

# Quality Assurance Manual – Part I

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# Quality Assurance Manual – Part I

## 1 GENERAL

### 1.1 Forensic Examinations and Services

The mission of the Questioned Documents Unit (QDU) is to conduct and promote high-quality and timely forensic document, handwriting, footwear, and tire impression analysis in support of FBI priorities.

The Questioned Documents Group performs their work in agreement with the ANSI/ASB Standard 011, Scope of Expertise in Forensic Document Examination. However, it should be noted that when examining electronically-captured writing and signatures, numerical metadata captured by electronic writing devices is not analyzed.

### 1.2 Quality System

The QDU operates in accordance with the [FBI Laboratory Quality System Documents](#). These documents are supplemented by the procedures contained within the QDU's quality system documents.

### 1.3 Abbreviations, Terms, and Definitions

#### 1.3.1 Document Examination Discipline Specific


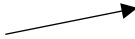

- **ACID** – Automated Counterfeiting Identification Database
- **Administrative record** – a record which is non-technical in nature but is maintained due to its relevance to a case (e.g., substantive emails, chain-of-custody, record images).
- **Alterations** – modifications made to a document or substrate that include obliterations, additions, overwritings, erasures, marks, holes, substitutions, and addition or subtraction of material.
- **Altered for examinations** – a modification(s) made to a document or substrate to improve the conditions for a forensic examination(s).
- **Arrowheads** – dark lines meeting at an apex and pointing away from the mandrel during the manufacturing process of polyethylene products.
- **BP** – Ball point
- **BRNF** – Bank Robbery Note File
- **CHAR** - Characteristic
- **Colored bands** – bands observed in clear polyethylene film when placed between polarizing filters.
- **COMP** – Comparison/Comparable
- **CT** – Control
- **DB** – Database
- **Destructive examination** – an examination that alters the original condition the evidence was received.

- **Die line** – light line that runs parallel to the machine direction and is caused by damage to or debris adhering to mandrel.
- **Elim** – Elimination/Source Exclusion
- **ENV** - Envelope
- **ESDA** – Electrostatic Detection Apparatus
- **FISH** – Forensic Information System for Handwriting
- **Fisheye** – dark spot with one or two light-colored tails that run parallel to the machine direction.
- **Hairline marks** – narrow straight lines observed in colored polyethylene film, probably caused by irregularities or deposits on the die lip or mandrel or both. These marks are usually 1 mm or less.
- **HP** – Hand printing
- **HSI** – Hyperspectral Imager
- **HW** - Handwriting
- **ID** – Identification/ Source Identification
- **IJ** – Ink jet
- **IMP** – Impression
- **IW** – Indented writing
- **Initial assessment** – a visual macroscopic examination, and if necessary, a microscopic examination which is conducted to identify physical features (e.g., substrate, mediums, handwriting, machine printing, stamped impressions, watermark) of an item of evidence.
- **K** – Known
- **LUM** – Luminescence
- **MA** – Moisture-activated

**Redacted**

- **MH** – May have/ Support for a common source
- **MNH** – May not have/ Support for different sources
- **NC** – No conclusion/ Inconclusive
- **OW** – Overwriting
- **PC** – Photocopy
- **Pigment bands** – bands of varying color that run in the machine direction or at a slight angle. These bands are caused by poorly dispersed dyes or pigments in the liquid resin mixture.
- **Pool examiner** – a document examiner who manages the initial preparation of a case in the QDU for forensic document examination.
- **Q** - Questioned
- **S & D** – Size and design
- **SA** – Self-adhesive
- **SDF** – Similar design features
- **SIG** – Signature
- **SL** – Side/ Oblique lighting
- **Streaks** – narrow short pigment marks, resembling half of an arrowhead.

- **Substrate** – a base material such as paper, plastic, foil, or fabric.
- **Surface scratches** – colorless scratches, usually just a few centimeters long, running at an angle from the edge of clear polyethylene film.
- **TCD** – Threatening Communication Database
- **Technical record** – a record of technical nature, such as a case-related note, which supports the examiner’s conclusion(s).
- **Tiger stripes** – wavy pigment lines that run perpendicular to the machine direction.
- **TW** – Typewriting
- **U** – Unexplained
- **V or VAR** – Variation
- **VSC** – Video Spectral Comparator
- **W** – Writing
- **WM** – Watermark

Unexplained characteristics; Unexplained variation; Inconsistency; Accidental	Characteristics in common; Similarity; Natural variation; Consistency	Difference
		

### 1.3.2 Impressions Discipline Specific (Footwear and Tire)

- **Administrative record** – a record which is non-technical in nature but is maintained due to its relevance to a case (e.g., substantive emails, chain-of-custody, record images).
- **AMIDO** – Amido Black
- **ASSN** – Association
- **Class characteristic** – a feature that is shared by two or more footwear items/tires.
- **CORR** – Correspond(s)
- **CR** – cropped
- **D & S** – Design and size
- **DAB** – Diaminobenzidine
- **DB** – Database
- **Design** – the manufactured pattern on the outsole of a footwear item or tread of a tire.
- **DF** – Driver side front
- **DFO** – 1, 8-Diazafluoren-9-one
- **DIFF** – Different
- **DOT number** – an alphanumeric string of characters beginning with “DOT” that is molded into a tire sidewall which includes both plant and date codes. The plant code identifies the factory in which the tire was manufactured. The date code identifies the week and year during which the tire was manufactured.
- **DR** – Driver side rear

- **DSIM** – Similar in design
- **EXCL** – Exclusion
- **EXCL-Support** – Support for exclusion
- **FCP** – Footwear comparison(s)
- **FMM** – Footwear make/model
- **FPX** – SoleMate FPX
- **FSZ** – Footwear size determination
- **FW** - Footwear
- **ID** – Source Identification
- **Image** – any one of the following types of media: a digital image, a photograph, a negative, a printout, or a video.
- **IMG** - Image
- **IMP** – Impression
- **Impression** – the retention of features of a footwear item/tire in or on an object through direct or indirect physical contact.
- **INC** - Inconclusive
- **INCL** – Inclusion
- **INCL-CLASS** – Inclusion based on class characteristics
- **INCL-RACS** – Inclusion based on class and randomly acquired characteristics
- **K** – Known
- **Known item** – a footwear item (e.g., a shoe, a boot, or a sandal) or tire whose origin was documented. A known item can be a physical item or a reproduction of an item (e.g., an image depicting an item, or an impression made from an item).
- **L** - Left
- **Laboratory reference materials** – the resources available to this laboratory, which include both reference footwear/tires and images and information related to reference footwear/tires to include commercial off-the-shelf footwear databases, footwear or tire databases created or maintained in the laboratory, the internet (e.g., zappos.com, ebay.com, tiretrack.com, and bestusedtires.com), and other resources (e.g., catalogs and industry publications).
- **LCV** – Leucocrystal Violet
- **LE** – Law enforcement
- **LUM** – Luminol
- **Make** – the brand name or manufacturer associated with a footwear item/tire.
- **M/M** – Make/Model
- **Model** – the specific product designation (e.g., name, number, or combination thereof) associated with a footwear item/tire.
- **NIN** – Ninhydrin
- **OD** – Outsole design
- **OS** – outsole
- **Outsole** – the bottom of a footwear item.
- **PATT** – Pattern or patterned
- **PD** – Police department
- **PF** – Passenger side front

- **Physical size** – the size, shape, spacing and relative position of the outsole design components on a footwear item or tread design components on a tire. Physical size is not the same as the size attributed by the manufacturer.
- **PS** – Photoshop
- **PR** – Passenger side rear
- **PROC-CHEM** – Processed with chemicals
- **PROC-PS** – Processed with Photoshop
- **PSZ** – physical size
- **Q** – Questioned
- **Questioned item** – a footwear item (e.g., a shoe, a boot, or a sandal) or tire whose source is unknown. A questioned item can be a physical item or a reproduction of an item (e.g., an image depicting an item, or an impression made from an item).
- **R** – Right
- **RAC** – Randomly acquired characteristic(s)
- **Randomly acquired characteristic (RAC)** – a feature (e.g., a cut, a scratch, a tear, a hole, or a stone hold) on the outsole of a footwear item or tread of a tire acquired through random events. The position, orientation, size, and shape of these characteristics can be used to differentiate one footwear item/tire from another when the items share the same class characteristics. One or more RACs are required for the ‘source identification’ of a known item to a questioned impression.
- **REF** – Reference
- **REF-COLL** – Reference collection
- **RV** – reversed
- **S & D** – Size and design
- **SDF** – Similar design features
- **Side-by-side comparison** – a comparison method performed by placing two or more objects adjacent to one another.
- **SIM** – Similar
- **SO** – Sheriff’s office
- **SP** – Shoeprint(s)
- **Suitable** – an evidence item that contains detail sufficient in quality that an examiner can rely on the features observed when conducting an examination.
- **Superimposition** – a comparison method performed by placing one object over the other. A transparent footwear item/tire test impression can be compared to a questioned impression using this method, which enables an assessment of physical size, wear and randomly acquired characteristics.
- **TCP** – Tire comparison(s)
- **TD** – Tread design
- **TDG** – Tread design guide
- **Technical record** – a record of technical nature, such as a case-related note, which supports the examiner’s conclusion(s).
- **Test impression** – an impression made from a known item as an aid in comparing a questioned impression to the known item.
- **TI** – Test impression(s)

- **TMM** – Tire make/model
- **TSZ** – Tire size determination
- **TT** – Tire tread(s) or tire track(s)
- **Upper** – the top portion of a footwear item excluding the outsole and midsole; the portion of the footwear item which covers the foot.
- **Wear** – the position and degree of erosion on the outsole of a footwear item or tread of a tire.
- **WGHS** – Webster Groves High School Footwear Reference Collection

#### 1.4 Externally Provided Products and Services

- Purchases of products and services that affect laboratory activities will comply with any specifications defined within the relevant technical procedure(s).
- Suppliers of these products and services will be evaluated in accordance with FBI policies and the FBI Laboratory Quality System.
- All requests for services and supplies will be reviewed and approved by the Unit Chief prior to ordering and a record of these purchases will be maintained.

## 2 DOCUMENT CONTROL

- Quality documents (Level 2 through Level 4) within the QDU will be approved for adequacy by the applicable Technical Leader(s) and the Unit Chief.
- Level 4 documents within QDU will be controlled and maintained electronically by the QDU Quality Assurance Program Manager.

## 3 DEVIATIONS

All minor deviations to QDU procedures will be recorded (request and approval) within the discipline’s case record communication log. Any minor deviations not directly related to a case record will be recorded on a log maintained by the QDU Quality Assurance Program Manager.

## 4 PERSONNEL

### 4.1 Training for FBI Laboratory Personnel in QDU

Information regarding the training, evaluation, and competency of FBI Laboratory Personnel working in the Questioned Documents Unit is contained in the [QDU Training Manual](#).

### 4.2 Continuing Education for FBI Laboratory Personnel in QDU

- Each employee within the QDU is required to take a minimum of eight hours of continuing education each fiscal year.
- No more than three of the eight hours of continuing education may be attributed to FBI or Laboratory mandated annual training.
- Continuing education training topics and courses in the QDU are chosen by the employee and their supervisor or the Unit Chief.

- Applicable topics of training must directly relate to the individual’s current job requirements and should focus on maintaining skills and expertise. The majority of continuing education hours must be related to the following topics:
  - Questioned Documents
  - Forensics (in general)
  - Leadership
  - Instrumentation
  - Other relevant work practices
- Continuing education training may include:
  - Instrument courses
  - Workshops at scientific meetings
  - Leadership/Management courses
  - Internal training provided by QDU
  - Factory tours
  - Computer courses
- Continuing education will be recorded electronically on an individual’s FBI Virtual Academy transcript.

## **5 SELECTION, VERIFICATION, AND VALIDATION OF METHODS**

Approvals obtained for method development, method validation, and software acceptance/validation plans may be recorded electronically. Documentation of these approvals will be maintained with the approved plan and include the version of the plan reviewed, name of approver, and the date of the approval.

### **5.1 Validation Plan**

- Validation plans prepared for testing methods to be used in the QDU will include the following information:
  - Test method(s)
  - Specific equipment
  - Sample preparation technique(s) to be used
  - Validation requirements of the procedure
  - Direction for the activities to be performed
  - Acceptance criteria for the validation

### **5.2 Validation Summary**

- Upon completion of the validation testing, a validation summary will be prepared and include the following information:
  - Limitations of the procedure, reported results, opinions, and interpretations
  - Conditions under which reliable results can be obtained
  - Critical aspects of the procedure that must be controlled and monitored
  - The scope and accuracy of the procedure to meet the needs of the given application
  - The associated data analysis and interpretation



- The data required to report a result, opinion, or interpretation

## 6 EQUIPMENT CALIBRATION/MAINTENANCE

### 6.1 Calibration

- The following is a list of QDU equipment with calibration requirements:

<u>Equipment</u>	<u>Frequency</u>
Acculab Balance	Yearly
Calipers	Yearly
Ohaus Balance	Yearly

- All calibrations performed by contracted service providers will be in accordance with the manufacturer’s specifications.
- All QDU equipment calibrations are coordinated by Forensic Analysis Support Unit and records maintained on the Equipment Calibration and Service site.

### 6.2 Maintenance

- The following is a list of QDU equipment with planned maintenance requirements:

<u>Equipment</u>	<u>Frequency</u>
Stereomicroscopes	Yearly*
Keyence Digital Microscope	As Needed
Electrostatic Detection Apparatus (ESDA)	As Needed
Electrostatic Dust Lifter	As Needed
Video Spectral Comparator (VSC)	As Needed**
Hyperspectral imager	As Needed
Personal Image Analysis System II (PIAS II)	As Needed
Contex IQ Quattro 2490 Scanner	As Needed

\*Provided through service contract

\*\*See Foster and Freeman VSC manual

- Maintenance performed will be done in accordance with the manufacturer’s manual and recorded in a logbook. The logbook will be located near the equipment, when practicable.
- Routine software updates for QDU equipment will be completed as suggested by the manufacturer and is considered maintenance. The version of the software will be recorded in the logbook in addition to the other required information as stated in section 9.4 (D) of the [Laboratory Quality Assurance Manual](#).

- If significant changes have been made as part of the software update, a new [validation](#) will be performed, as determined by the Technical Leader.

### 6.3 Performance Verification

- The following is a list of QDU equipment with planned performance verification requirements:

<u>Equipment</u>	<u>Frequency</u>
ESDA	Weekly <sup>1</sup>
VSC	Every two weeks <sup>2,3</sup>
Hyperspectral imager	Prior to use
PIAS II	Prior to use
Keyence Digital Microscope	Prior to use
Contex IQ Quattro 2490 Scanner	Prior to use

<sup>1</sup>Prior to use for the portable travel kit, and Hazardous Evidence Analysis Team (HEAT) partner laboratories

<sup>2</sup>Prior to use in biohazard room and HEAT partner laboratories

<sup>3</sup>VSC 40/HD, VSC80i: if used within the FBI Laboratory, every two weeks; if used in the field or at HEAT partner laboratories, prior to use

- Performance verifications performed by QDU personnel will be done in accordance with the manufacturer’s manual or equipment specific procedure and recorded in a logbook. The logbook will be located near the equipment, when practicable.
  - Performance verifications performed by document analysts (technicians) will be verified by an examiner and recorded in the corresponding logbook.
- The PIAS II and Keyence Digital Microscope have a built-in method of performance verification. If the performance verification fails on these pieces of equipment, they will not function at all.
- If power is lost during the use of the VSC or HSI, once power is restored the QDU employee will properly shut down and restart the instrumentation. A performance check will be performed once the restart is complete and prior to continuing with casework.
- If failure of the performance verification persists, maintenance for the equipment will be performed and a record of the maintenance will be maintained as described in the [Maintenance](#) section above.

### 6.4 Portable Equipment

- Portable equipment will be stored and transported in suitable protective and secure containers for field examinations.

- The use and maintenance of the portable equipment will follow the same procedures and guidelines as described in the [Maintenance](#) section and [Performance Verification](#) section above.
- Whenever possible, portable equipment will be maintained under the control of QDU personnel.

## 6.5 Reference Files

Reference material will not be removed from the reference area(s) without advising the program manager or designee responsible for the specific collection. Reference file material will be returned to its secured area at the end of the workday.

## 7 MONITORING

- All QDU examiners, analysts, and contractors will complete a minimum of one proficiency test, interlaboratory comparison, intralaboratory comparison, or observation-based performance monitoring per calendar year.
- The QDU will participate in external proficiency testing if the test available meets the requirements of the [Laboratory Quality Assurance Manual](#) and the unit. If an acceptable external test is not available, an internal performance monitoring method will be utilized.
- Examiners, analysts, and contractors in QDU complete the following performance monitoring:

Discipline	Test Participant	Test Description	Type of Performance Monitoring
Document Examination	Examiners	Document Examination	Proficiency Test
Document Examination	Examiners	Handwriting/Hand Printing	Proficiency Test
Document Examination	Analysts and trained Contractors	Electrostatic Detection Apparatus (ESDA)	Observation-Based Monitoring
			Intralaboratory Test
Impressions	Examiners	Footwear Examination	Proficiency Test
Impressions	Examiners	Tire Examination	Proficiency Test
Impressions	Analysts	Make/Model Determination	Intralaboratory Test

- QDU personnel will follow all appropriate technical procedures when participating in performance monitoring.

### 7.1 Proficiency Testing

- Two examiners will be designated to take the proficiency tests independently, review them, and determine the acceptable answer parameters/range for the test participants, if applicable.

- The acceptable answer parameters/range will be recorded by the examiners performing the reviews within the communication log for their case record.
- The Proficiency Test Representative (PTR) will distribute the tests to the other examiners for independent examination once the answer parameters/range has been established, if applicable.
- The examiners will complete their independent examination, preparing case notes, recording their results, write their report, and request the appropriate reviews utilizing the laboratory information management system (LIMS).
  - All proficiency tests will be verified as well as technically and administratively reviewed by the two originally designated examiners.
- Once the reviews have been completed, QDU examiners will electronically submit their results to the external provider for the proficiency test.
  - The PTR will ensure this task has been completed and maintain records of the submissions within the case communication logs.
- When the proficiency test results are furnished to QDU by the test provider, the technical reviewers will evaluate the provider's test results and provide feedback to the participant.
  - Record of the review and feedback will be documented within the communication log for the participant's case record.
  - The PTR will record the results provided by the test provider within the case communication log.
- Participants will acknowledge the feedback received in their case record communication log.

## 7.2 Other Performance Monitoring

- Qualified examiners may design and prepare internally provided performance monitoring.
  - The [7-290a](#) will be utilized to record the details of the developed performance monitoring activity.
  - All records, including any prepared materials and/or samples, will be maintained by the PTR.
- All work products, to include the following, will be uploaded as part of the performance monitoring activity case file and approved by the test participant:
  - Images of any indented writing lifts
  - **Redacted**
  - Make/Model database search worksheets
  - Other documentation as identified as part of the performance monitoring activity
- All reviews and evaluations will be performed by a qualified examiner.
  - Performance monitoring of the ESDA technical procedure is observation-based and will be assessed on the ability of the participant to properly demonstrate the technical procedure and obtain the expected results.

**Redacted**

- Performance monitoring for make/model determinations will be assessed by reviewing of the search criteria as identified on the search worksheet with the expected results.
- When appropriate, previous proficiency tests may be utilized as performance monitoring activities, provided the participants have no knowledge of the previous proficiency test results.

**8 REVISION HISTORY**

<b>Revision</b>	<b>Issued</b>	<b>Changes</b>
00	01/14/2022	Drafted new manual- Combined QD-101-07, QD-105-07, QD-106-04, QD-107-09, QD-108-05, QD-113-04, and QD-000 (Abbreviations).
01	6/30/2023	Updated mission statement in section 1.1. Added CT, VAR, Class characteristic, Cropped, Design, Image (abbreviation), Impression, Known item, Outsole (term and abbreviation), Physical size (term and abbreviation), Questioned item, Reversed, Side-by-side comparison, Suitable, Superimposition, Test impression, and Wear to section 1.3 and updated the section for clarity. Added location for recording non-case minor deviations in section 3. Section 4.2 was updated for clarity. Updated section 6 for clarity and removed the comparison microscope. Changed the requirement in section 6.3 for performance checks in the biohazard room to be weekly instead of prior to use and added requirement for performance checks performed by technicians to be verified by an examiner. Added contractors to the ESDA performance monitoring and added Tire proficiency tests in the section 7 table.