

# **Trace Evidence Submission Guidelines**

## **Contact Information**

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## **TRACE**

The Trace section compares the physical and chemical properties of items of evidence to determine if there is a similarity between known and unknown samples of tape, glass, paint, fibers, and other materials. Instruments that may be utilized in these examinations include Fourier Transform Infrared Spectroscopy (FTIR), scanning electron microscopy-energy dispersive spectrometer (SEM/EDS), pyrolysis gas chromatography mass spectrometry (PGCMS), microspectrophotometry (MSP), glass refractive index measurement (GRIM 3), and microscopic examinations. Instruments utilized will be stated in the results section of the Trace report. Other examinations in the Trace section include the comparisons of footwear and tire track impressions, filament determination for on/off status as well as physical matches of broken or torn objects, airbag analysis, and fabric damage.

## **Sealing, Marking and Submitting Trace Evidence:**

1. Ensure samples are dry and are adequately protected from damage (e.g. plaster shoeprint case; consider if it would survive a fall).
2. Most envelopes, bags, and containers are not manufactured for the purpose of containing microscopic evidence. Therefore, additional measures must be taken to ensure there is no loss of microscopic particles. Reinforcing the seals, seams, and corners of envelopes, bags, and boxes with tape will ensure microscopic particles will not be lost or contaminate other evidence.
3. When placing multiple items into containers, make sure all corners and seams of bags or envelopes are completely sealed before placing into the containers.
4. Protect CDs. They should be adequately protected to survive heavy evidence placed on top of them.
5. Be diligent about accurately and completely labeling known and unknown samples and the area the sample was removed from. (Example: Paint smears removed from RF fender of the (Victim's name) vehicle, MN license # ABC 123).
  - a. Known Samples- Samples for which the source is known.  
Examples:
    - i. Glass collected from the broken window.
    - ii. Paint collected from the non-damaged area of a vehicle.

- iii. Paint from a door frame.
  - iv. A roll of duct tape.
  - v. Trash bags still on the roll or in the box.
  - vi. Hairs removed directly from an individual's body.
  - vii. Shoes from a suspect
- b. Unknown Samples– Samples for which the original source is NOT known.  
Examples:
- i. Glass or paint collected from clothing or shoes.
  - ii. Paint, glass, or insulation on a tool.
  - iii. Paint smear on car/bike/building from a hit and run.
  - iv. Paint from damaged area of vehicle.
  - v. Duct tape used to bind victim.
  - vi. Tape used in an explosive device.
  - vii. Trash bag found on the body.
  - viii. Hairs tape-lifted from clothing.
  - ix. Foreign hairs on a body.
  - x. Impressions (footwear, tire, etc.) found at the scene.
6. In a hit and run case involving two vehicles – at least four samples should be submitted:
- a. Known from victim's car near the damage.
  - b. Unknown paint from the victim's car in the damaged area.
  - c. Known paint from the suspect's car near the damaged area.
  - d. Unknown paint from the suspect's car in the damaged area.

More known paint should be submitted if more than one area is damaged since hood, doors, fenders, etc. can have different paint chemistry even on the same vehicle.

7. The use of tape lifts is acceptable for unknown samples of fibers and hairs, but should not be used for paint samples. Paint samples should be collected by using a razor blade and scraping paint until the metal\*, plastic, or other substrate is reached. These scrapings should be collected in a small piece of paper, which should be folded and taped so the sample is secured. This sealed paper fold should then be placed into an envelope and tape sealed.

\*Note: Many automotive primers are grey. Paint on metal should be scraped until the metal substrate is shiny in appearance.

8. Most examinations done in the Trace section are comparative and require a known sample along with the questioned material
9. In cases where a known sample is not available, several examinations done in the Trace section can produce investigative leads.
- a. Questioned Automotive Paint Smears- Can be searched in a database (PDQ) to determine a possible make and model of the vehicle.
  - b. Questioned Footwear Impressions- Can be searched in several databases (BCA and SICAR) and online to determine possible make and model of the shoe/boot/sandal.

- c. Questioned Tire Track Impressions- Can be searched in several databases (BCA, SICAR, and Tire Tread Design Guides) to determine the possible make and model of the tire.
- d. Unknown substance/material- May be able to identify unknown substances and/or materials using various physical and chemical analyses.

The next few pages include a table listing collection and packaging guidance for a variety of Trace evidence specimens.

Specimen	What to Collect?		Wrapping & Packaging	Remarks
	Standard/Known	Evidence/Unknown		
<b>Broken Parts (Physical Matches)</b>	Areas that are broken	All pieces recovered.	Protect edges from further breakage and damage. Place in a sturdy container.	Do not attempt to fit them together prior to submission. It may alter the edges.
<b>Building Materials and Wood</b>	Collect a sample of drywall, wood, particle board, bricks, cinder blocks, cement, etc.	All recovered pieces, tools, clothing, etc.	Use an envelope or small box with all of the seams and corners sealed.	
<b>Clothing</b>	All clothing of principals, blankets, comforters, sheets, carpet, etc. from the scene	Clothing of principals, blankets, comforters, sheets, carpet, etc. from the scene	Place each item of clothing in a separate clean brown paper bag. Items of bedding should be packaged separately.	Avoid the use of plastic bags. Air dry wet items before packaging
<b>Fabric Impressions</b>	All outer clothing.	Object the impression is on.	Protect the impression against loss through abrasion (secure to box).	Photograph the impression with a scale prior to packaging. Submit photos with impression.
<b>Fibers</b>	All clothing of principals, blankets, comforters, sheets, carpet, ligatures/cordage etc.	Loose fibers, objects containing fibers or tape lifts or vacuumings of areas of interest.	Place fibers in a "druggist fold"/paper fold or inside a folded yellow "Post-It," then inside an envelope with all seams taped closed.	Avoid the use of plastic bags. Gloved fingers or tweezers are best. Tape lifts are acceptable. Vacuumings only as last resort.
<b>Glass</b>	At least 1 square inch from each broken window (take from frame - not from the ground) or as much of the container that remains. Both panes and the polymer should be sampled on windshields.	Any fragments recovered, clothing of suspects, objects that may have been used to break glass, etc.	Use puncture resistant packaging such as pillboxes, film canisters, cardboard boxes, etc. with all edges taped. Keep each source separate.	Be aware of possible shoeprints on broken pieces. All pieces should be submitted for attempt of a physical match.
<b>Hairs</b>	25 - 50 <u>pulled</u> hairs from head and pubic area (packaged separately and labeled).	Loose hairs, objects containing hairs or tape lifts or vacuumings of areas of interest.	Place in a "druggist fold"/paper fold or inside a folded yellow "Post-It," then inside an envelope with all seams taped closed.	A good known sample consists of hairs from all areas of the head/pubic area.
<b>Headlights and Taillights</b>	Headlight(s) and taillights	Any broken pieces from the scene.	Place in a sturdy container and protect from further damage (use Styrofoam cups to protect filament area).	Do not turn on lamps in question at the scene. All information regarding incident is helpful. Photographs of damaged area on vehicle are useful.
<b>Paint</b>	Paint source (e.g., spray paint can, tool) or a small portion of the larger painted object (enough to cover an area the size of a penny, include the substrate which paint is on)	Collect objects with smears, victim/suspect clothing, transferred paint, etc.	Use a druggist or paper fold inside an envelope with all the seams taped.	Do not use tape or plastic bags to collect. Collect known samples from an area close to but outside of damage. If automotive, collect known from each damaged panel.

Specimen	What to Collect?		Wrapping & Packaging	Remarks
	Standard/Known	Questioned/Unknown		
<b>Footwear Impressions</b> <a href="#">Shoep rint/Tire Track Collection Guideline</a>	Collect all known shoes.	Collect photographs, lifts, and casts of questioned impressions	Package shoes in a paper bag. Questioned images should be submitted on a CD-R, DVD-R, or in another write protected format.	Ensure photographs include a proper scale at the same depth (bottom) as the impression. It is useful to have both casts and photographs.
<b>Tape</b>	Rolls of tape or objects with similar tape to the one in question.	All pieces recovered.	Place rolls in a box or paper bags. Zip tie questioned tape to the bottom of a box to prevent further 'balling'.	Tape may also contain other evidence (e.g., hairs, fibers, latent prints, or DNA). Never unwrap bindings, rather cut bindings away from torn tape ends to remove. Label the cut ends clearly.
<b>Tire Track Impressions</b> <a href="#">Shoep rint/Tire Track Collection Guideline</a>	Collect photographs, impressions of tires and tires.	Collect photographs, lifts, and casts of questioned impressions	Submit photos on CDs. Place casts in boxes to prevent breakage. Place lifts in envelopes.	Ensure photographs include a proper scale at the same depth (bottom) of the impression. Impressions of the tires are best taken if they remain on the suspect car but can be removed and submitted also.
<b>Tools</b>	Any tools of interest.	Known comparison samples of paint or glass from scene. Also collect casts or objects containing possible tool marks.	Protect the area of interest (e.g. by taping a paper bag around the end), and sealing in a sturdy container.	Make certain that suspect tools are not in contact with scene samples.
<b>Wood</b>	1 cubic inch	All	Use sturdy container.	

**Additional notes:**

- Dry all wet or bloody items over clean paper prior to packaging. Once dry, place paper and items in a paper bag or box.
- Information concerning a case should be submitted with the evidence.
- Each item of evidence should be marked for identification.
- Standard/known and evidence/unknown items must be packaged separately.
- Containers must be sealed and marked. Tape-seal all seams and sign initials across the seals.
- All photographs of fabric impressions, tire track, and footwear impressions, must contain a scale (ruler) and be taken with the film plane parallel to the object.
- Photographs should be submitted.
- In general, avoid the use of plastic bags as evidence containers for Trace Evidence.

## CHEMICAL TESTING

The Chemical Testing section analyzes fire debris and liquid samples for the presence of ignitable liquids that may have been used to start or accelerate a fire. This section also analyzes chemical unknowns; e.g. non-narcotic, non-biological materials of evidentiary value.

The prompt collection, preservation, and timely transmittal of fire debris evidence are important steps in the investigation of suspicious fires. When submitting fire debris to the laboratory, use the following guidelines:

### FIRE DEBRIS EVIDENCE

1. Packaging – unused lined metal paint cans with tight fitting friction lids or sealed nylon bags.
  - a. The size of the can is determined by the size of the evidence – the can should be approximately half-full (not packed full, but not mostly empty either).
  - b. Lined cans are preferred because unlined cans will rust through in a matter of weeks (even days, in some cases).
  - c. Septa-top cans are not recommended, as they are not airtight as advertised.
  - d. Nylon bags (aka Ampac<sup>®</sup>) can be used for evidence that does not fit well in cans (e.g. bedding, bulky clothing, etc.). Bag length should be sufficient so that approximately half the bag is empty; ensure that all heat seals are intact.



**Fig. 9.3- 1:** New and clean paint-like lined metal cans with tight fitting friction lids are available from manufacturers.

2. Liquid Samples – use glass bottles up to one-ounce maximum in size with Teflon lined screw caps and secure against breakage during transport.
3. “Clan lab” packs (glass vial with Teflon-lined cap stored in a Nalgene bottle) work very well for this purpose – these are available from Evidence Intake.
4. Original Containers (such as gas cans or lighter fluid bottles)

- a. Liquid samples only – sample as for liquid samples above, secure and retain the container and remaining liquid.
  - b. Photograph original container including a close-up of the ingredient list and lot number if available. Submit with evidence.
  - c. Containers – analysis only (such as for latent prints or DNA):
  - d. Intact Container – transfer liquid to another suitable container and retain separately. Then, seal openings of the questioned evidence with the original cap(s).
  - e. Ruptured and cap-less containers – transfer liquid to another suitable container and retain separately. Air-out the questioned evidence container.
  - f. Both liquid and container analysis – submit two separate samples as described in 3a and 3b above and retain the excess liquid in another suitable container.
5. Clothing
- a. Package clothing items separately, including shoes.
  - b. Wet clothes are OK- DO NO DRY them prior to packaging.
  - c. Use appropriate sized container
    - i. 3.5 & 5 gallon cans work well for bulky clothing items and shoes.
6. When Collecting Fire Debris Evidence
- a. If possible, collect samples that are only partially burned.
  - b. If possible, collect separate samples of the same material from an area that has been protected from the fire (Comparison Sample).
  - c. Absorbent materials are better than non-absorbent materials.
  - d. Only fill the container half-full – the size of the sample determines the size of the container. Soil samples must be kept frozen from the time of collection to the time of analysis.
7. Practices to Avoid
- a. Do not package samples in paper bags unless serology examinations are required (DNA).
  - b. Do not allow samples to dry before packaging.
  - c. Do not package samples in regular plastic bags. Nylon bags are acceptable.
  - d. Do not submit leaking containers (if the outside is wet or you can smell vapors, the evidence is not packaged properly).
  - e. Do not submit large quantities of ignitable liquids (maximum is one ounce).
  - f. Do not submit more than one case per package – each case must be packaged individually.
8. Label each container with the following information:
- a. Agency Case Number
  - b. Exhibit Number
  - c. Date of Collection
  - d. Investigator's Name or Initials
  - e. Contents of Container
  - f. Location where evidence was collected
  - g. Address of Incident

## CHEMICAL UNKNOWN EVIDENCE

1. Acids & Bases (corrosives and caustics, including Bleach)
  - a. Liquids & Solids
    - i. Package in regular plastic. Do NOT use cans or paper bags.
  - b. Clothing, etc.
    - i. Place item in a sealed plastic bag while still wet and store in refrigerator.
    - ii. If DNA is also needed, notify the laboratory so it can be analyzed and repackaged ASAP.
    - iii. Exception – suspected ammonia or acetic acid (vinegar) – items should be placed in cans.
  - c. SAFETY
    - i. If any skin contact occurs, flush with water. If substance is suspected of etching glass or cleaning masonry, seek medical attention immediately for possible exposure to hydrofluoric acid.
2. Bottle bombs (aka Drano bombs, chemical or MacGyver bombs)
  - a. Pre-blast Ingredients
    - i. Package in regular plastic. Do NOT use paper bags.
  - b. Ruptured Bottles
    - i. If ingredients are not known, package in plastic with an outer can. If suspected to be acid & aluminum, or drain cleaner, a plastic bag is sufficient. If suspected to be toilet tank sanitizer or pool chlorine, place in arson bag or can.
  - c. Clothing
    - i. Place in regular plastic while still wet and store in refrigerator. If DNA is also needed, notify the laboratory so it can be analyzed and repackaged ASAP.
  - d. SAFETY
    - i. If any skin contact occurs, flush with water.
3. Pepper Spray, Mace, Tear gas, Bank dyes
  - a. Canisters, Security packs
    - i. Package in regular plastic or security envelope, unless DNA needed. Paper bags OK, but clearly label suspected contents.
  - b. Clothing, Carry bags, etc.
    - i. Paper bags OK, clearly label suspected contents.
4. Organic Liquids
  - a. Examples: rubbing alcohol, acetone, chloroform, dry cleaning solvents, etc.
  - b. Package samples the same way as fire debris samples using cans or nylon bags (see above for specifics).
  - c. If sampling a container too large to submit to the lab, clearly photograph the container and submit photos to lab.
5. Other “Chemical Unknown” Evidence



- a. The Chemical Testing also analyzes other non-narcotic chemicals for identification and/or comparison. Please call before submission to find out whether or not we can perform a particular analysis and for packaging advice.

NOTE: With chemical unknowns, it is critical that information concerning what may be suspected based on case circumstances is given to the laboratory (e.g. chemical exposure, biological exposure, poison, victim's symptoms, etc.).

***NOTE: Prior approval from the Trace Group Supervisor and/or Directors is required for all non-fire debris cases.***

Any further questions you may have in regards to fire debris or chemical unknowns, please contact the Chemical Testing Section.