deleted "questioned". Section 6.8 second bullet, deleted "questioned" and added "being searched". Section 6.8 added the last bullet. In the Limitations section, added "submitted" and parentheses, and deleted "questioned and/or known" in the first bullet.
5	03/03/15	Updated Header to read "QDU Standard Operating Procedures Manual". Section 2 first bullet updated to more current version. Replaced "equivalent" with "comparable equipment". Changed "RAW" to "RAW II" throughout document (except third bullet in Section 5.3). Deleted Section 4 "Calibration" and renumbered accordingly. Section 5.1.1 deleted "that is". Sections 5.1.1.2 and 5.4 changed "with" to "within". Section 5.2.1.1 changed "worksheet" to "Laboratory Worksheet", added ", or equivalent in FA". Section 5.3 changed "shall" to "will". Section 5.6.2 added "impression" after "fiber" and updated title of referenced document. Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Made grammatical corrections throughout document.

Approval

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Questioned Documents Unit (QDU)

Procedures for Conducting Paper Fiber Impression Transfer and Fracture Pattern Examinations

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations of documents containing typewritten impressions or corrections with most carbon and correction film ribbons.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Leica DMC Comparison Microscope (minimum magnification, 32X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Ribbon Analysis Workstation 3.9.2 (RAW II), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the questioned typewritten text using lighting and magnification sufficient to allow fine detail to be distinguished to determine the type of ribbon used (Table 1).

If a carbon ribbon or correction ribbon was used, then analyze the typewritten document using the *QDU Procedures for Conducting Typewriting Examinations*. If fabric or multi-strike carbon ribbons were used, discontinue paper fiber examinations.

Table 1: Characteristics of Various Types of Ribbon

Type of Ribbon	Characteristics of Ribbon
Fabric	<ul style="list-style-type: none"> • Warp and weave pattern of fabric • Ink soaks into paper • Uneven inking of letter • No flaking
Carbon yellow or orange (Single-strike)	<ul style="list-style-type: none"> • Plastic film ribbon • Carbon-wax coating on ribbon • No ink absorbing into paper • Clean outline of letter • May be flaking of carbon • May be lift off or cover up corrections
Carbon Pink (Permanent)	<ul style="list-style-type: none"> • Plastic film ribbon • Carbon, wax, dye coating on ribbon • Permanent • No correction
Carbon Blue (Multi-strike)	<ul style="list-style-type: none"> • Plastic film ribbon • Liquid ink • Multi-strike or security • Looks like a combination of fabric ribbon and carbon
Carbon Green (Composer)	<ul style="list-style-type: none"> • Used by type-setters • Wider and bigger ribbon
Thermal	<ul style="list-style-type: none"> • Heated wax carbon ribbon • Adheres to surface of paper

5.2 Examine the ribbon to be compared using back lighting, if necessary, to determine if it is consistent with the type of ribbon and style of type used to prepare the questioned text. If the ribbon is not consistent with the questioned typewriting, **Redacted** discontinue the examinations.

5.3 Refer to the *QDU Procedures for Conducting Office Equipment Ribbon Examinations* to determine whether the questioned typewritten text is present on the ribbon. If the questioned text is not present, discontinue the examination.

5.4 Compare the wording, type style, size, and any corrections for consistency between the comparable text on the ribbon and the questioned typewritten text. If typewritten text and ribbon text are consistent, then proceed with paper fiber and/or fracture pattern comparisons. If

the same wording appears multiple times on the same ribbon, evaluate each repetition independently, as necessary. If the text is not consistent, discontinue examination and make appropriate notations in the examination records.

5.5 Using a comparison microscope, VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments), or similar equipment, compare similar portions of the typewritten text and ribbon text.

5.5.1 Characteristics to evaluate during a comparison

Redacted

If consistent, the examiner will draw, photograph, or by any other means document the correspondence between the paper fibers and/or fracture patterns and the typewritten text. If not consistent, make the appropriate notations in the examination records.

5.5.2 Examine like characters from several areas of the text and ribbon (e.g., the beginning, middle, and end) for correspondence between the typewritten text and the corresponding portions of the ribbon.

5.6 Make notations in the examination records that, at a minimum, include any printouts, photographs, digital images, or drawings of any identifying and/or eliminating characteristics and/or fracture patterns used to support your findings or conclusions.

5.7 Conclusions

- **Identification** - The examiner's opinion that the questioned typewritten text was prepared by the known typewriter ribbon due to agreement in all identifying characteristics. No differences that would preclude an identification were observed.
- **No Conclusion/No Determination** - No determination can be reached whether the typewritten text originated/did not originate from a known ribbon. Although there may be correspondence in class characteristics between the items, factors are present that significantly limit meaningful examinations. This opinion requires explanation of limiting factors.
- **Elimination** - The examiner's opinion that the questioned typewritten text was not prepared by the known typewriter ribbon due to sufficient disagreement in class and/or identifying characteristics.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

Redacted

- Insufficient quantity of original material submitted for examination.
 - Prior destructive forensic examinations such as some latent print processing.
 - Ribbons that are not suitable Redacted
-
- Lack of sufficient identifying characteristics.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

Gerhart, F. James, "Examinations of Paper Fiber Impressions on Carbon Paper, A Method of Positive Identification." (320)

Gerhart, F. James, "Methods of Associating Typewriter Ribbons and Correcting Tapes with a Questioned Text," American Society of Questioned Document Examiners, September 1988. (234)

Hahn, G. H., "Paper Fiber Impressions on Carbon Tape Ribbons," *Journal of Forensic Sciences*, December 1972. (635)

Rev. #	Issue Date	History
3	03/03/15	Updated Header to read "QDU Standard Operating Procedures Manual". Added "Impression" to title. Section 2 changed "equivalent" to "comparable equipment" and "instrumentation" to "equipment". Added sixth bullet and last bullet. Deleted Section 4 "Calibration" and renumbered accordingly. Renumbered Section 5. Section 5.1 Table 1 reformatted bullets. Section 5.7 for the conclusions "Identification" and "Elimination" replaced "A determination" with "The examiner's opinion". Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Section 8 hyphenated "Nonoriginal". Reformatted bullets and made grammatical changes throughout document where necessary.
4	03/01/18	2 Equipment/Materials/Reagents, seventh bullet, added "II" to RAW, ninth bullet, changed 100 to "200" HSI.5.1 added "were used" for multi-strike carbon ribbons. 5.5 added, "(for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments."

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Questioned Documents
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Polyethylene Film Product Examinations

1 Scope

These procedures will be used by a forensic examiner who is qualified in the nondestructive examination of polyethylene film products. Polyethylene film is usually in the form of plastic bags, but may also come in the form of a variety of other plastic products. **Redacted**

It should be noted that these procedures do not apply to determining the chemical composition of polyethylene film products, which requires destructive testing.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- Ruler marked in a minimum of 1 millimeter and/or 1/16 inch increments.
- 3M Glare-Stop polarizing filters of various sizes (usually between 6" and 18"), or equivalent

Redacted

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Observations

The following procedures will be performed when applicable. The procedures need not be performed in the order given.

5.1.1 Examinations, notations, and results will be recorded in the examination records. |

5.1.2 Make a record of the polyethylene film, usually by free-hand sketch.

5.1.3 Visually evaluate the polyethylene film evidence, to the extent possible, to determine general class characteristics **Redacted**

A ruler will be used to record measurements.

Redacted

5.2 Comparisons

5.2.1 If an evidential item does not correspond to another evidential item in general class characteristics, **Redacted** no side-by-side comparison is necessary. Report that the items were not manufactured from a common source or did not originate from a common source.

5.2.2 If two or more evidential items correspond in general class characteristics, compare items for common manufacturing characteristics, **Redacted**

5.2.2.1 If two or more evidential items correspond in general class characteristics but do not correspond in manufacturing characteristics, report that the items were not manufactured from a common source **Redacted**

The items, however, correspond in general class characteristics.

5.2.3 If two or more evidential items correspond in both general class characteristics and manufacturing characteristics, examine the items for individualizing characteristics **Redacted**

Visually analyze and conduct a side-by-side comparison of the polyethylene items using a transparent light source, polarizing filters if necessary, or the VSC or comparable equipment.

5.2.3.1 If two or more evidential items correspond in both general class characteristics and all or the majority of manufacturing characteristics, but do not correspond in individualizing characteristics, report **Redacted**

However, the items correspond in general class characteristics and manufacturing characteristics.

Redacted

5.2.3.3 If two or more items correspond in general class characteristics and possible manufacturing characteristics but there are significant limiting factors, an inconclusive result is appropriate. Additionally, if two or more evidential items correspond in both general class characteristics and manufacturing characteristics, but lack observable individualizing characteristics, report that the items correspond in general class characteristics and manufacturing characteristics. **Redacted**

5.2.4 Record in the examination records all notes, printouts, photographs, overlays, or drawings used to support the conclusions derived from the examination.

Redacted

Redacted

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- **Redacted**
- Limited quantity of questioned and/or known items.
- Prior destructive forensic examinations such as latent print processing.
- Lack of sufficiently suitable characteristics for comparison.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

PRIDE Instruction Manuals

PRIDE Training Manual

FBI Laboratory Safety Manual

Castle, D.A., Gibbins, B., Hammer, P.S., Physical Methods for Examining and Comparing Transparent Plastic Bags and Cling Films, *Journal of Forensic Science Society*, 1994; 34:61-68.

Ford, K.N., The Physical Comparison of Polyethylene Film, *Journal of Forensic Science Society*, 1975; 15, 107.

Pierce, David S., Identifiable Markings on Plastics, *Journal of Forensic Identification*, 1990.

Stanko, Richard F., Attenberger, David W., The Evidentiary Value of Plastic Bags, *FBI Law Enforcement Bulletin*, 1992.

USI Chemicals Company, "How to Solve Blown Film Problems", *USI Technical Brochure*, Cincinnati, Ohio.

Vanderkolk, John R., Identifying Consecutively Made Garbage Bags Through Manufactured Characteristics, *Journal of Forensic Identification*, 1995.

von Bremen, U.G. and Blunt, L.K.R., "Physical Comparison of Plastic Garbage Bags and Sandwich Bags," *Journal of Forensic Sciences*, JFSCA, Vol. 28, No. 3, July 1983, pp. 644-654.

Redacted

Rev. #	Issue Date	History
4	03/03/15	Changed Header to read "QDU Standard Operating Procedures Manual". Section 2 modified descriptions of equipment to be consistent with other unit documents. Removed Section 4 and renumbered document accordingly. Section 5.1.1 changed "shall" to "will". Sections 5.1.5 and 5.2.2 changed "specimen" and "specimens" to "item" and "items", respectively. Section 5.2.3 changed "equivalent" to "comparable equipment". Section 5.3.1. first bullet changed "Identification" to "Items at One Time Attached" and added "general, manufacturing, and". Added "Items" to second and third bullets. Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty".
5	03/01/18	Deleted "properly trained", added "qualified"

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 02/28/2018

Questioned Documents
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Stamped Impression/Dry Seal Examinations

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations of impressions from stamps, dry seals, and other mechanical devices. Stamps and dry seals may be produced from an array of materials to include rubber, wood, plastic, photo polymers, metals, and wax.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the questioned and/or known stamped impression(s) using lighting and magnification sufficient to allow fine detail to be distinguished.

5.1.1 Characteristics of a stamped impression include:

- Even ink coverage.

- Ring of darker ink outlining the individual letter(s) (i.e., the “squeegee effect”). This is a result of the relief of the printing area squeezing the ink out to the edge of the ink line. It may be difficult to observe if the entire character is heavily inked.
- Absence of any indentation in the line of ink.
- Rounded beginning and ending of letters.
- Ink filling in sharp angles and intersection points of two lines.
- Uneven outline of the letter may be observed.
- Some patchy areas within the inked impression may be observed.
- Some bleeding of ink through the paper may be observed.

5.1.2 Characteristics of a dry seal impression include:

- Embossing of the paper.
- The impression may not be uniform. This depends on the mounting of the plates in the press, the pressure exerted, or the type of document being embossed.
- Pressure variation may be observed. This may be due to variation in the depth of the letters on the seal itself, warping, unusual wear or misuse, or by the pressure exerted during the embossing process.

5.2 Note, at a minimum, the class characteristics of the impression(s), which include:

- Design
- Format
- Size
- Wording
- Alignment may be a class characteristic depending on the manufacturing process of the stamp(s) or seal(s)

5.2.1 If the comparison of the impressions (questioned to questioned or questioned to known) reveals inconsistencies in class characteristics, this indicates exclusion. Discontinue this procedure and report accordingly.

5.2.2 Examine the impressions(s) macroscopically and microscopically, using direct and oblique lighting, to determine whether any non-print areas, extraneous markings, or alignment problems are present. These are usually considered defects and may be identifying characteristics. Note, at a minimum, the size, shape, and location of the defects.

5.2.2.1 If the impression is from a dry seal, ensure that the front and back of the impression are examined.

5.3 If a known stamp or seal is received, note, at a minimum, the class characteristics of the known stamp(s) or seal(s), which include:

- Design
- Format

- Size
- Wording
- Alignment may be a class characteristic depending on the manufacturing process of the stamp(s) or seal(s).

5.3.1 If the known stamp(s) or seal(s) is not consistent in class characteristics with the questioned impression(s), this indicates exclusion. Discontinue this procedure and report accordingly.

5.3.2 If the known stamp(s) or seal(s) is consistent in class characteristics with the questioned impression(s), examine the stamp(s) or seal(s) visually and note, at a minimum, its condition (e.g., clean, dirty, worn, damaged).

5.3.3 Examine the known stamp(s) or seal(s) macroscopically and microscopically, using direct and oblique lighting, to determine whether any defects are present. These defects may be identifying characteristics. Note, at a minimum, the size, shape, and location of the defects.

Redacted

5.3.3.1 Photograph and/or otherwise record the condition, to include any transitory defects observed, of the submitted known stamp(s) or seal(s). The Keyence Digital Microscope (for performance and verification frequency, refer to the Keyence Performance logbook nearest the instrument) may prove useful for these purposes.

5.3.3.2 Redacted

5.3.4 Make known impressions with the stamp(s) or dry seal(s), as received, using materials similar to the questioned items, if possible. Known impressions should be made using varying pressures and/or rolling techniques.

5.3.4.1 After impressions have been made with the stamp(s) or dry seal(s), **Redacted** clean the stamp(s) or seal(s) and make an additional set of known impressions.

5.4 Conduct a side-by-side comparison of the questioned and/or known impressions or the impression(s) to the known stamp(s) or seal(s) using sufficient lighting and magnification to allow fine detail to be distinguished. The digital microscope or VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments) may be useful. Compare and evaluate identifying characteristics accordingly.
Redacted

5.5 Evaluate the similarities, differences, and limitations. Determine their significance individually and in combination.

5.6 Make notations in the examination records. Include, at a minimum, any impressions made during the examination process, as well as any printouts, photographs, or drawings of any class, identifying, and/or eliminating characteristics observed during the examination process that were used to support your conclusions.

5.7 Conclusions

5.7.1 Conclusions when comparing a questioned impression(s) to a stamping device/dry seal:

- **Identification** – The determination that the questioned impression(s) was prepared by a particular stamping device/dry seal due to agreement in identifying characteristics. No differences that would preclude an identification were observed.

- **May Have Prepared** – A less than definitive determination that a particular stamping device/dry seal, or its duplicate, was used to prepare the questioned impression(s). There is a correspondence in characteristics between the device/seal and the questioned impression(s); however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** – No determination can be reached whether the stamping device/dry seal was or was not used to prepare the questioned impression(s). There may be correspondence in class characteristics between the device and impression(s), however, there are factors that significantly limit meaningful examinations. These factors can include the absence or limited quantity of identifying characteristics in the questioned and known impressions, non-original items, lack of sufficient quantity of items, prior destructive forensic examinations, or the lack of detail and clarity in the impressions. This opinion requires explanation of limiting factors.
- **May Not Have Prepared** – A less than definitive determination that a particular stamping device/dry seal was not used to prepare the questioned impression(s). There is a lack of correspondence in characteristics between the device/seal and questioned impressions(s). Some inconsistencies are noted but limitations are present. This opinion requires explanation of the limiting factors.
- **Elimination** – A determination that the questioned impression(s) was not prepared by a particular stamping device/dry seal due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.7.2 Conclusions when comparing an impression(s) to an impression(s):

- **Items Share a Common Source** - A determination that the impressions originated from a common source due to agreement in identifying characteristics. The common source may include the same stamping device/dry seal, duplicate stamps, or any of the components used to create the device/seal (e.g., artwork). No differences that would preclude a definitive conclusion were observed.
- **May Share a Common Source** - A less than definitive determination that two or more impressions originated from a common source. The common source may include the same stamping device/dry seal, duplicate stamps, or any of the components used to create the device/seal (e.g. artwork). The comparison of the impressions reveals no significant, reproducible, or inexplicable differences. There is significant agreement in all observable aspects of the

results; however, limitations are present. This opinion requires explanation of limiting factors.

- **No Conclusion/No Determination** - No determination can be reached whether the items originated/did not originate from a common source. There may be correspondence in class characteristics between the impressions, however, there are factors that significantly limit meaningful examinations. These factors can include the absence or limited quantity of identifying characteristics within the impressions, non-original items, lack of sufficient quantity of items, prior destructive forensic examinations, or the lack of detail and clarity in the impressions. This opinion requires explanation of limiting factors.
- **May Not Share a Common Source** - A less than definitive determination that two or more impressions did not originate from a common source. Common source may include the same stamping device/dry seal, or any of the components used to create the device/seal (e.g. artwork). The comparison of the impressions reveals reproducible and inexplicable variations. Inconsistencies are observed; however, limitations are present. This opinion requires explanation of the limiting factors.
- **Do Not Share a Common Source** - A determination that the impressions did not originate from a common source (to include the stamping device/dry seal, or any of the components used to create the device/seal) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- **Redacted**
- Insufficient quantity of original material submitted for examination.
- Prior destructive forensic examinations such as latent print processing.

- Lack/limited number of sufficient suitable identifying characteristics.
- **Redacted**

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

ASTM E 2286, "Standard Guide for Examination of Dry Seal Impressions," *Annual Book of ASTM Standards*, Vol 14.02.

ASTM E 2289, "Standard Guide for Examination of Rubber Stamp Impressions," *Annual Book of ASTM Standards*, Vol 14.02.

Cadigan, James, "Examination of Rubber Stamp Impressions," Federal Bureau of Investigation.

Casey, Maureen A., "The Individuality of Rubber Stamps," *Forensic Science International*, 12, 1978.

Ellen, David, *Scientific Examination of Questioned Documents: Methods and Techniques Third Edition*, CRC Press, Boca Raton, FL, 2006.

Herbertson, Gary, *Rubber Stamp Examinations: A Guide for Forensic Document Examiners*, Wide Line Publishing, Colorado Springs, CO, 1997.

Herkt, A., "Rubber Stamps, Manufacture and Identification," *Journal of the Forensic Science Society*, Vol. 25:1, 1985.

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

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

Seaman Kelly, J., *Forensic Examination of Rubber Stamps: A Practical Guide*, Charles C. Thomas Publisher, Ltd., Springfield, IL, 2002.

Vastrick, T.W., "The Examination of Notary Seals," *Journal of Forensic Sciences*, JFSCA, Vol. 7, No. 4, Oct. 1982, p. 899-911.

"Rubber Stamps and Rubber Stamp Impressions as Evidence," Federal Bureau of Investigation.

Rev. #	Issue Date	History
4	03/01/18	Minor typographical corrections made throughout document, as necessary. 2 Equipment/Materials/Reagents, seventh bullet, changed 100 to the "200" HSI. 5.3.3.1, added, "for performance and verification frequency, refer to the Keyence Performance logbook nearest the instrument)" 5.4 added "(for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)"
5	01/15/20	Removed "or its duplicate" from "Identification" "May Not Have Prepared" and "Elimination" sections of 5.7.1 and "May Not Share a Common Source" and "Do Not Share a Common Source" sections of 5.7.2. Added the word "stamps" to "Items Share a Common Source" and "May Share a Common Source" in Section 5.7.2, and added last bullet in Section 8 "Limitations".

Approval

Redacted - Signatures on File

Questioned Documents
 Unit Chief

Date: 01/14/2020

Questioned Documents
 Technical Leader

Date: 01/14/2020

Questioned Documents Unit (QDU)

Procedures for Conducting Footwear and Tire Tread Examinations

1 Scope

These procedures apply to examiners, analysts and unit chief in the QDU for the examination of impressions made by footwear, tires, and gloves using both the Legacy system and Forensic Advantage (FA). Glove impressions are those made by rubber/vinyl gloves or knit/woven gloves with areas of patterned rubber/vinyl. Patterned impressions made by other objects may be examined as well, if approved by the Unit Chief.

2 Equipment/Materials/Reagents

- Foster and Freeman Crime-Lite™ 80-L Light Source or comparable equipment
- Magnification (hand magnifier 2X to 5X)
- Foster and Freeman Electrostatic Dust Lifter or comparable equipment
- Spex Crimescope CS-16 Forensic Light Source or comparable equipment
- Foster and Freeman Electrostatic Detection Apparatus (ESDA) or comparable equipment
- Reagent Grade JT Baker Saturated Potassium Sulfate Solution
- ODV, Incorporated Gelatin Lifters or equivalent
- Kinderprint White Adhesive Tape Lifters
- Armor Forensic Black Fingerprint Powder
- Brayer Roller
- Kinderprint #2-6025 Clear Adhesive Sheets or equivalent
- Kinderprint #2-8025 Clear Acetate Sheets or equivalent
- Kodak 4955 “Roller Transport Cleanup Film” or equivalent
- Identicator® LE 25 Inkless Footprint Materials or equivalent
- Melinex ICI #454 mil Optically Clear Drafting Film
- Speedball®, #3550 Black Oil-Based Block Printing Ink
- Charrette Crescent #0 (Zero) Board or equivalent
- Bio-foam®, soil, sand or other material
- Dentsply #99043 Dental Stone casting material or equivalent
- Lab Safety #4BW-4573 Disposable foot covers or equivalent
- Brushes
- Enhancement reagents (Refer to *QDU Chemical Enhancement Manual*)
- Scanner
- Computer
- Adobe® Photoshop, or comparable software
- HP Printer or equivalent

- Nikon D610 Digital Camera or equivalent
- Nitrile Gloves or equivalent
- Lab Coat
- Legal Size Coated File Folders or equivalent

3 Standards and Controls

Refer to the *QDU Chemical Enhancement Manual* for complete procedures for conducting chemical enhancements.

4 Sampling

Not Applicable.

5 Procedures

5.1 Procedures for Handling Submitted Items

5.1.1 Casts

If a cast is submitted for examination, determine whether the item is a plaster cast or a dental stone cast.

5.1.1.1 Plaster Casts

Clean with a soft brush to remove extraneous material, taking care not to damage the cast impression. Do not use water on a plaster cast. If a plaster cast gets wet, the cast will disintegrate and be damaged. The cast will be photographed and natural size photographs may be printed as needed. If soil examinations are requested, they will be conducted prior to the removal of any extraneous material from the cast.

5.1.1.2 Dental Stone Casts

Clean with a soft brush and water to remove extraneous material, taking care not to damage the cast impression; a saturated solution of potassium sulfate may be used to remove adhering debris. Casts will be photographed and natural size photographs may be printed as needed. If soil examinations are requested, they will be conducted prior to the removal of any extraneous material from the cast.

5.1.2 Lifts

5.1.2.1 Examine electrostatic dust lifts in total darkness with an oblique light source.

5.1.2.2 Examine gelatin lifts in total darkness, after removing the polyester cover, using a Crime-Lite, Crimescope, or comparable light source at an oblique angle. Use ultraviolet light, if appropriate.

5.1.2.3 Examine adhesive lifts with visible light and ultraviolet light, if appropriate.

5.1.2.4 Lifts will be photographed or scanned and natural size photographs may be printed as needed.

5.1.3 Digital Images, Photographs, and Negatives

5.1.3.1 If photographs are submitted without negatives, contact the contributor to have original negatives submitted, if available.

5.1.3.2 Negatives will be submitted to the Forensic Imaging Unit (FIU) for scanning and printing, as directed by the Examiner or analyst.

5.1.3.3 Digital images will be submitted to FIU for natural size prints, as directed by the Examiner or analyst.

5.1.3.4 Digital images, photographs, and/or negatives without a proper scale may be able to be sized using other objects in the digital image, photograph, and/or negative.

5.1.3.5 Digital images, photographs and/or negatives created with the film plane at any position that is not parallel to the impression may be able to be rectified using the scale or other object in the photograph and/or negative.

5.1.4 Original Items Bearing Impressions

5.1.4.1 The original item bearing an impression will be photographed or scanned and natural size photographs may be printed as needed. If an item is submitted to FIU, the transfer will be recorded on the appropriate Chain-of-Custody Log.

5.1.4.2 After an item is photographed, the Examiner will visually examine the item to determine its suitability for chemical or physical enhancement to improve the clarity of the impression.

5.1.4.3 If the item is suitable for physical enhancement, an impression may be lifted from the item using various methods, including: electrostatic, gelatin, adhesive, and ESDA.

5.1.4.3.1 If an impression is lifted, the lift will be submitted to FIU for photography, and natural size photographs may be printed as needed. If an item is submitted to FIU, the transfer will be recorded on the appropriate Chain-of-Custody Log.

5.1.4.3.2 When an examiner or analyst lifts an impression from an original item of evidence, the prepared lift will be treated as secondary evidence.

5.1.4.3.3 For Legacy cases, lifts will be identified with the item identifier of the item from which the impression was lifted (e.g., Q1 Lift1).

5.1.4.3.4 For FA cases, a new item number will be assigned to the lift(s) and the examiner or analyst will then label each lift with the new item number and his/her initials.

5.1.4.3.5 A *QDU-19 Secondary Evidence Inventory*, or equivalent in FA, will be completed. Refer to the *QDU Evidence Handling Procedures for Legacy Cases* and *QDU Evidence Handling Procedures Using Forensic Advantage (FA)* for further guidance.

5.1.4.4 If the item is deemed suitable for chemical enhancement, the examiner or analyst will contact the contributor for permission to chemically enhance the item.

5.1.4.4.1 Depending on the background color and porosity of the questioned item, determine the appropriate chemical enhancement method for the item and follow the procedure outlined in the *QDU Chemical Enhancement Procedures Manual*.

5.1.4.4.2 An item that has been chemically enhanced will be submitted to FIU for photography, and natural size photographs may be printed as needed. If an item is submitted to FIU, the transfer will be recorded on the appropriate Chain-of-Custody Log.

5.1.5 Footwear, Tires, or Other Known Items

5.1.5.1 Footwear, tires, or other known items will be photographed and natural size photographs may be printed as needed. If an item is submitted to FIU, the transfer will be recorded on the appropriate Chain-of-Custody Log. Photography will be performed prior to conducting examinations.

5.2 Database Searches

5.2.1 If the submitted item requires a database search, refer to the *QDU Procedures for Conducting a Footwear Database Search* and/or *QDU Procedures for Conducting A Tire Tread Database Search*.

5.2.2 If the submitted item does not have sufficient detail for a database search to be conducted, no database search will be conducted. Record and report accordingly.

5.3 Comparison Procedures

5.3.1 Examine the questioned impression to determine if there are sufficient gross design features observed to conduct a comparison.

5.3.1.1 If there is insufficient detail and clarity observed in the questioned impression, no examinations will be conducted. Record and report accordingly.

5.3.2 Compare the questioned impression to the known item to determine if they correspond in class characteristics (e.g., design, physical size, wear/general condition).

5.3.2.1 If a difference in any class characteristic is observed between the questioned impression and the known item, an elimination may be possible. The Examiner must be aware of the date of the crime and the date of the collection of the known item. This is of particular significance if a difference in wear is observed between the impression and the known item. In addition, when a known tire is submitted to the Laboratory for comparison, record the DOT (Department of Transportation) number to verify that the tire was manufactured prior to the date of the crime.

5.3.3 If the class characteristics correspond between the questioned impressions and the known item, prepare test impressions from the known item utilizing one or more of the following procedures:

- Two dimensional impressions of footwear outsoles or other known items using fingerprint powder/adhesive sheets: Apply fingerprint powder to the footwear outsole or other known item, put the footwear on your foot, step onto clear adhesive material, and cover the resulting impression with a clear acetate sheet. Apply fingerprint powder to other known items and press them into contact with clear adhesive material and cover the resulting impression(s) with a clear acetate sheet.
- Two dimensional impressions of footwear outsoles using fingerprint powder/roller transport film: Apply fingerprint powder to the footwear outsole, put the footwear on your foot, wet one side of the roller transport film, remove excess water with a single pass of a squeegee, step onto the dampened film, and allow the resulting impression(s) to dry.
- Two dimensional impressions of footwear outsoles or other known items using inkless Identicator[®] pad and treated paper: “Ink” the footwear outsole by placing the footwear on your foot and pressing it repeatedly against the inkless pad, step onto the treated paper, and allow the resulting impression to dry. “Ink” other known items by pressing repeatedly against the inkless Identicator[®] pad, press the coated item against the treated paper, and allow the resulting impression(s) to dry.
- Three dimensional impressions of footwear outsoles or other known items using Bio-foam[®], modeling clay, soil, or other substrates as deemed necessary: Put the footwear on your foot and step into the Bio-foam[®], dampened soil, or other substrate to the desired depth to record a three dimensional impression of the footwear outsole. Press other known items into

the chosen substrate. The resulting impression(s) may be photographed or cast with dental stone and the resulting cast photographed. If a dental stone cast is made, allow cast to harden before removal from Bio-foam®.

- Two dimensional impressions of tires using drafting film and oil-based printing ink: Measure the circumference of the tire and cut two pieces of 18" wide zero board to the circumference of the tire plus 6". Apply a thin layer of printing ink to one board with a spatula and Brayer roller. Tape a 12" wide clear piece of drafting film down the center of the second board. Mount the tire on a vehicle, and push the vehicle with the tire over the inked board, then over the drafting film. Allow the resulting impression to dry.

5.3.4 Visually compare questioned items and/or natural size photographs of questioned items and known items using the prepared test impressions for correspondence of class characteristics (e.g., physical size, design, wear/general condition) and/or randomly acquired characteristics (e.g., cuts, nicks, defects).

5.3.4.1 Areas of the known tire(s) that correspond with the questioned items will be marked and photographed. Known footwear or other known items will be submitted to FIU for additional photography of randomly acquired characteristics as directed by the Examiner.

5.3.4.2 If known footwear/tires are eliminated as a source of the item, a record copy of the outsole design or tread pattern will be maintained in the case record.

5.3.5 Record the examination results in case notes and annotate photographs or photocopies of the questioned items, known items, and/or test impressions where appropriate. Include all characteristics observed during the examination process that support conclusions.

5.4 Conclusions

- **Identification** - In the opinion of the Examiner, the footwear/tire is the source of the impression because there is sufficient quality and quantity of corresponding features such that he/she would not expect to find that same combination of features repeated in another source. This is the highest degree of association between a questioned impression and a known source. This opinion requires that the questioned impression and the known source correspond in class characteristics and also share one or more randomly acquired characteristics. This opinion acknowledges that an identification to the exclusion of all others can never be empirically proven.
- **Probably made** - In the opinion of the Examiner, the footwear/tire probably made the impression and it is unlikely that another footwear/tire is the source of the impression; however, there are limitations which prevent effecting an identification. This opinion indicates a high degree of association between the questioned impression and the known source, which is based on the

correspondence of class characteristics in combination with specific wear and/or randomly acquired characteristics.

- **Could have made** - In the opinion of the Examiner, the footwear/tire is a possible source of the impression, but other footwear/tires with the same class characteristics are also included in the population of possible sources. This opinion indicates an association of class characteristics (e.g., outsole design and physical size for footwear, tread design and tread dimension for tires) between the questioned impression and the known source. Correspondence of general wear may also be present.
- **Could not be determined** - In the opinion of the Examiner, it could not be determined if the known footwear/tire is the source of the impression. This opinion indicates that similarities and/or differences in class characteristics were noted between the questioned impression and the known source, but there are significant limiting factors within the evidence that do not allow for a specific association or non-association.
- **Indications did not make** - In the opinion of the Examiner, the evidence indicates that the footwear/tire is not the source of the impression, but there are limitations which prevent eliminating the footwear/tire. This opinion indicates a degree of non-association between the questioned impression and the known source, which is based on observed dissimilarities.
- **Elimination** - In the opinion of the Examiner, the footwear/tire is not the source of the impression. This opinion is the highest degree of non-association between a questioned impression and a known source. This opinion requires an observable difference in class and/or randomly acquired characteristics between the questioned impression and the known source.
- **Unsuitable** – In the opinion of the Examiner, the submitted evidence is unsuitable to conduct footwear/tire examinations. This opinion indicates one of the following: there are significant limitations which prevent the Examiner from conducting a meaningful comparison between the questioned impression and the known source; or no discernible footwear/tire impressions were observed on the questioned item which prevents the examiner from conducting any comparisons.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

Some of the factors that may limit the examination of footwear/tire impression evidence include the following:

- Poor condition/age of the items.
- Prior destructive forensic examinations.
- Lack of sufficient detail in the impression.
- Lack of a proper scale in impression photographs.
- Improper scale placement in impression photographs.
- Improper alignment of film plane with impression.
- Non-availability of original impression source.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space. Personal protective equipment will be worn at all times.

10 References

FBI Laboratory Safety Manual

QDU Chemical Enhancement Procedures Manual

QDU Procedures for Conducting A Footwear File Search

QDU Procedures for Conducting A Tire Tread File Search

QDU Quality Assurance Manual

Bodziak, W. J., *Footwear Impression Evidence*, 2nd ed.; CRC Press: Boca Raton, FL, 2000.

Nause, L., *Forensic Tire Impression Identification*, Canadian Police Research Centre: Ottawa, ON, Canada, 2001.

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Music, D., Bodziak, W.J. A Forensic Evaluation of the Air Bubbles Present in Polyurethane Shoe Outsoles As Applicable in Footwear Impression Comparisons. Journal of Forensic Sciences September 1988; 33(5).

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Rev. #	Issue Date	History
7	03/01/18	1 Scope added “examiners, analysts and unit chief in the QDU for”, deleted “or designee” 5.1.3.2 deleted “designee”, added “analyst” 5.1.3.3 deleted “designee”, added “analyst” 5.1.4.1 deleted <i>Chain-of-Custody Log</i> (7-243 and/or 7-243a), or equivalent in FA, will be used.”, added “transfer will be recorded on the appropriate Chain-of-Custody Log.” 5.1.4.3.1, deleted “ <i>Chain-of-Custody Log</i> 7-243 and/or 7-243a), or equivalent in FA, will be used.” added, “transfer will be recorded on the appropriate Chain-of-Custody Log.” 5.1.4.3.2 deleted “designee”, added “analyst” 5.1.4.3.4 deleted “designee”, added “analyst” 5.1.4.4 deleted “designee”, added “analyst” 5.1.4.4.2 deleted “ <i>Chain-of-Custody Log</i> 7-243 and/or 7-243a), or equivalent in FA, will be used.”, added “transfer will be recorded on the appropriate Chain-of-Custody Log.” 5.1.5.1, deleted “ <i>Chain-of-Custody Log</i> (7-243 and/or 7-243a), or equivalent in FA, will be used.”, added “transfer will be recorded on the appropriate Chain-of-Custody Log.”
8	04/19/18	In section 2 Equipment/Materials/Reagents deleted Stereo Microscope (5X to 30X), Foster and Freeman Video Spectral Comparator (VSC) or comparable equipment, and Aristo DA-17 Ultraviolet Light Source or comparable equipment as these items are no longer in use.

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 04/18/2018

Footwear/Tire Tread
Technical Leader

Date: 04/18/2018

QA Approval

Quality Manager

Date: 04/18/2018

Questioned Documents Unit (QDU)

Procedures for Conducting a Footwear Database Search

1 Scope

This document applies to examiners, analysts and the unit chief in the QDU for conducting footwear database searches.

The footwear database is used to determine the make (or brand name) and model of an item of footwear under the following conditions:

- The contributor requested a determination of the make and model of the item of footwear that could have made a questioned footwear impression.
- The contributor requested a determination of the make and model of an item of footwear recovered from a crime scene or from unidentified human remains.
- The contributor requested a determination of the make and model of the item of footwear that is depicted in images.

In this document, the term *database* refers collectively to the SoleMate and Sole Searcher databases, the Internet, and other reference materials. In this document, the term *questioned item* refers collectively to a footwear impression, an item of footwear or an image depicting an item of footwear. In this document, the term *image* refers collectively to multimedia including film negatives, photographs, digital images and videos.

The results of the make/model determination can be used to provide investigative assistance or aid in conducting forensic comparisons.

2 Equipment/Materials/Reagents

- Digital imaging system
- Digital imaging software
- Foster and Freeman SoleMate database
- FBI Sole Searcher database
- Internet
- Other reference literature

3 Standards and Controls

Not applicable.

4 Sampling

Not applicable.

5 Procedures

5.1 A search of the submitted item(s) will be recorded in the examiner's case notes. A footwear make/model determination requires manually searching the database via a side-by-side comparison of the questioned item with footwear contained in the database.

5.1.1 Images of evidence may be searched in the database directly.

5.1.2 Original evidence will be photographed or scanned prior to searching the database.

5.1.3 It may be necessary to make prints from images prior to searching the database.

5.2 For adding to, maintaining, and searching items in the SoleMate and Sole Searcher databases, refer to the users manuals provided by the manufacturers.

5.3 Search results will be recorded in the examiner's case notes.

5.4 The examiner will report the results of the make/model determination under the "Results of Examinations" heading of the report. The results will be reviewed according to the procedures set forth in the following documents: *QDU Case Records and Review for Legacy Cases* and/or the *QDU Case Records and Review for Cases in Forensic Advantage (FA)*.

5.5 Conclusions

- **Association** – The questioned item that was searched has features that correspond to one or more items of footwear in the database. This association is made solely on information contained in the database.
- **No Association** – The questioned item that was searched was not associated with an item of footwear in the database.
- **Not Suitable for a Database Search** – The questioned item lacks sufficient detail or is too damaged to conduct a database search.
- No discernible footwear impression was observed.

6 Calculations

Not applicable.

7 Measurement Uncertainty

Not applicable.

8 Limitations

The following factors may prevent associating a questioned item with an item of footwear in the database:

- The database is not comprehensive.
- The questioned item is limited in detail.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

Equipment/Software Manuals

Rev. #	Issue Date	History
4	03/03/15	Updated entire document to reflect current and new processes, including the use of Forensic Advantage.
5	03/01/18	1 Scope added, "This document applies to examiners, analysts and the unit chief in the QDU for conducting footwear database searches."

Redacted - Signatures on File

Approval

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU) Procedures for Conducting a Tire Database Search

1 Scope

This document applies to examiners, analysts and the unit chief in the QDU for conducting tire database searches.

The tire database is used to determine the make (or brand name) and model of a tire under the following conditions:

- The contributor requested a determination of the make and model of the tire that could have made a questioned tire impression.
- The contributor requested a determination of the make and model of a tire (or piece of a tire such as the tread or sidewall) recovered from a crime scene.
- The contributor requested a determination of the make and model of the tire that is depicted in images.

In this document, the term *database* refers collectively to the Tread Design Guide, Tire Business publication, the Internet, and other reference materials. In this document, the term *questioned item* refers collectively to a tire impression, a tire (or a piece of a tire) or an image depicting a tire. In this document, the term *image* refers collectively to multimedia including film negatives, photographs, digital images and videos.

The results of the make/model determination can be used to provide investigative assistance or aid in conducting forensic comparisons.

2 Equipment/Materials/Reagents

- Digital imaging system
- Digital imaging software
- Clear acetate
- Tread Design Guide
- Tire Business publication
- Internet
- Other reference literature

3 Standards and Controls

Not applicable.

4 Sampling

Not applicable.

5 Procedures

5.1 A search of the submitted item(s) will be recorded in the examiner's case notes. A tire make/model determination requires manually searching the database via a side-by-side comparison of the questioned item with tires contained in the database.

5.1.1 Images of tire impressions must be reversed prior to searching the database.

5.1.2 Cast tire tread impressions can be searched in the database directly without reversing.

5.1.3 Lifts or tire impressions must be oriented in the proper direction depending on the type of lift. This must be done prior to searching the database.

5.1.4 It may be necessary to make prints from images prior to searching the database.

5.2 For adding to, maintaining, and searching items in the database, refer to the users' manuals provided by the software manufacturer.

5.3 Search results will be recorded in the examiner's case notes.

5.4 The examiner will report the results of the make/model determination under the "Results of Examinations" heading of the report. The results will be reviewed according to the procedures set forth in the following documents: *QDU Case Records and Review for Legacy Cases* and/or the *QDU Case Records and Review for Cases in Forensic Advantage (FA)*.

5.5 Conclusions

- **Association** – The questioned item that was searched has features that correspond to one or more tires in the database. This association is made solely on information contained in the database.
- **No Association** – The questioned item that was searched was not associated with a tire in the database.
- **Not Suitable for a Database Search** – The questioned item lacks sufficient detail or is too damaged to conduct a database search.
- No discernible tire tread impression was observed.

6 Calculations

Not applicable

7 Measurement Uncertainty

Not applicable.

8 Limitations

The following factors may prevent associating a questioned item with a tire in the database:

- The database is not comprehensive.
- The questioned item is limited in detail.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Quality Assurance Manual

Equipment/Software Manuals

Rev. #	Issue Date	History
4	03/03/15	Updated entire document to reflect current and new processes, including the use of Forensic Advantage.
5	03/01/18	1 Scope added, "This document applies to examiners, analysts and the unit chief in the QDU for conducting tire database searches."

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 02/28/2018

Footwear/Tire Tread
Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Conducting Typewriting and Computer-Generated Text Examinations

1 Scope

These procedures will be used by a forensic document examiner to conduct examinations, classifications, and comparisons of typewriters, typing elements, and/or items containing typewritten impressions. These procedures will also be used to examine computer-generated text.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Typewriter measurement grids or standard ruler
- Typewriter standards
- Reference materials

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the items using lighting and magnification sufficient to allow fine detail to be distinguished, in order to determine whether the text to be examined is typewritten or computer-generated. If the text is computer-generated, refer to Section 5.9. If the text is typewritten, note the physical properties of the typewriting in the examination records. The following characteristics should be noted:

5.1.1 The technology used to prepare the typewriting (e.g., typebar or single element).

5.1.1.1 A typebar typewriter uses typefaces attached to individual typebars that move individually to print the desired character when each key is struck. **Redacted**

5.1.1.2 A single element typewriter uses a printing element (e.g., ball, printwheel, or thimble) containing a full set of characters that moves to print the desired character when each key is struck. **Redacted**

5.1.2 The type of ribbon(s) used.

5.1.2.1 A fabric ribbon(s) is usually nylon cloth that contains ink. Fabric ribbon impressions are not crisp, but rather the outlines of characters are somewhat fuzzy or blurry in appearance, and the fabric pattern of the ribbon can usually be observed.

5.1.2.2 A carbon ribbon(s) is usually a carbon wax coating on a polyethylene base. Carbon ribbon impressions usually leave a clear outline of the character that was typed. Carbon ribbons include single-strike paper or film, permanent or lift-off correctable film, and multi-strike film.

5.1.2.3 A thermal ribbon is usually a carbon ribbon that is coated with wax. When heated, the wax adheres to the surface of the paper and can be removed using a scalpel or other such instrument. The edges of the printed characters may be stepped.

5.1.3 The horizontal and vertical spacing of the typewritten text.

5.1.3.1 Measure the horizontal and vertical spacing using grids. Overlay the transparent grids on the typewriting until all the characters evenly fill the boxed fields. Horizontal measurement

must be done on the longest line of continuous typewriting. Vertical spacing must be measured using lines of type that repeat in a regular pattern. A ruler may also be used to make a general determination of the number of characters per inch.

5.1.3.2 Determine whether the size of type is consistent with the measured spacings, both horizontal and vertical. If individual type fills the boxes but does not do so evenly moving across the horizontal space, the size of type may be inconsistent with the spacing used to type it.

5.1.4 The presence of any typewritten corrections and the method or technology of the correction.

Redacted

5.2 Evaluate the consistency of typewriting throughout the document for possible interlineations by attempting to align typewriter grids so that multiple lines of type fall into the grid spaces. When multiple pages are present, each line of each page should be examined to determine consistency with other pages.

5.3 Classify the style of type, which may include the manufacturer of the style of type, and the possible make and model of the typewriter, by referring to the *QDU Procedures for Conducting An Office Equipment File (OEF) Search*.

5.4 Record and evaluate any identifying characteristics which may associate questioned typewriting to a particular machine, exemplars from a known machine, or other questioned typewriting.

Redacted

5.5 If a known typewriting element or typewriter is received, note, at a minimum, the class characteristics, which include:

- Typewriting mechanism (typebar, single element using a ball element, daisy wheel element, or thimble element; manual, electric, or electronic)
- Style of type
- Horizontal character spacing
- Vertical line spacing
- Character pitch (i.e., fixed or proportional)
- Printed manufacturing information on element or typewriter and serial number, if available

Redacted

5.5.2 If the known element(s) or typewriter(s) is not consistent in class characteristics with the typewritten impression(s), this indicates exclusion. Discontinue the procedure and report accordingly.

5.5.3 If the known element(s) or typewriter(s) is consistent in class characteristics with the typed impression(s), examine the element or typewriter and note, at a minimum, its condition (e.g., clean, dirty, worn, damaged).

5.5.4 Examine the known element or typewriter typefaces microscopically, using direct and oblique lighting, to determine whether any defects are present. **Redacted**

5.5.5 Take exemplars from the typewriter, on the stencil setting if possible, using a ribbon appropriate for the machine. The ribbon that was submitted with the machine should not be used to take exemplars. A sheet of carbon paper may be substituted when the appropriate ribbon cannot be used.

5.5.6 To make known impressions of an element when a typewriter has not been submitted, mount the element on another appropriate typewriter if one is available. If such a typewriter is not available, conduct comparisons using the element itself.

5.6 Conduct a side-by-side comparison of the questioned and/or known typed impressions or element(s) using sufficient lighting and magnification to allow fine detail to be distinguished. The digital microscope (for performance and verification frequency, refer to the Keyence Performance logbook nearest the instrument) or VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instrument) may

be useful. Compare and evaluate identifying characteristics accordingly. Redacted

5.7 Evaluate the similarities, differences, and limitations. Determine their significance individually and in combination.

5.8 Make notations in the examination records. Include, at a minimum, any typewritten impressions made during the examination process, as well as any printouts, photographs, or drawings of any class, identifying, and/or eliminating characteristics observed during the examination process that were used to support your conclusions.

5.9 If the item(s) being compared contain computer-generated text, note the technology used to prepare the text.

5.10 Using sufficient lighting and magnification to allow fine detail to be distinguished:

5.10.1 Examine the computer-generated text. Note the general class characteristics, including:

- Width of font (thin/thickness of characters)
- Serif, sans serif, ornamental, or script style
- Weight of characters (blackness/lightness)
- Stylistic variants (regular/italic)

5.10.1.1 Size is not considered a characteristic of value when examining computer-generated texts, since digital fonts can be scaled to any size.

5.10.2 Classify the style(s) of computer-generated text, if necessary, by following these procedures:

- Determine how many different fonts are present on each item based on general class characteristics.
- Create a character set for each font.
- Classify each font based on the style (e.g., serif, sans serif, slab serif, geometric, script, ornamental, headline).
- Note any unusual characters in the font.
- Conduct a font search using published resources, Redacted
- Determine the font based on correspondence of all observed features.

5.10.2.1 Many fonts are similar and appear indistinguishable. Therefore, it may not be possible to narrow a search to a particular font.

5.10.3 Conduct a side-by-side comparison of the text on the item(s).

5.11 Evaluate the similarities, differences, and limitations of the features of the text being compared. Determine their significance individually and in combination.

5.12 Make notations in the examination records. Include any reference information, printouts, photographs, overlays, or drawings of any characteristics observed during the examination process that will support your findings or conclusions.

5.13 If printing voids are observed in a character, refer to the *QDU Procedures for Conducting Graphic Arts, Photocopiers, and Printer Examinations*.

5.14 Conclusions

Once examinations have been completed, reports may include one or more of the following conclusion(s):

5.14.1 Conclusions when determining whether a particular typewriter or typing element prepared a questioned document(s):

- **Identification** – A determination that the questioned typewritten text was prepared by the known typewriter or typing element due to agreement in identifying characteristics. No differences which would preclude an identification were observed.
- **May Have Been Used** – A less than definite determination that a particular typewriter or typing element was used in the preparation of the questioned document(s). There is a correspondence in characteristics between the typewriter/typing element and the questioned document(s); however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion** – No determination can be reached as to whether a particular typewriter or typing element was or was not used in the preparation of the questioned document(s) due to significant limitations. This opinion requires explanation of the limiting factors.
- **May Not Have Been Used** – A less than definite determination that a particular typewriter or typing element was not used in the preparation of the questioned document(s). There is a lack of correspondence in characteristics between the typewriter/typing element and the questioned document(s) and

some inconsistencies are noted; however, limitations are present. This opinion requires explanation of the limiting factors.

- **Elimination** – A determination that a particular typewriter or typing element was not used in the preparation of the questioned document(s) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.14.2 Conclusions when determining whether two or more typewritten documents share a common source:

- **Items Originated from a Common Source** - A determination that the items originated from a common source (e.g., typewriter, typing element) due to agreement in identifying characteristics. No differences which would preclude a definitive conclusion were observed.
- **May Have Originated from a Common Source** - A less than definite determination that the typewritten items originated from a common source. There is significant agreement in observed characteristics of the typewritten impressions and no significant, reproducible, or inexplicable differences are noted; however, limitations are present. This opinion requires explanation of the limiting factors.
- **No Conclusion/No Determination** - No determination can be reached whether the items originated/did not originate from a common source. Although there may be correspondence in class characteristics between the items, factors are present that significantly limit meaningful examinations. This opinion requires explanation of the limiting factors.
- **May Not Have Originated from a Common Source** - A less than definite determination that the items did not originate from a common source. Reproducible and inexplicable variations are found at some level in the analysis. Inconsistencies are observed, however limitations are present. This opinion requires explanation of the limiting factors.
- **Did Not Originate from a Common Source** - A determination that the typewritten items did not originate from a common source (e.g., typewriter, typing element) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.14.3 Conclusions when conducting an examination of items containing computer-generated text:

- The style of font(s).

- **Corresponds in Class Characteristics** - When the comparison of two or more bodies of text reveals correspondence in all observed class characteristics with no significant, inexplicable differences, it may be concluded that the styles of computer-generated text are in agreement. This conclusion does not eliminate the possibility that the font used to prepare the text being compared is different, but is so close in design that they are virtually indistinguishable. Limitations may be present and should be explained.
- **No Conclusion/No Determination** - No determination can be reached whether the item(s) being compared contain the same style of computer-generated text. Although there may be correspondence in class characteristics between the styles of text, factors are present that limit the examinations. This opinion requires explanation of the limiting factors.
- **Elimination** - A determination that the item(s) being compared do not contain the same styles of computer-generated text due to sufficient disagreement in general class characteristics. Significant differences are observed.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

Redacted

- Lack of sufficient comparability between the text being compared.
- Prior destructive forensic examinations such as latent print processing.
- Lack of/limited identifying characteristics.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance.

Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

ASTM E 2494, "Standard Guide for Examination of Typewritten Items," *Annual Book of ASTM Standards*, Vol 14.02.

Attenberger, David W. and Kanaskie, W. Gary, Examination of a Typewritten Document, *FBI Law Enforcement Bulletin*, June 1981. (57)

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

Redacted

Rev. #	Issue Date	History
4	03/03/15	Changed Header to read "QDU Standard Operating Procedures Manual". Section 2 added bullets 5 and 7, replaced "equivalent" with "comparable equipment" and "instrumentation" with "equipment". Removed Section 4 and renumbered document accordingly. Section 5.1 changed referenced section to account for renumbering. Section 5.1.1 changed "i.e." to "e.g.". Section 5.1.1.1 added third bullet. Section 5.1.1.2 changed second bullet to read "Relatively consistent depths of impressions". Section 5.1.2.1 revised the second sentence. Section 5.1.2.2 changed "letter" to "character". Sections 5.6 and 5.10 changed "lighting and magnification of sufficient intensity" to "sufficient lighting and magnification". Section 5.6 added "digital microscope or". Revised and reworded Section 5.14.1, added Section 5.14.2 and renumbered remainder of document accordingly. Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Section 8 first bullet hyphenated "Nonoriginal" and added "/limited" to last bullet. Made grammatical changes and formatting adjustments throughout document, where necessary.
5	03/01/18	2 Equipment/Materials/Reagents seventh bullet, deleted 100, added "200" for HSI 5.6 added "(for performance and verification frequency, refer to the Keyence Performance logbook nearest the instrument)" "(for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)"

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Questioned Documents
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018

Questioned Documents Unit (QDU)

Procedures for Preserving Liquid Soaked Documents

1 Scope

These procedures will be used by a forensic document examiner for the preservation of liquid soaked documents to facilitate subsequent examinations. The particular methods employed in a given case will depend upon the nature of the material available for examination.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 100 QD, or comparable equipment
- Picks (e.g., dental) and tweezers
- Atomizer
- Bone folder or similar device
- Drying rack
- Fume hood
- Humidity Chamber
- 12" x 17" pan with wire screen, or comparable equipment
- Chamber vacuum sealer
- Commercial heat sealable vacuum bags
- Rigid clear polyethylene film

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Visually examine the items using lighting and magnification sufficient to allow fine detail to be distinguished. Include the following in the examination records:

5.1.1 Nature and Condition of the Document(s)

Visually assess if evidence is a single page or multi-page document. Also, assess if the document(s) is soaked, damp, or dried.

5.1.2 Nature of the Liquid(s)

Based on case documentation, assess to the extent possible if the liquid was water-based or another type of liquid, such as gasoline or diesel fuel. Precautions should also be exercised for liquids considered chemical or biological hazards.

5.1.3 Extent of the Effect from the Liquid(s)

Assess to the extent possible if the liquid caused ink damage to the writing or printing on the document(s).

5.2 Preservation of the Document(s)

5.2.1 For wet, single-page documents, select a method, such as air drying or pressing, and dry the document.

5.2.2 For wet, multi-page documents, determine if the wet pages can be separated without additional damage. If not, select a drying process, such as air drying or pressing.

5.2.3 For dried document(s), attempt to separate, if necessary, and flatten the pages using appropriate equipment such as bone folders, picks, and tweezers. Prior to or during the attempt to separate and flatten the documents, **Redacted**

When submerging the document in water, an appropriate container and screen should be used.

5.2.4 For documents received frozen, **Redacted** refer to 5.2.3. If time does not permit, thaw the documents and treat as wet documents.

5.3 Once the above procedures are completed and the documents are completely dry, encapsulation of the documents may be advisable. Encapsulate the items using polyethylene film and the chamber vacuum sealer in accordance with the instructional CD, *Preservation of Charred Documents Using a Vacuum Sealer*.

5.4 Record images of the evidence using a camera, computer scanner, or photocopier and make notations in the case records. Include any printouts, photographs, or drawings of the

records, pertinent observations, and/or characteristics observed during the preservation/examination process that support the findings or conclusions. The digital microscope, VSC, or comparable equipment may be utilized to recover information.

5.5 Conduct the examinations **Redacted**
requested by the contributor, as well as any others that may be probative. Refer to the appropriate QDU procedures for the examination(s) being conducted.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the preservation process, results rendered, and may also inhibit further examinations:

- **Redacted**
- Excessive discoloration.
- Destruction of physical characteristics due to excessive moisture.
- **Redacted**

9 Safety

Standard precautions should be followed for the handling of liquid-soaked documents contaminated with chemical and biological materials. These documents are potentially hazardous and will be handled and processed in specifically designated areas within the QDU space. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance.

10 References

FBI Laboratory Safety Manual

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

McConnell, Michael P., Questioned Documents: Collection and Examination of Charred and
Watersoaked Documents, FSD, V4, N8, February 1978, pp 178-188. (QDRAC 1704)

Mokrzycki, Gregg M., *Preservation of Charred Documents Using a Vacuum Sealer*. Presented at
Mid-Atlantic Association of Forensic Sciences Meeting, 2001.

Rev. #	Issue Date	History
2	05/18/11	Changed “should” to “will” in Scope. Changed “specimen” to “items” throughout. Changed “documentation” to “records” throughout. Deleted reference to Appendix A in section 11. Added “Include” in 6.1. Changed wording in 6.4 and 6.5.
3	03/03/15	Section 2 added the Keyence Digital Microscope and the ChemImage Hyperspectral Imager to the list of equipment and reworded this section to be consistent with other QDU documents. Removed Section 4 Calibration and renumbered document accordingly. Section 5.1.2 added last sentence. Section 5.3 added “and the documents are completely dry”. Section 5.4 added “images of”, “digital microscope”, and “or comparable equipment”. Section 7 changed “Uncertainty of Measurement” to “Measurement Uncertainty”. Made grammatical corrections throughout document.

Approval


Redacted - Signatures on File

Questioned Documents Unit (QDU)

Procedures for Conducting a Watermark Search

1 Scope

These procedures will be used by a forensic document examiner or document analyst in order to determine the source of identifying marks (i.e., watermarks and brands) placed into or on the paper by the manufacturer, to identify the manufacturer of the paper, and/or to determine when a particular paper became commercially available (for dating purposes).

2 Equipment/Materials/Reagents

- Post's Paper Mill Directories
- Lockwood's Directories
- Lockwood-Post's Directories
- Information provided by paper manufacturers
- Walden's Paper Catalogues
- Walden's ABC Guide & Paper Production Yearbooks
- Phillips International Paper Directories
- Paper manufacturers' websites
- Other related paper source materials obtained by the Laboratory when needed

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 The presence of a watermark(s), as determined in the *QDU Procedures for Initial Assessment of Documentary Evidence*, may necessitate a watermark search if it is a requested examination or if it is determined to be a probative examination. A watermark search may yield information regarding the manufacturer, as well as information regarding commercial introduction of a particular paper (i.e., dating).

5.1.1 Information regarding the manufacturer of an item may be present **Redacted**
While this is not a traditional watermark, probative information similar to watermarks may be gained by following similar search methods using the internet.

5.2 The case examiner may conduct the watermark search, or request that the assigned analyst/technician conduct the search, by recording the request in Forensic Advantage. For Legacy casework, written instructions will be given to the analyst/technician.

5.3 **Redacted**
the watermark is the information that is to be searched. This information can be searched using a variety of reference materials and resources. These resources include QDU watermark references, the internet, **Redacted**
The search may be performed in one of the following ways:

5.4 QDU Watermark References

5.4.1 Manufacturer's information regarding watermarks and brands can be found in the following publications in the QDU's watermark references: Walden's Paper Catalog, Walden's ABC Guide & Paper Production Yearbook, Lockwood's Directory, Lockwood-Post's Directory, and Phillips International Paper Directory.

5.4.1.1 The Lockwood-Post's Directories after 2003 do not contain information regarding watermarks and brands.

Redacted

Redacted

5.7

Redacted

the paper manufacturer may be contacted or the contact information may be provided to the appropriate law enforcement official for investigative assistance. Contact with the paper manufacturer must be recorded on an *Activity and Communication Log* (7-245), or FA Case Communication Log, as appropriate. Information provided by the paper manufacturer that is probative to the case will be recorded and retained in the case records.

5.8 The case records will include, at a minimum, any image files, printouts, referenced pages from paper directories, and photographs or drawings of watermarks that were used to support the conclusions.

5.9 Conclusions

- The text of any watermark(s) present.
- The manufacturer's information for any watermark(s) present.
- The date the watermark(s) became commercially available.
- Other information pertaining to the watermark(s).
- **No Conclusion/No Determination** - No determination could be reached as to information concerning the watermark, Redacted

This conclusion requires an explanation of the limiting factor(s).

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The search capabilities are limited to items and/or information contained in the QDU watermark references, **Redacted**

9 Safety

Standard precautions should be followed for the handling evidence suspected of being contaminated with chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

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

Rev. #	Issue Date	History
7	03/01/18	5.2 deleted, “by completing a <i>QDU – 1 Case Processing Request Sheet</i> (Appendix A) or <i>QDU – 1 (LIMS) Case Processing Center Request Sheet</i> (Appendix B) and selecting “Watermark” for the exam indicating which items contain the watermark, and selecting “Watermark File Search” for the method.”
8	09/26/19	Section 5.2 deleted “QDU’s Case Processing Center (CPC)” “CPC” and added “assigned analyst/technician” and “analyst/technician.” Section 5.5.1 deleted “documented” added “recorded” and “image files.” Section 5.7 deleted both “documented” entries and added two “recorded” entries. Section 5.8 added “image files.”

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 09/24/2019

Questioned Documents
 Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Questioned Documents Unit (QDU)

Procedures for Conducting Writing Medium Examinations

1 Scope

These procedures will be used by a forensic document examiner to examine ink, pencil, or other writing mediums usually observed on a writing surface. Examination requests include determining the type of writing instrument used to prepare an item, consistency between two or more writing mediums, backdating, and insertion/alteration issues.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyper Spectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Reference materials

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

Only nondestructive examinations of ink, pencil, and other writing mediums will be conducted in the QDU.

5.1 Examine the specimen(s) visually for physical characteristics using lighting and magnification sufficient to allow fine detail to be distinguished. The VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments), HSI, (for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument), or digital microscope (for performance and verification frequency, refer to the Keyence Maintenance and Performance logbook nearest the instrument) may be useful. Note, at a minimum, the class characteristics of the writing medium(s) and any differentiation of the writing mediums. Physical characteristics include:

- Color
- Consistency of the writing medium
- Writing instrument characteristics as described below

5.1.1 Class characteristics of ball point pen writing include:

- Striations may be visible within the written stroke.
- Defects in the writing line may include small dot-like deposits of ink known as gooping.
- Indentations down the center of the ink stroke may be visible.
- Ink is paste-like with high viscosity.
- There may be skipping or short gaps in the ink stroke.
- The ball size may be medium, fine, or extra fine.

5.1.2 Class characteristics of porous-tip pen writing include:

- A broad, solid, or ribbon-like stroke may be observed.
- Indentations in the ink line are not usually observed.
- The aqueous ink may saturate the paper with slight bleeding into the paper fibers.
- Subtle line quality characteristics, such as hesitations and pen lifts may be harder to detect.
- The size of the porous tip may be broad, fine, or very fine.

5.1.3 Class characteristics of roller ball writing include:

- Ink stroke is similar to the porous-tip pen, but the ball tends to emboss the paper.
- The aqueous ink may saturate the paper with slight bleeding into adjacent fibers.
- Ink flow-back can often be seen at the end of a stroke.
- Characteristics of skipping and gooping are absent.

5.1.4 Class characteristics of gel pen writing include:

- An outline of darker ink along the edges of the ink stroke (i.e., "the squeegee effect"). This is a result of the high-viscosity ink being pushed by the ball to the outer edges of the ink stroke.
- The ink does not tend to bleed into the paper fibers as much as with water-

based roller ball or porous-tipped pens.

- Indentations may be visible.
- A broad range of ink colors, including metallic, are available.

5.1.5 Class characteristics of fountain or nib pen writing include:

- Pronounced darker double track within the stroke on flexible points.
- Shading may be recognized with flexible point pens by the gradual increase in the width of the stroke due to the pressure of the pen, particularly on the downstrokes.
- Variation in ink density may be observed.

5.1.6 Class characteristics of encased graphite, encased color, and mechanical pencil writing include:

- The written stroke is not a solid line, but may vary in intensity of color.
- There may be microscopic gaps and clumps of graphite.
- Graphite flakes adhere to the paper surface wedged between the paper fibers.
- The graphite does not penetrate the paper fibers as ink does.

5.1.7 If the writing mediums to be compared are not consistent in class characteristics, this indicates exclusion. Discontinue this procedure and report accordingly.

Redacted

5.3 Using the VSC, HSI, or comparable equipment, examine the items by using various filters while applying a range of wavelengths of light as necessary (i.e., visible light, UV, and/or IR).

Redacted

5.3.3 Note any differentiation of the writing mediums in question and, if using the VSC, HSI, or digital microscope, print out the representative images with the filter and light settings.

5.4 If special photographic techniques are necessary, transfer the items to the Operational Projects Unit (OPU).

Redacted

5.7 Documents requiring only chemical ink composition comparisons will be referred to the FBI Laboratory's Chemistry Unit.

5.8 Make notations in the examination records. Include all notes, data, and observations used to support your findings or conclusions. Include any information gathered, printouts, photographs, overlays, or drawings of any optical, physical, or microscopic characteristics observed during the examination process.

5.9 Conclusions

- **Corresponds in Optical Characteristics** - When the comparison of two or more writing mediums reveals correspondence in optical characteristics (i.e., significant agreement in all observable aspects of the results with no significant, reproducible, inexplicable differences), it may be concluded that the writing mediums are optically similar within the limitations of this methodology. The possibility that other analytical techniques might be able to differentiate the samples must be considered. This conclusion does not eliminate the possibility that the writing medium samples being compared are from different manufacturing batches or writing instruments.
- **No Conclusion/No Determination** - No determination can be reached whether or not the writing mediums originate from a common origin due to factors that significantly limit meaningful examinations. This opinion requires explanation of the limiting factors.
- **May Not Share a Common Origin** When the comparison of two or more writing mediums reveals correspondence in general class characteristics (i.e., color and type of writing instrument) but inexplicable differences are found at some level of the analysis, it may be concluded that the writing mediums are

not similar at that level of analysis and that the results of the examination indicate the samples may not be from a common origin. This opinion requires explanation of limiting factors which preclude an elimination.

- **Elimination** - A determination that the two inks do not have a common origin based on significant, reproducible, or inexplicable differences in class characteristics.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:
Redacted

- Factors that interfere with the writing process, such as blotting wet ink.
Redacted

- Prior destructive forensic examinations such as latent print processing.
- Lack of a sufficient quantity of questioned and/or known items.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

ASTM E 1422, "Standard Guide for Test Methods for Forensic Writing Ink Comparison," *Annual Book of ASTM Standards*, Vol 14.02.

ASTM E 1789, "Standard Guide for Writing Ink Examination," *Annual Book of ASTM Standards*, Vol 14.02.

Brunelle, Richard L., "A Systematic Approach to Ink Identification," *Identification News*, November 1972. (673)

Brunelle, Richard L., Cantu, Antonio A., "A Critical Evaluation of Current Ink Dating Techniques," *Journal of Forensic Sciences*, March 1987. (386)

Redacted

Conway, James 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. (380)

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

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

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

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

Redacted

Rev. #	Issue Date	History
5	03/01/18	2 Equipment/Materials/Reagents, seventh bullet, deleted 100, added “200” for HSI. 5.1 added (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)” “(for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument) “(for performance and verification frequency, refer to the Keyence Performance logbook nearest the instrument)”
6	09/26/19	Section 5.1 added “Maintenance and” before the word Performance. Section 5.3 deleted “i.e.” and added “e.g.” Section 5.3.1 added “as necessary.” Section 5.3.2 added “as necessary.” Section 5.3.2.2 added “and/or other inks.” Section 5.4 deleted “Forensic Imaging Unit (FIU)” and added “Operational Projects Unit (OPU). Section 5.6 added “brand and possibly.” Section 5.7 added “only.” Section 5.9 first bullet, added “optically” in front of similar. Section 5.9, third bullet, added “When the comparisons of two or more writing mediums reveals correspondence in general class characteristics (i.e., color and type of writing instrument) but”, added “some”, added “similar”, added “which preclude an elimination”, deleted “any” and “the same.” Section 5.9 fourth bullet, added “reproducible, or inexplicable.”

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 09/24/2019

Questioned Documents
Technical Leader

Date: 09/24/2019

QA Approval

Quality Manager

Date: 09/24/2019

Questioned Documents Unit (QDU)

Procedures for Conducting Paper Comparisons

1 Scope

These procedures will be used by a forensic document examiner in the examination and comparison of paper and other document substrates to determine similarities or differences.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt, transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Mitutoyo Digimatic Caliper, or comparable equipment
- Ruler (marked in a minimum of 1 millimeter and/or 1/16th inch increments)
- Puissant 30 watt short wave Ultraviolet (UV) source, or comparable equipment
- Safety goggles
- Protective gloves

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

Only nondestructive examinations of paper will be conducted in the QDU.

5.1 Visually examine the items using lighting and magnification sufficient to allow fine detail to be distinguished, and note their physical properties in the examination records. The following characteristics should be noted for each piece of paper, when deemed necessary.

5.1.1 Dimensions

5.1.1.1 Use a ruler to measure the approximate width and length of the paper and record the measurements in standard or metric increments.

5.1.1.2 Use a calibrated caliper to measure the approximate thickness of the paper and record the measurement in standard or metric increments as follows:

- Set the caliper to zero prior to each measurement.
- Measure the thickness of the paper in at least three locations as follows:
 - Document center (as far into the substrate's center as the caliper allows);
 - Opposite ends of the substrate.
- Averaging the measurements is recommended.
- Record the specific caliper used.

5.1.2 Optical Properties

5.1.2.1 Visually assess the paper color in general terms, such as white, off-white, or yellow.

5.1.2.2 Examine the paper with transmitted light utilizing a transmitted light box, the transmitted light feature of the VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments) or HSI (for performance and verification frequency, refer to the HSI Examiner 200QD Performance and logbook nearest the instrument), or by holding the document up to a natural or artificial light source. Note the general opacity of the paper in general comparative terms, such as transparent, semi-transparent, or opaque as well as the presence of any watermarks.

Redacted

Redacted

5.1.3 Physical Construction and Components

5.1.3.1 Observe and record the paper's physical construction and components for all general class characteristics (e.g., dimensions, color, opacity, optical properties), and manufacturing class characteristics and post-manufacturing characteristics, (e.g., lines, punch holes, perforations, folds, cuts, and staple holes). Measure the relative spacing and size of the components utilizing a ruler and record measurements in standard or metric increments.

5.1.3.2 If a physical component of the paper is a printing process, **Redacted** and not a physical feature in the paper, refer to the *QDU Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations*.

5.1.3.3 If a physical component of the paper is a watermark or other brand marking, refer to the *QDU Procedures for Conducting a Watermark Search*.

Redacted

5.1.3.5 If a physical component of the paper is a torn edge, refer to the *QDU Procedures for Conducting Torn or Cut Edge Examinations*.

5.2 Compare and evaluate the approximate dimensions, optical properties, and physical construction and components of the items. Evaluate the quality and quantity of the similarities, differences, and limitations and reach a conclusion.

5.3 All observations used to support your conclusions must be noted in the examination records, to include printouts, copies, photographs, overlays, and/or drawings of any optical, physical, or microscopic characteristics.

5.4 Conclusions

- **Correspond in General Class Characteristics and Manufacturing Characteristics** - There is agreement in general class characteristics and manufacturing characteristics, but an absence of individual characteristics. This indicates the items may have been produced by the same manufacturing source. This opinion requires an explanation of the limiting factor(s).

- **No Conclusion/No Determination** – When there are limiting factors, a report that no conclusion could be reached is appropriate. It may be possible to report that the items correspond in general class characteristics. This opinion requires explanation of the limiting factor(s).
- **Do Not Correspond in General Class Characteristics and/or Manufacturing Characteristics** - The items do not correspond to one another due to disagreement in general class characteristics and/or manufacturing characteristics. Any limited similarities are far outweighed by the combined effect of sufficient disagreement in all other details.

5.5 Destructive Paper Analyses

5.5.1 Documents requiring comparative chemical paper analysis and/or paper fiber composition analysis can be **Redacted**

returned to the contributor with instructions to submit the paper to a private paper chemistry company, such as the Institute of Paper Science and Technology in Atlanta, Georgia.

5.5.1.1 Chemical paper analysis and/or paper fiber composition analysis are destructive techniques. As such, the employee will contact the contributor and record contributor consent or non-consent to have the other laboratory conduct examination(s) of the submitted items. Contributor consent/non-consent will be recorded on the *Activity and Communication Log* (7-245), or Case Communication Log in FA.

5.5.1.2 If it is determined that use of the destructive technique may interfere with examinations of another forensic discipline, contact the affected unit to determine if preliminary examinations need to be conducted prior to questioned document examinations.

Redacted

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- Redacted
- Lack of a sufficient quantity of questioned and/or known items.
- Variations or dissimilarities Redacted present in individual paper items that have been packaged or distributed together.
- Prior handling of the items Redacted
- Lack of individual characteristics.
- Inability to determine the quantity of similar items produced.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

Use appropriate personal protection equipment when utilizing harmful wavelengths of illumination, including short wave UV illumination. The VSC is equipped with safety flaps that are electronically interlocked with the selection of harmful wavelengths to prevent operator exposure.

10 References

FBI Laboratory Safety Manual

ASTM E 2325, "Standard Guide for the Non-Destructive Examination of Paper," *Annual Book of ASTM Standards*, Vol 14.02.

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

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

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

The Mead Corporation, *Paper Knowledge*, 1999.

Rev. #	Issue Date	History
3	03/03/15	Section 2 added the Keyence Digital Microscope and the ChemImage Hyperspectral Imager to the list of equipment and reworded this section to be consistent with other QDU documents. Removed Section 4 Calibration and renumbered document accordingly. Sections 5.1.1.1, 5.1.1.2 and 5.2 added “approximate”. Sections 5.1.2 through 5.1.2.4 added “or HSI”. Section 7 changed “Uncertainty of Measurement” to “Measurement Uncertainty”. Section 8 changed “identifying” to “individual”. Corrected grammatical and formatting errors throughout document.
4	03/01/18	1 Scope, deleted, “for the determination of physical characteristics in common” and added “to determine similarities or differences.” 2 Equipment/Materials/Reagents, changed bullet 6 from 100 to “200” 5.1.2.2 added “(for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)” “(for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument)” 5.5.1.1 deleted “equivalent”, added Case Communication Log”

Redacted - Signatures on File

Approval

Questioned Documents
 Unit Chief

Date: 02/28/2018

Questioned Documents
 Technical Leader

Date: 02/28/2018

QA Approval

Quality Manager

Date: 02/28/2018