OSAC 2023-N-0027 Standard for Forensic Trace Evidence Recovery

Trace Materials Subcommittee
Chemistry: Trace Evidence Scientific Area Committee
Organization of Scientific Area Committees (OSAC) for Forensic Science

Draft OSAC Proposed Standard

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Prepared by
Trace Materials Subcommittee
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1. Scope

1.1 Trace evidence is physical evidence that can result from the transfer of small quantities of materials such as hairs, fibers, paint, tape, glass, and geological materials. The primary focus of this guide is to assist individuals in the detection, handling and preservation of trace evidence in the laboratory. Although the bulk of the procedures and steps included in this guide are applicable in the laboratory settings, certain aspects of trace evidence collection, handling, and preservation can be applicable in the field (i.e. crime scene).

1.1.1 Some specialized types of trace evidence such as soil (see Guide E3272-21), lubricants, lachrymators, fire debris, and explosives have special considerations for collection that are outside the scope of this document.

1.2 The goal is to aid the forensic examiner in the selection and application of these techniques based on the circumstances of each case.

1.3 *This standard is intended for use by competent forensic science practitioners with the requisite formal education, discipline-specific training (see Practice E2917), and have demonstrated proficiency to perform forensic casework.*

1.4 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

E620 Practice for Reporting Opinions of Scientific or Technical Experts
E1188 Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator
E1459 Guide for Physical Evidence Labeling and Related Documentation
E1492 Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory
E1732 Terminology Relating to Forensic Science
E2917 Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs
E3272 Standard Guide for Collection of Soils and Other Geological Evidence for Criminal Forensic Applications

3. Terminology

3.1 Definitions- For definitions of terms used in this guide, refer to Terminology E1732.

4. Summary of Guide

4.1 This guide includes a summary of techniques for the detection, collection, and preservation

of trace evidence. The techniques described are those that are most often used in a laboratory setting.

5. Significance and Use

5.1 Trace evidence collection is a complex and delicate process. Certain trace evidence materials are more prone to deterioration, degradation, or obliteration than others during collection, storage, and analyses in the laboratory. Therefore, the integrity and significance of trace material as evidence relies on its proper detection, collection, and preservation for future analysis.

5.1.1 The order of testing is considered as other forensic examinations could result in the loss, damage, or destruction of trace evidence. This includes both physical processes such as creating test fires from firearms and swabbing for DNA, and chemical processes such as processing for latent prints and applying chemicals for Gun Shot Residue (GSR) analysis.

5.1.1.1 The collection of trace evidence is considered prior to these types of examinations.

5.1.2 The collection and preservation of trace evidence could, if not done in a deliberate manner, damage other types of evidence present on an item such as DNA, latent prints, and GSR.

5.2 To minimize loss or destruction of trace evidence, only trained personnel will collect and handle trace evidence. Coordination or consultation with other forensic science practitioners in other specialty areas is encouraged.

6. Materials

6.1 Tools: tweezers, cutting tools (for example: scissors, scalpels), scraping tools (for example: large straight blade metal spatula, razor blades), hand magnifiers, stereomicroscope, lighting/light sources, camera, vacuum with specialized vacuum collection filters, etc.

6.2 Collection supplies: adhesive lifters, adhesive notes, etc.

6.3 Packaging materials: envelopes, bags, other leak proof containers, adhesive notes, tape, labeling materials.

7. Documentation

7.1 Records are generated during the detection, collection, and preservation processes and maintained. For additional information, see E1492 and E1188. These records include:

7.1.1 Label on the outer packaging of each item to identify the contents. For additional information see Guide E1459.

7.1.2 Initial condition of the item from which evidence is collected.

7.1.3 Location from which trace evidence was collected is documented via notes,

7.1.4 Sketches, measurements, photographs, or a combination of these.

7.1.5 Condition of the trace evidence prior to collection.

7.1.6 Collection technique(s) used and method(s) of application.

7.1.7 Observations made on trace evidence collected.

7.1.8 The condition of the item after trace evidence collection is completed. For example, situations where a portion of the trace evidence was collected but additional trace evidence remains on the item.

7.2 If the examiner observes other types of evidence with potential forensic value, it is communicated in accordance with laboratory policies and procedures.

8. Evidence Handling

8.1 Evidence requiring analyses by multiple disciplines calls for coordination between those forensic science practitioners to determine the order of examinations. Unless circumstances dictate otherwise, the trace evidence should be collected and preserved prior to other examinations.

8.2 General principles and practices to prevent evidence contamination and loss include the following:

8.2.1 Appropriate personal protective equipment (PPE) is worn such as laboratory coats, masks, hair nets, disposable gloves, and respirators to prevent contamination or transfer of material between locations, personnel, and evidentiary items such as clothing from the victim and suspect, locations, and personnel.

8.2.2 Evidence examination areas have adequate lighting, easy to clean surfaces, and a physical environment designed to restrict excessive air currents, static electricity, and general foot traffic.

8.2.3 Equipment and work surfaces used during collection and examination are cleaned before processing begins and as often as necessary to prevent contamination.

8.2.4 Collection supplies, such as adhesive lifts, are stored and maintained in a manner to avoid contamination. Protect the edges of tape and other adhesive lifters to prevent extraneous materials from adhering to them.

8.2.5 Handle evidence as little as possible to minimize exposure to contaminants or

loss of evidence prior to its collection.

8.2.5.1 Items that contain trace evidence are processed on a clean sheet of paper to preserve any material that falls from the item. The material captured on the paper or the paper itself are preserved.

8.2.5.2 The initial examination of questioned and known items for trace evidence are conducted separately in different locations, at different times, or both, to prevent cross-contamination.

8.2.5.3 If the examination dictates that two items be examined in close proximity such as the physical fit examination of tape from bindings and a roll, first collect and preserve trace evidence and other materials that could be transferred between the items.

8.2.6 Any contact, condition, or situation that could have caused contamination, the loss of evidence, or otherwise compromised the evidence is documented and communicated in accordance with laboratory policies and procedures.

9. Detection of Trace Evidence

9.1 Methods used for detecting trace evidence include, but are not limited to, general visual searches, visual searches assisted by different types of illumination, such as oblique lighting and alternate light sources, and visual searches assisted by magnification (hand magnifier, stereomicroscope, etc.).

9.1.1 Visual searches can be assisted by different configurations of illumination.

9.1.1.1 It can be helpful to reduce overhead lighting, such as ceiling lights, when using lighting at different angles.

9.1.1.2 Oblique lighting is useful for visualizing surface particles such as a hair sticking up off of clothing or reflective items such as glass and glitter.

9.1.2 Visual searches for materials such as paint, fibers, hairs, and glass can be assisted by using different wavelengths of light.

9.1.2.1 Materials such as fibers, paint, and glass can fluoresce or respond differently than the substrate when exposed to certain wavelengths of light, making them more visible.

9.1.3 Visual searches can be assisted by using magnification such as a lighted magnifier lamp, lighted hand magnifier, or stereomicroscope, which can aid in visualization of small particles.

9.2 The use of different colored backgrounds also aids in the visualization and collection of

trace evidence, for instance, using black paper as a background for collecting white hairs from debris.

10. Collection of Trace Evidence

10.1 Use trace evidence recovery techniques that ensure the targeted evidence is collected while minimizing the collection of background material. More general recovery techniques are used when the targeted material is unknown.

10.2 Consider how the collection technique might affect the targeted trace evidence to be collected.

10.3 Consider how the collection technique might affect any subsequent testing being done by other disciplines

10.4 Collection methods can be performed sequentially, for example, picking hairs intertwined in the fabric of a fleece jacket followed by scraping to collect loose particles.

10.5 Collecting Trace Evidence from Items or Areas

10.5.1 *Particle picking.* Evidence can be picked from items of evidence using clean forceps or other implements.

10.5.2 *Lifting.* An adhesive-bearing substrate such as tape, adhesive note, or adhesive lifter can be used to collect trace evidence from a surface.

Discussion: See 8.2.4 for the maintenance of adhesive lifters used for collection purposes.

10.5.2.1 Consider the type of evidence targeted for collection when choosing to use adhesive lifters. For example, do not use adhesive lifters to collect paint or polymers as the adhesive can leach into the material and change its chemistry.

Note: These adhesive lifters are not suitable for collection of dust or soil evidence. Consult other standards or a geological subject matter expert.

10.5.2.2 Adhesive lifters are not always appropriate for items to be tested for wearer DNA as it would remove skin cells from the surface of clothing items. A DNA subject matter expert should be consulted prior to the use of adhesive lifters in these cases.

10.5.2.3 Large adhesive sheets are available for use on larger areas such as vehicle seats. Small lifters such as adhesive notes are suitable for small areas such as a knife blade.

10.5.2.4 The lifter is repeatedly and firmly patted or rolled over the item, causing

loosely adhering trace evidence to stick to the lifter. Do not overload the lifter.

10.5.2.5 Lifts should be maintained in a manner that allows the trace material collected to be easily viewed, recovered, and preserved (for example placing the lifter on a clear piece of plastic before placing it in a manila envelope).

10.5.3 *Scraping to Collect Loose Material.* A clean spatula or similar tool is used to dislodge trace evidence from an item onto a collection surface such as clean paper.

10.5.4 *Scraping to Collect Embedded or Adhering Material.* A razor blade or scalpel is used to scrape evidence from an object, for example, scraping paint smears from a car part.

10.5.5 *Cutting*. Trace evidence can be cut from an item. The area to be cut is chosen so as not to affect subsequent testing of the item.

10.5.6 *Vacuum Sweeping.* A vacuum cleaner equipped with a filter trap is used to recover trace evidence from an item or area.

10.5.6.1 The appropriate vacuum parts, filter, and trap are changed and cleaned between uses.

10.5.6.2 Specialized vacuum filters are needed. A traditional vacuum cleaner bag is not suitable for collection unless the vacuum cleaner bag is new and the vacuum has been cleaned in a manner to ensure cross-contamination does not occur.

Note: These filters are not suitable for collection of dust or soil evidence. Consult other standards or a geological subject matter expert.

10.5.6.3 Consider using this method after other collection techniques as it is indiscriminate and can result in the collection of a large amount of extraneous material.

10.5.6.4 Vacuuming can be appropriate in cases where the evidence is not accessible by other methods such as an item with deep crevices, the collection area is large or when a significant amount of time has passed since the incident in question.

10.6 Collecting Trace Evidence from Individuals

10.6.1 These types of collections are not typically performed in a laboratory setting. This information is included so an examiner can advise other personnel such as police, nurses or medical examiners in these types of collections. There are also situations where laboratory personnel are requested to perform such collections.

10.6.2 *Combing.* A clean comb or brush is used to recover trace evidence from the hair of an individual.

10.6.2.1 This is performed over a clean piece of paper to collect any material that can become dislodged during the combing process.

10.6.2.2 The combing device, the paper, and collected debris from the hair are collected and packaged together.

10.6.3 *Clipping.* While DNA is typically the focus for evidence collection from fingernails, trace evidence such as fibers, paint, etc. can also be recovered from fingernails by nail clipping, scraping, or both.

10.6.3.1 Fingernails are clipped with clean scissors or clippers and packaged in clean paper.

10.6.3.2 Fingernails are scraped with a clean implement to collect debris from under the fingernails. Package the collected debris and the scraping device as one unit, typically in a paper fold.

10.6.3.3 Commonly, fingernails from the right and left hands are packaged separately. This does not preclude the collection of each or any nail, such as a nail with obvious damage, separately from all others.

10.6.3.4 *Particle picking.* Evidence can be picked using clean forceps or other implements.

10.7 Collecting Known Samples

10.7.1 Consult specific ASTM standards for the collection of known samples such as hairs, fibers, paint, glass, tape, etc.

10.7.2 A subsample from the known is collected for comparison with the questioned trace evidence, when applicable. The subsample can be targeted or representative, sufficient to represent all variations present within that item, as applicable. The areas from which these samples are collected are documented.

10.7.3 If chemical processing of an item can change or affect its chemistry, a representative known sample is collected prior to processing and is preserved for future comparisons. For example, collect a small portion of tape, which includes the backing, scrim, and adhesive, prior to processing the tape for latent prints.

11. Packaging of Trace Evidence

11.1 Trace evidence and items to be examined for trace evidence are packaged and sealed in a way that prevents loss or contamination.

11.1.1 Collect, package, and seal items individually in appropriate packaging.

11.1.2 Keep items in a secure, sealed package until the item is processed in a controlled environment.

11.1.3 Small or loose trace evidence is secured in clean, appropriately sized, unused primary leak-proof containers such as paper packets or plastic boxes. The primary container is appropriately secured in an envelope or paper bag.

11.1.4 Clothing and other items that are wet are air dried as soon as possible, without exposure to heat or sunlight, in a secured area in a manner that prevents loss or contamination of trace evidence. However, items to be examined for ignitable liquid residues or other chemicals such as bleach are not dried as this can cause a loss of evidence.

11.1.4.1 Clean sheets of paper are laid under items to collect any trace evidence that can fall from the item during drying. Any trace evidence collected on the paper will be preserved.

12. Reporting

12.1 The general requirements for reporting opinions of scientific or technical procedures will meet or exceed the requirements of Practice E620 and in laboratory policies and procedures.

12.2 The trace evidence recovery can be reported separately or in conjunction with a material-specific analysis report.

12.3 A trace evidence recovery report should include the following:

12.3.1 The items of evidence processed.

12.3.2 A description of what was collected from each item. This can be a general descriptor such as “debris” or more specific descriptors such as “apparent hairs”, “apparent paint”, etc.

Note: If material-specific analyses are not performed, appropriate qualifiers such as “possible” or “apparent” are added to the descriptors when describing the materials that were collected.

12.3.3 Collection of known exemplars

12.3.4 Recommendations for further examination of the collected material.

12.3.5 Request for known standards if future comparison examinations are recommended.

13. References

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