

ATTENTION: If any portion(s) of the Trace Quality Assurance Manual or any of the Trace Policies is/are unclear to any analyst or if a circumstance arises outside the scope of these documents, it is the responsibility of each analyst to immediately notify the Technical Manager and the respective Supervisor to seek clarification/approval or obtain guidance on the issue BEFORE proceeding.

This manual is set out in several sections that deal with different areas relating to the quality of the work performed by the Criminalists in the Trace Laboratory.

Table of Contents

Objective:	2
1. Equipment Maintenance/Calibration	2
Maintenance.....	2
Calibrations.....	2
Temperatures	2
2. Reagents and Supplies.....	3
Definitions:	3
Procedure:	3
3. Reference Collection	3
4. Handling Physical Evidence in the Trace Lab	4
General Evidence Handling.....	4
Evidence Handling Precautions/Procedures Specific to the Trace Evidence Laboratory	4
5. Start/Stop Dates of Analysis	6
6. Abbreviations	6
7. Documentation for the Trace Evidence Training Manual.....	6
8. Examination Documentation.....	7
9. Case Reviews	8
Approval.....	10
History.....	11

Objective:

Throughout the Criminalistics Services Division of the OSBI, quality in all aspects of the work performed is sought. It is the goal of all Criminalists involved in trace analysis to provide the most accurate analyses possible. Some issues that concern specifically trace analysis not covered in division policy will be addressed in this manual. The purpose of the Trace Quality Assurance Manual is to ensure consistency of practices among all of the trace analysts and to ensure that the quality of casework is maintained.

1. Equipment Maintenance/Calibration

Maintenance

If an instrument is out of service for any reason, the instrument must be marked “out of service.” In the Instrument Maintenance Log, the “Out of Service” and the “In Service” dates must be documented, along with specific wording stating that the instrument is “Out of Service” and “In Service.” Documentation must also include why the instrument was taken out of service and the steps taken to resolve the issue(s).

Calibrations

- A. There is no equipment in the trace laboratory that requires calibration *prior to daily use*.
- B. If the dial caliper or digital micrometer exceeds the requirements in the protocol, the instrument must be removed from service until it has been repaired and calibration checked by an outside vendor that is accredited to ISO/IEC 17025 by an accrediting body that is a signatory to the ILAC Mutual Recognition Arrangement, with the calibration to be performed listed in the scope of accreditation.
- C. The CRAIC Reference Filter Set, which includes the Reference Filter, Holmium Oxide Reference Filter, Didymium Reference Filter, and Neutral Density Filters, is sent to the manufacturer every two years to be re-certified.

Temperatures

- A. The temperature setting on ovens located in the trace evidence laboratory will be verified monthly using an ASTM and/or NIST certified thermometer. The set temperature of the oven and the measured temperature of the oven will be documented. The actual temperature should be within $\pm 5.0^{\circ}\text{C}$ of the expected value.
- B. If the measured temperature is outside this range, adjust the temperature by doing the following:
 1. If the oven is not digital, adjust the temperature knob to obtain desired temperature.
 2. If the oven is digital, allow the oven to equilibrate and then perform a temperature offset if the measured temperature falls outside of the acceptable range.
 3. Repeat the temperature check.
 4. If the second temperature check is outside the acceptable range, notify the Supervisor and Technical Manager of trace analysis and place the oven out of service.

2. Reagents and Supplies

Definitions:

Function Verification: A test that is performed on a reagent/solvent/supply to verify that it will function as expected.

Reagent: A substance used in a chemical reaction to detect, measure, examine, or produce other substances.

Solvent: A substance that is intended to provide a solution.

Procedure:

- A. The Trace Evidence Unit does not have any reagents that are used in analysis.
- B. When a new solvent bottle is opened, the analyst opening the bottle will write his or her initials on the bottle and the date the bottle was opened.
- C. Solvents require function verification prior to their use in casework.
- D. Solvents used exclusively for cleaning do not require function verification.
- E. All solvents in their original containers will bear:
 1. Solvent name
 2. Lot number
 3. Manufacturer
 4. Date and initials of the analyst receiving the container
 5. Date and initials of the analyst opening the container.
 6. If the solvent is transferred into another container, the new container will be labeled with the name of the solvent, the lot number, and the initials of the person transferring the solvent.
- F. The following supplies require function verification prior to their use in casework:
 1. Carbon strips
 2. OSBI GSR Evidence Collection Kits
 3. Carbon tabs
 4. Lined metal cans and lids
 5. Autosampler vials
 6. Autosampler vial caps
 7. Other sampling systems as required by individual protocols.

Ignitable Liquid Standards, known GSR stubs, elemental standards, and fiber dyes are not critical reagents.

3. Reference Collection

The Trace Laboratory maintains an ignitable liquid reference collection. The items in this collection are generally purchased from a local retailer (i.e. Home Depot, Wal-Mart), but could also be acquired from chemical suppliers (i.e. Fisher Scientific or Sigma Aldrich).

The ignitable liquid reference collection will be stored at room temperature in a flammable cabinet which is not located in the same storage area as ignitable liquid evidence.

Each item in this collection will be labeled with a unique OSBI identifying number. The following format should be used: YY-NNN, where YY is a two-digit representation of the year the item was received in the trace lab and NNN is the chronological number assigned to the item. The Excel spreadsheet (IL Standards Updated 2019) with the list of references can be found on the OSBI network, \\vm-fsc-files\Common\Trace\1 - Trace Instrument Maintenance\GCMS - Ignitable Liquid.

The original package and/or a sample of the original ignitable liquid reference may be retained in the ignitable reference collection. If a sample is taken, it must be labeled with the manufacturer's name, the brand, and the unique OSBI identifier.

4. Handling Physical Evidence in the Trace Lab

General Evidence Handling

The trace analyst will adhere to the practice that evidence attributed to the victim and to the subject/suspect will be searched/examined in a manner that prevents loss, cross-contamination and deleterious changes. This is best accomplished by separating the handling of evidence by time and/or distance.

When a case involves the direct comparison of an unknown to a known, the unknown item(s) will be evaluated to identify characteristics suitable for comparison, prior to comparison to one or more known item(s); this is not applicable to searching cases, in which the known may need to be assessed first.

When evidence is received, any abnormalities regarding the packaging or condition of evidence will be recorded, examples: an IL can does not have a lid on tightly, or if the item for IL testing was submitted in a paper sack, if multiple pieces of clothing for GSR analysis are packaged together. If there is doubt whether the item is suitable for testing or if the item does not match the description provided, the customer will be consulted for clarification and the conversation recorded using the "Narrative" button on the "Case Info" tab in the LIMS before proceeding. If testing the items is possible and the customer agrees to continue with testing the item, the report shall include a disclaimer indicating which results may be affected by the abnormality.

Evidence Handling Precautions/Procedures Specific to the Trace Evidence Laboratory

There are no requirements for the facilities, necessary accommodations and/or environmental conditions for evidence collection and handling that is performed within the FSC Laboratory. There are no known factors that would impact testing results.

Ignitable liquid residue casework:

- A. An analyst should not process ignitable liquid evidence if they have been exposed to ignitable liquids which may contaminate the evidence, such as recent filling of a vehicle fuel tank.
- B. The Trace Evidence Laboratory prefers to receive fire debris in lined metal cans. Unlined metal cans are acceptable; however, the can will rust through more quickly than a lined can. Cans should be filled no more than approximately $\frac{3}{4}$ full to allow for sampling.

- C. Large and/or soft items can be placed inside a biohazard bag that is inside a properly sealed second biohazard bag or may be placed into nylon arson bags and properly sealed.

GSR casework:

- A. Ideally, the evidence should be collected with an OSBI GSR Evidence Collection Kit. The OSBI Trace Evidence Unit does not possess the capability to analyze GSR evidence collected on swabs.
- B. An analyst should not process GSR evidence or be in the immediate vicinity of open GSR evidence if they have been exposed to GSR which may contaminate the evidence, such as firing a weapon earlier in the day.

Paint casework:

- A. The questioned paint specimens will be packaged in a manner that prevents cross-contamination with the known paint specimens. For example, paint evidence would be packaged inside a size appropriate inner container and properly sealed in an outer container. Additional samples would be packaged in a separate outer container.
- B. Generally, when searching evidence, the questioned paint specimen will be processed / examined in an area separated by time and/or distance from the known paint specimen.

Fiber casework:

- A. The questioned fiber evidence will be packaged in a manner that prevents cross-contamination with the known fiber evidence. For example, fiber evidence would be packaged inside a size appropriate inner container and properly sealed in an outer container. Additional samples would be packaged in a separate outer container.
- B. The questioned fiber evidence will be processed / examined in an area separated by time and/or distance from the known fiber evidence.

Tape analysis casework:

- A. The questioned and/or known tape evidence should be placed upon a thick clear plastic surface such as transparency or page protector. Plastic wrap or saran wrap are not suitable for use.
- B. Generally, tape should not be folded back on itself. At a minimum, the ends should be attached to a thick clear plastic surface.

Physical Match Casework:

- A. Any items that will be compared should not be packaged in the same outer package.
- B. The edges that will be compared should be protected from any further damage.

5. Start/Stop Dates of Analysis

The start date of analysis is the date the analyst assigns the case to themselves in the BEAST. The stop date of analysis is the date the analyst routes the report for technical review in the BEAST.

For cases in which the following instruments are used, the date of testing will be reflected on the PDF printouts from the instrument:

1. Gas Chromatograph/Mass Spectrometer
2. Scanning Electron Microscope with Energy Dispersive Spectrometer
3. Fourier Transform Infrared spectrometer
4. Microspectrophotometer

For cases in which microscopy or searching is used, the date of testing will be documented in photographs/PDF and/or in the casefile.

6. Abbreviations

The following is a list of approved abbreviations for OSBI Trace Laboratory protocols, analysts' notes and within Trace matrix panels.

Charc	Charcoal
FTIR	Fourier Transform Infrared Spectrometer
GC/MS	Gas Chromatograph-Mass Spectrometer
GC/MSD	Gas Chromatograph-Mass Spectrometer
GSR	Gunshot Residue
HPD	Heavy Petroleum Distillate
IL	Ignitable Liquids
LPD	Light Petroleum Distillate
MPD	Medium Petroleum Distillate
MSP	Microspectrophotometer
PLM	Polarizing Light Microscope
RI	Refractive Index
SAM	Standard Accelerant Mix
SBLANK	System Blank
SEM	Scanning Electron Microscope
SEM/EDS	Scanning Electron Microscope-Energy Dispersive Spectrometer

7. Documentation for the Trace Evidence Training Manual

Included in the training manual are topics and checklists that should be used when training a new employee. Copies of the checklists that document an employee's training will be kept in the employee's training manual that is maintained by the unit's supervisor or the employee. Employees that have prior experience in specific instrumentation or trace analysis may receive a modified training plan. The most recent training manual will be modified for such purposes; all modifications must be approved by the Trace Technical Manager. The most recent training manual is available in the Quality Management System (QMS).

Liquid Nitrogen (LN₂) is used in the FTIR in the Trace Evidence Unit. Specific training regarding safety and hazards must be received before handling the liquid nitrogen. This training must be documented in the Training Manual.

8. Examination Documentation

- A. All trace case files will be in an electronic format in the Laboratory Information Management System (LIMS or also known as the “BEAST”). Case record examination documentation will be stored within the Image Vault in the BEAST.
- B. All documentation in the case file is required to adhere to the directives mandated by the Criminalistics Services Division (CSD) Quality Manual.
- C. The CSD Quality Manual requires that all items in a container be listed on each report. In the case of evidence containing items needing additional testing and items that have been tested and reported in a previous report, report the untested items using the following example:

Item #: No Additional Analysis
- D. Copies of the data/documentation may also be kept on the analyst’s OSBI computer. The goal is to keep required documentation in the BEAST, without using excessive storage. If an analyst wants to keep multiple documents/images from a sample, they may keep a copy on their OSBI computer and only upload the required documentation.
- E. Case record examination documentation will include, at a minimum, all documentation required to support the conclusion. Instrument documentation (GC/MS, SEM/EDS, MSP, or FTIR) supporting the conclusion must be kept in the image vault in the BEAST. Depending on the case, required documentation may also include photographs, and Quality Assurance/Quality Control documents. Raw instrument data is not required to be retained.
- F. If the person that prepares examination documentation is not the reporting analyst, the name or initials of the person that prepares the examination documentation must be on each page he/she prepares.
- G. *Rejected data/observation/test result:* Data/observations/test results that cannot be used to reach a conclusion because of quality issues or because it does not meet requirements of policy. Additional or alternative testing must be performed. Examples include but are not limited to: standard information not on the scan, particle not identifiable on GSR standard, autotune was not run prior to casework, carryover in a sample or contamination of a blank.

Rejected information will be entered in the BEAST matrix. The analyst making the rejection must identify the data/observation/test result that is rejected (instrument &/or item number), document the date of the rejection, and the reason for the rejection.

- H. In cases in which carbon strip extracts or stubs are created or collected:
 - 1. The carbon strip extracts and stubs are considered evidence and will be given an item number and listed on the Items Tab in the BEAST.
 - 2. Carbon strip extracts do not need to be included on the report, but will be returned to the agency in the original container.
 - 3. Stubs collected will be included on the report as part of the Description of Evidence. The stubs will be returned to the agency in the original container.

- I. In cases in which the items received have already been reported by another analyst, the inventory will be consistent with the initial report. For example, packaging and items listed on the initial report will be included on the trace report. Any additional items that require itemization (i.e. paint chips, debris, etc.) will follow CSD QM itemization requirements.

9. Case Reviews

QP-31 requires that all OSBI case files be reviewed by an individual other than the reporting analyst prior to being released to an outside agency. Administrative and Technical Reviews will meet all requirements set forth by QP-31 and will include a thorough review of the entire case file and Criminalistics Examination Report by a qualified reviewer.

The specific procedure followed by the Trace Laboratory will be as follows:

- A. The minimum number of cases sent for technical review will be at least 20 percent of each type of case worked per month (i.e. GSR, Elemental, Paint, Fiber, etc.).
- B. Once the analyst has signed the case in the BEAST, the case will be distributed for review utilizing the routing function in the BEAST. By signing the case, the analyst is documenting that a review of the technical records was performed.
- C. If any changes or corrections are required, QP-31 requires the case to be routed for correction. The reviewer must include an explanation in the comments field of the routing box describing what must be corrected. Once corrections have been made, the case will be routed back, with corrections/changes documented in the comments field, to the original reviewing analyst for additional review.
 - 1. If the correction involves multiple cases, the analyst must notify the Technical Manager, or designee, of all cases that were reviewed for necessary correction and cases in which corrections were required and made.
 - 2. If the two analysts are unable to come to an agreement, the Technical Manager should be consulted and the case routed to the Technical Manager, or designee, using the "Route to Technical Manager" code. The Technical Manager, or designee, will then route the case back with their decision; the Technical Review will be completed by the original reviewer.
 - 3. The reviewing analyst is considered a "designee" approved by the Technical Manager for approving Simple Corrections. At any time during the review process, if the reviewing analyst has a question regarding the Correction they need to contact the Technical Manager for clarification. The Technical Manager receives a daily report of routings and will document any relevant

corrections on the Simple Correction Log. The Technical Manager maintains authority to override decisions of the reviewing analyst.

4. If the Technical Review is performed by a reviewer outside the OSBI, all communications regarding changes or corrections will be included in the casefile. These can be documented as Narratives.
 5. If the Technical Review is performed by a reviewer outside the OSBI, the Administrative Review will be performed by an OSBI analyst prior to approval.
- D. By answering “yes” to the statement on the Technical Review form, the reviewer agrees to the following statements:

For all cases:

1. Tests conform with the appropriate Trace Laboratory protocols and methods, the Trace Evidence Quality Assurance Manual and CSD policies and procedures.
2. Results, opinions and interpretations are accurate, properly qualified and supported by the technical records.
3. Spectra, data, images, and observations, etc. that support findings, are included in the file.
4. Conclusions reported are in accordance with conclusions listed in the analytical notes.
5. Result reporting is consistent with protocol recommended reporting.
 - a. Significance of any reported associations was properly qualified.
 - b. Any/all eliminations were clearly communicated in the results.
 - c. If no definitive conclusion can be reached, the report clearly communicates the reason the analysis is inconclusive.
6. QA/QC documentation is included (i.e. blanks, standards, autotune, etc.).
7. Handwritten notes, calculations, analyst notations in PDFs and the naming of PDFs have been reviewed and compared to documentation in the BEAST Matrix.
8. The case number is included in the BEAST uploaded file name.

For cases in which FTIR was used:

9. FTIR ValPro System Qualification of the accessory is performed on the day of casework.

For cases in which GC/MS was used:

10. Autotune and Tune Evaluation was performed and passed, on the day of casework.

For cases in which MSP was used:

11. Photometric and Wavelength Check was performed and passed, on the day of casework.

For cases in which SEM or SEM/EDS was used:

12. Positive and negative standards were analyzed and produced satisfactory spectra, on the day of casework.

For cases in which images are uploaded:

13. All images are properly labeled or include labeling in the image (i.e. case number, date, initials and item number).

For searching and evidence collection reports:

14. Report indicates what items were searched.
15. Report indicates what items were collected and where they were collected from.
16. If applicable, the report indicates the evidence will be forwarded for analysis.
17. If evidence was collected off-site, the accreditation seal was removed from the report.

- E. Approving the report will be documentation that an administrative review was completed by the approving analyst. Once a technical/administrative review is complete, the reviewing analyst will notify the requesting analyst that the review has been completed.

Approval

Technical
Manager



Heather Schafstall

08-13-19

Date

Division Director



Andrea Fielding

8-16-19

Date

History

Rev. #	Issue Date	History
0	01-04-2000	Original Issue
1	01-22-2001	Deletion of obsolete training sections and duplicated information present in the OSBI policy manuals. Addition of Analytical Standards Records. Refining of training requirements to match OSBI standards
2	10-31-2002	Minor word changes Converted document to MSWord format. Created history page.
2	11-26-2003	Reviewed with no changes
3	05-09-2005	Removed footer Changed Thermometer calibration date on page 3 Capitalizing starting words of sentences Changed 'section' to 'unit' Added hyperlink to training manuals
4	01-29-2007	Minor word changes throughout document Updated references of GRIM II to GRIM III Updated cross-references to OSBI Quality Manual Updated cleaning of SEM Wehnelt assembly Edited Section VI – Trace Evidence Forms Edited Section VIII – listing of training manuals Added digital photography to documentation parameters.
5	12-15-2008	Added reference to obtaining reagent forms on the OSBI Intranet in Section 1. Reference to the BEAST added to Section VI (Trace Evidence Forms). Deletion of reference to CLEET and OSBI Academy Training from Section X (Training Period). Changed “discrepancy” to “discretion” in Section X (Examinations).
6	07-16-2010	Changed the title & <u>major</u> revision of the entire document. Renumbered the body of the document. Added OSBI Trace Evidence Unit Mission Statement. Integrated the history document into this document. Added the signature block for the Division Director.
7	07-30-2010	Added Sections 10, 11 and 12 to Table of Contents . Removed reference of TR-500 in Section 7.0 Added new Section 10.0 Examination Documentation . Renumbered sections following Section 10.0.

8	02-04-2011	Added new section 11.0 Administrative / Technical Reviews Changed previous section 11.0 to section 12.0 Changed previous section 12.0 to section 13.0 Changed last name of Laboratory Director
9	03-11-2011	Added new section 12.0 Opinions and Interpretations Changed previous section 12.0 to section 13.0 Changed previous section 13.0 to section 14.0
10	12-31-2012	Removed analyst's initials from abbreviation list in section 2.0 Removed references to individual training manuals in section 7.0 Added "nylon arson bags" to section 9.3.2.3 Replaced section 12.0 Opinions and Interpretations with 12.0 Start/Stop Dates of Analysis Change of Technical Manager
11	12-31-2013	Creation of History Page Corrected the numbering in Outline of Manual and throughout Policy Added monthly oven temperature verification in section 3.2 Removed SEM/EDS from 4.0 Liquid Nitrogen Safety
12	08-01-2014	Added "IL" and "SAM" to the abbreviation list Added 6.2.5 and 6.2.6 Physical Evidence Handling for tape analysis and physical match casework Modified 7.1 to require all trace case files to be electronic Added section 7.2 and 7.3 detailing what examination documentation will be included in the case file and how to indicate if someone other than the reporting analyst prepares the examination documentation.
13	10-31-2015	Modified section 3.1 to specify instrument maintenance. Added 3.1.1, 3.1.2, and 3.1.3.
14	12-31-2016	Added section 3.3 which states "There is no equipment in the trace laboratory that requires calibration prior to daily use." Added section 10 "Reference Collection"
15	12-31-2017	Annual Review. Change of Technical Manager. Merged QM and History into one document. Added "Assurance" to document title. Added statement regarding clarification. Moved & changed Outline of Manual to a Table of Contents. <u>1. Abbreviations</u> – added statement before abbreviation list. Put abbreviations in alphabetical order and place border around them. Removed: Par, Perp, PyGC, PyGCMS, & X Section; added SBLANK.

3.0 Equipment Maintenance/Calibration – removed paragraph numbering system. Rearranged paragraphs by topic. Paragraph regarding MSP Filter Set was moved to MSP protocol. Temperature range of oven changed to +/-5°C.

4.0 Liquid Nitrogen Safety – removed paragraph numbering system

5.0 Trace Evidence Training Manual – Changed location of Training Manual from OSBI Intranet to QMS.

6.0 Handling Physical Evidence – removed paragraph numbering system

7.0 Examination Documentation – removed paragraph numbering system

8.0 Admin/Tech Reviews – removed paragraph numbering system. Section completely re-written.

9.0 Start/Stop Dates of Analysis – removed paragraph numbering system

10.0 Reference Collection – removed paragraph numbering system. Changed wording for labeling IL reference collection samples. Made numbering system format a “should”; SRN samples are not labeled with year.

16

05-31-2018

Annual Review. Re-arranged and added sections
Renamed “Trace Evidence Training Manual” to “Documentation for the Trace Evidence Training Manual.” Merged the Liquid Nitrogen Safety section into the Training Manual section and added requirement for documenting the safety training. Renamed “Administrative/Technical Reviews” to “Case Reviews.” “Critical Reagent/Supplies” removed this section, duplicate to a copy kept as spreadsheet in QMS.

1. Equipment Maintenance/Calibration – Maintenance/Cleaning
A. - added location for instrument maintenance log. *Calibrations* – added sections B and C regarding calibrations & certifications.

2. Reagents and Supplies – New section.

3. Reference Collection –renumbered from #10. No changes.

4. Handling Physical Evidence – renumbered from #6. Added paragraph regarding the order of evaluating known and unknowns.

5. Start/Stop Dates of Analysis – renumbered from 7.1. Added paragraphs regarding dates on PDF printouts.

6. Abbreviations – renumbered from 8.

7. Documentation for the Trace Evidence Training Manual – renumbered from 5 and renamed.

8. Examination Documentation – renumbered from 7. Added to A. that documentation will be stored within the Image Vault. Separated documentation requirement from A into B. Added C. allowing analyst to keep documentation on OSBI computer not required for reporting results. D. Added wording regarding supporting instrument documentation must be kept in BEAST. Reworded paragraph regarding required examination documentation (now D.) Added F. Rejected data paragraph. Added G. reporting of created carbon extracts & stubs
9. Case Reviews – renumbered from 8. Added C.3. regarding designation of TRs for Simple Corrections.

17

08-31-19

Annual Review.

1. Equipment Maint/Calibration – Renamed

Maintenance/Cleaning section to *Maintenance*. Removed paragraphs A. and B. Moved information to instrument specific protocols. Added statements regarding documentation necessary when instruments are taken out of service.

2. Reagents and Supplies – No changes.

3. Reference Collection – Added network location for Ignitable Liquid Reference Collection.

4. Handling Physical Evidence in the Trace Lab – *General Evidence Handling* section - Added paragraph regarding documentation of abnormalities and discrepancies. *Evidence Handling Precautions...section* - Added paragraph regarding facility requirements.

5. Start/Stop Dates of Analysis – No changes.

6. Abbreviations – Added Charc for Charcoal abbreviation.

7. Documentation for Trace Evidence Training – No changes.

8. Examination Documentation – Added section lettering. Added third paragraph (C.) regarding reporting of untested items. Paragraph H. changed requirements for documentation/reporting of carbon strips and stubs. Added paragraph I. added requirement for reporting of items that have been previously reported.

9. Case Reviews – Section B, added statement regarding signing of the case as documentation of review of technical records.

Changed last name of Division Director.