

**SANTA BARBARA COUNTY  
SHERIFF'S OFFICE  
FORENSICS UNIT**

**COLLECTION OF TRACE EVIDENCE AT CRIME SCENES**

**1.0 BACKGROUND**

Trace evidence is a generic term for small, often microscopic material, which can be transferred when contact is made with an individual or an environment. This evidence includes such things as hair, fiber, glass, paint, soil, safe insulation, building materials, and so on. It can be found on most any surface including people, floors, clothing, furniture, bedding, and on both the interior and exterior surfaces of vehicles. The method used to collect trace evidence will depend on the following: the location of the evidence, the nature and condition of the article to which the trace is adhering, the presence or absence of other evidence and its nature and condition, the type of crime being investigated, the relationship of the evidence to the reconstruction of the crime scene and any other circumstances that might arise.

**2.0 MATERIALS AND EQUIPMENT**

2.1. Materials

- A. Paper Bindles / Coin Envelopes
- B. Small boxes
- C. Latent Print Lifters
- D. Vacuum filters (if available)
- E. Tweezers (forceps)
- F. Envelopes (various sizes)
- G. Scalpel (handle and blade) or disposable scalpel
- H. Source of light (such as a flashlight)
- I. Combs or brushes
- J. Clear acetate sheet / clear sheet protector
- K. Clear Tape
- L. Magnifying glass (optional)

2.2 Equipment

- A. Metal detector
- B. Global Positioning System (GPS)

**3.0 PROCEDURE**

3.1 Preliminary Considerations

- A. Prior to the collection of any evidence including trace evidence from a crime scene, overall photographs as well as close-up of the items examined should be taken.

- B. On those occasions when the item to be examined is too large or the search at the crime scene would present a contamination problem, the item should be carefully packaged and brought back to the laboratory for further examination. Any trace evidence observed on the item should be removed so that it doesn't get lost during transportation.
- C. The mode of collection of the trace evidence will depend on a number of different variables, including the type of surface to be examined, the amount of area to be examined, the portability of the object, the type of trace evidence being sought and the examiner's preference. In many instances, more than one mode of collection can be used.

### 3.2. Methods of Collection of Trace Evidence at Crime Scenes

- A. *Hand picking*- This method involves the visual examination of an object for trace evidence such as hairs, fibers, glass, soil and paint. Normal room light, oblique lighting, and the alternate light source can be used in the search. The examiner can also be aided by a magnifying glass. When trace evidence is located, it is collected by hand or with a pair of forceps and placed into an appropriately sized packaging, such as a paper bindle. If the location of the trace evidence is significant, record its location by means of a photograph before recovering the item.
- B. *Tape Lifts* – This method uses clear one-sided adhesive tape or fingerprint tape lifts to remove trace evidence from an object (e.g., from a car seat). The tape or tape lifts are pressed against the item along each surface area until the stickiness of the tape is gone. At this time, if necessary, additional tapes are used on the item being examined until the entire surface area of interest has been completely tape lifted. Once collected, the clear tape can be placed on a clear acetate sheet (or sheet protector) for protection and the original backing found on the fingerprint lifters can be placed back onto the lifter.
- C. *Combing*- This method uses a comb or brush to collect trace evidence from the body of a victim or suspect. A piece of paper should be placed under the area to be brushed to collect any evidence that may fall. The brush or comb should only be used on one particular area of the body at a time, such as the pubic region. If additional areas (regions) are to be brushed or combed, a new brush/comb should be used. Each combing (comb and paper) should be packaged individually and marked with the appropriate information
- D. *Removal of an object*- If the trace evidence is securely attached to an object and cannot be easily removed (e.g., a paint smear on an article of clothing), then the entire object can be collected or just the portion containing the trace evidence can be collected. If an area is to be removed, it should first be photographed to show the relative location of the object at the scene and the location of the trace evidence (if possible).

### 3.3. Packaging of Trace Evidence at Crime Scenes

- A. The type of packaging used to store the collected trace evidence will depend on what type of evidence is collected and will minimize the chance of cross contamination. In most instances a paper bindle/glassine bindle/or a coin envelope will be used. The trace evidence should be placed in the smallest container that the trace evidence will comfortably fit in.
- B. At no time should the item (trace evidence) be packaged with cotton directly touching the object. If the trace evidence is subject to breakage, as is the case with glass or even large paint samples, then it can be packaged in a bindle and placed into a box to prevent further breakage.
- C. The original covering supplied with the tape lift should be used to protect the sticky surface after it has been used. The tape lift can then be placed into a manila envelope and marked with the appropriate information.
- D. Each bindle should be individually marked with the case number, date, initials of the collector, item number, tag number, and a brief description of the item. When appropriate, one can also document the location from which the sample was collected from.
- E. If the bindle is small, it should be placed into a coin envelope and the outside of the coin envelope should be marked as described above.
- F. Trace evidence, which consists of fine particles such as a dry soil sample, should be first collected in a plastic or glass container with a lid to prevent loss of the sample. If this is not available, then use a paper bindle placed in a manila envelope making sure the comers are sealed to ensure the material stays in its packaging. If the sample is wet, it will need to be air-dried at the laboratory before packaging and booking. Again, the proper information should be on both the inner and outer packaging.
- G. Once all the trace evidence has been individually packaged, the items can all be individually placed into in a larger envelope or brown paper bag. The individual bindles and envelopes must be folded in such a manner to prevent leakage, and should be taped closed to prevent leakage. The exterior of the packaging material should be marked with an adhesive evidence label (SH-1003) containing all pertinent case information (case number, tag number, charge, date, time, item number, etc.).
- H. In most circumstances, this evidence will be collected at the scene by the Forensic Technicians and/or the Forensic Detective. Information regarding the chain of evidence should be noted in your report.

### 3.4. Preservation of Trace Evidence Collected at Crime Scenes

- A. Trace evidence of a biological nature, such as hair evidence, should be frozen so that any root sheaths or other residue such as blood, if present, can be analyzed for DNA. However, even if there is no root material or foreign matter on the hair, the hair may still be suitable for mitochondrial DNA analysis and still should remain frozen.
- B. Most other trace evidence can be stored at room temperature in a controlled environment unless there is the possibility that biological evidence is physically present on the trace evidence collected. If this is the case, then this trace evidence should be preserved in the freezer.
- C. If the trace evidence is collected at the scene, a notation on the exterior packaging of the item(s) should indicate whether or not the contents should be stored frozen or at room temperature. This information should also be conveyed to the rest of the responding Forensic Technicians and/or Forensic Detectives.

### 3.5. Collection of Control Samples at Crime Scenes

- A. The collection of control samples from the scene, such as carpet, upholstery, and soil samples, should be done in a timely manner while initially at the scene and should not be an afterthought. In some cases, additional controls may be needed after the items have been examined at the laboratory. If collecting an item (such as a large area of carpeting, drywall, etc.) you must immediately inform the Forensic Supervisor before cutting any items from a residence/vehicle/or area.
- B. When collecting various control samples, the sample should be representative of the material being collected. For example, if a multi-color carpet is present, the sample collected should contain all the various colored fibers present in the carpet. More than one fiber of each color should be collected. A representative swatch of the material can also be collected.
- C. If the material from which the control is being collected is damaged in some areas either through wear, chemical or environmental causes (such as the sun), samples from the damaged area as well as the undamaged area should be collected.
- D. When collecting control samples from the interior of the vehicle, do not forget to collect upholstery fibers as well as carpet and, if present, floor mat and seat covers. If the upholstery is damaged and the underlying seat foam is visible, collect a sample from the foam material as well.
- E. In most cases, the greater number of control samples collected, the better the chance of associating the perpetrator to the crime scene or to the victim. However, the control sample must be representative of the sample. Never **just collect a single fiber, paint chip, or hair as a control sample.**

## 4.0 COLLECTION OF GLASS

As with many other areas of Forensics, the examination process is often more concerned with establishing an association between an individual, item or crime scene than the actual identification of the substance itself. Broken glass, which can commonly be found at crime scenes or on persons who have been involved in crimes is one of those substances. Although during the examination process the unknown material will be identified as glass, the fact that glass is present usually provides no association with a particular crime or victim unless it can be linked to broken glass found at the scene. Therefore the proper collection of control glass samples from the crime scene is the first step in the glass examination and comparison process. The following outline provides the basic steps involved in the proper collection of control samples from known sources of glass, which will be used as a source of comparison.

### 4.1 Materials

#### A. Tools Used in Collection

1. Forceps.
2. Gloves.

#### B. Packaging Materials

1. Paper bindles/glassine bindles/ coin envelopes (size dependent on sample being collected).
2. Boxes (size of box depends on size of glass collected).
3. Manila envelopes.
4. White butcher paper.
5. Various sizes of brown paper bags.

### 4.2 Procedures

#### A. Preliminary Considerations

1. When collecting control glass samples especially from large pieces of remaining broken glass the possibility of a fracture or "jig-saw" puzzle match (physical match) should be considered.
2. Caution must be taken in preserving additional types of trace evidence that might be present on the control glass sample including blood, fibers, hairs, shoeprint impressions, fingerprints and paint transfers.
3. When taking a sample from a known source of glass, the glass should be sampled from various locations throughout the sample in order to best represent the source material.

4. The known sample should consist of the largest amount of material that can be reasonably collected. If the sample is still present in a structure, for example a window frame or light assembly, then the inside and outside of the remaining glass pieces should be marked. This information can be useful in determining the direction of force and to facilitate a possible physical match.
5. Large glass pieces should be packaged with care to prevent further breakage that might result from the transportation of the item. Each of the packages containing the control glass sample should be marked with at least the case number, date, location obtained, and the initials of the person collecting the sample.
6. At all times care should be taken to avoid contamination of known and control glass samples as well as the mixing of control samples, which have been collected from various locations.
7. The following are a set of general guidelines for the collection of commonly occurring reference (control) glass samples and does not attempt to cover all sources of glass that may be found at a crime scene or might be used for comparison purposes.

B. Sample Collection and Handling

1. Vehicle Door Window Glass
  - a. Vehicle door glass usually consists of tempered glass, which when broken, will be found in small cube "diced" shaped pieces. The broken pieces of tempered glass will not have sharp or pointed edges. In most circumstances the window will be completely broken with little if any glass left in the frame.
  - b. If only a single vehicle window is broken then a sample of glass from that window should be collected. The control sample may be collected from various areas of the vehicle including the floor, inside the doorframe and/or from pieces that remain in the frame. The sample should consist of as many pieces as reasonably possible.
  - c. The control glass samples from the window should be collected with forceps; however, depending on the size of the control glass pieces they can be collected by gloved hands. Care must be taken not to cut oneself.

- d. Depending on the amount of sample collected, it should be placed in a suitably sized container such as a pillbox, coin envelope or paper bindle.

## 2. Vehicle Windshield Glass

- a. Modern front windshield glass is laminated consisting of a piece of plastic laminate sandwiched between two pieces of glass. This type of glass resists penetration and is very hard to break into pieces.
- b. Since the possibility exists that the two flat glass pieces used in the glass may be from different pellets (sources) or may actually be different in color, control samples of the glass if broken on both sides should be taken.
- c. Since vehicle window glass usually remains intact in the windshield when damaged, care should be taken in documenting any damage to the window that might indicate the direction of an impact prior to the collection of any control glass sample.
- d. Control samples can be collected with forceps from areas around any damage to the windshield. Since most of the glass will likely be slivers and/or very small pieces, it is unlikely that a physical match can be made; however, prior to collecting the sample consider the possibility of a physical match.
- e. Depending on the amount of sample collected, it should be placed in a suitably sized container such as a pillbox, coin envelope or paper bindle.

## 3. Window and door glass

- a. Window type glass, sometimes referred to as flat glass, may consist of a double pane (two pieces of glass with air or a gas trapped between the pieces). If this is the case, and both panes are broken, then samples from each of the panes should be collected.
- b. Keep in mind that the surface area of larger pieces of broken window and door glass, especially if these areas were a point of entry is made, can be prime surfaces for latent footwear impressions if these pieces of glass are on the ground. Care should be taken to preserve this type of evidence as well as pieces of fabric, individual fibers and/or hairs that may be adhering to any remaining glass pieces still present in the window or doorframe.

- c. Glass can be collected for the purpose of determining direction of impact of a bullet or other fracture analysis. Record which side of the glass was on the outside of the window, and which side was on the inside before collecting the remaining pieces of glass from the window or door. Prior to collecting the glass in this situation the damage should be documented as well as any supporting evidence that might support the direction of the breakage.
  - d. If size limitations preclude collecting all the glass, always attempt to obtain a sample from an area near the point of impact and then collect and mark separate specimens from distant comers of the pane as well.
  - e. Collection of the glass samples can be done using forceps or by hand. Gloves and the proper hand protection should be worn while collecting the glass pieces by hand to avoid injury.
  - f. Depending on the amount of sample collected, it should be placed in a suitably sized container such as a pillbox, coin envelope, paper bindle, paper bag or wrapped in butcher paper. Whatever packaging is used, it should be free of leaks and should not contaminate the specimen. Do not place the control samples in glass containers.
4. Bottle and Ornamental Glass (vases, candle holders, etc.)
- a. In many instances, large pieces of broken bottle glass or ornamental glass may remain at the scene and there exists the possibility of a physical match between these pieces and those deposited on a suspect. Therefore, an attempt to collect all pieces of the broken bottle or ornamental glass, which appear to be from a single source, should be made.
  - b. If there appears to be more than one source of glass, either due to location of the item, color, shape or other distinguishing features then collect each type separately. The pieces should be packaged to prevent further breakage, using items such as butcher paper or paper bags for cushion if placing the items in a box and to help minimize the loss of additional evidence such as fingerprints and trace evidence.
  - c. If the item is primarily intact, prior to its collection consideration should be given to fingerprinting the glass object at the scene to minimize loss of potential fingerprint evidence.



- d. Again, the size of the packaging should be relative to the size of the object seized.
5. Headlamps and Automotive Mirrors
    - a. When a headlamp or automotive mirror is broken, attempt to collect the entire assembly leaving the glass in place so as to facilitate a possible physical match. Pieces of these items may be left at a scene of a hit and run, or found on the victim's clothing.
    - b. All glass found at a hit and run scene should be collected due to the fact that more than one type of glass may be present and there may be a possibility of a "physical match" with glass remaining on a vehicle, such as with a broken headlamp.
    - c. Like other glass evidence, it should be packaged in a manner that will not contaminate the specimen and will prevent its loss.
    - d. If only pieces remain in the headlamp or mirror assembly, then collect as many pieces as possible or remove the assembly and package appropriately.
  6. Other Sources of Glass
    - a. Mineral wool (glass wool, slag wool and rock wool) is often found as insulating material in ceiling tiles and home insulation. Glass fibers are also a primary component of fiberglass boats and automotive parts.
    - b. As with other sources of glass, control samples should be collected so that a representative sample of the item is collected. It is best to collect the sample near the damaged area as well as areas near the damage to get a representative sample. Unless it is the only option, it is best not to collect the control samples from like or undamaged ceiling tiles or insulation due to the fact that variations may occur due to lot number or the use of different manufacturer's products.
    - c. Samples should be collected in the same manner as described above and should be labeled with the appropriate information.

## 5.0 COLLECTION OF PAINT SAMPLES

Paint, as a type of trace evidence can be present in a variety of cases including hit and runs, assaults, burglaries and homicides. Paint can be found as a chip, consisting of single or multiple layers, a smear, or may be painted on an object in an act of vandalism. Like other forms of trace

evidence, paint evidence can be used to link a suspect or victim to a scene, or to link an object to the scene or an individual. One of the most important aspects of any comparison of paint involves the proper collection of the paint sample from an unknown source as well as the control paint sample to which it is to be compared. The information derived from the control sample through its analysis will be the basis of its comparison to an unknown sample.

## 5.1 Materials and Equipment

### A. Materials

1. Glassine/paper bindles/coin envelopes (proportional to size of sample).
2. Envelopes.
3. Marking pen.
4. Paper bags and/or butcher paper (for wrapping large objects).

### B. Equipment

1. Tweezers.
2. Scalpel with scalpel blade.
3. Disposable scalpels or razor blades (optional).
4. Digital camera.
5. Various tools (screwdrivers, wrenches, etc.) that might be used to move Objects.

## 5.2 Procedures

### A. Preliminary Considerations

1. Collection of items should be noted in the report. In some instances, photographs showing various features found during an examination/collection process should also be made.
2. Note that trace evidence including control paint samples can be susceptible to contamination during the collection process and care must be taken to avoid such contamination. This includes insuring that the tools used for collection are cleaned between each control sample collected even if it is from the same vehicle. Disposable scalpels or razor blades can also be used in the collection process.
3. Keep in mind that the amount of paint submitted for examination will often be the determining factor in what types of analysis can be done. This includes the control paint sample collected for comparison.

4. When choosing the areas from which a control sample is collected keep in mind that a physical match (Jig-saw puzzle) may be possible and care should be taken when collecting the control sample.

#### B. Collection and Packaging of Control Paint Samples from Vehicles

1. Collect control paint samples from all areas of a vehicle showing fresh damage. This will provide a range of samples due to the fact that the paint may be different in type or composition on different areas of a vehicle even if the color is the same. If more than one vehicle is involved, then collect control samples from each vehicle as well as any cross transfer that may have occurred.
2. If large flakes are present along broken edges or chips of paint are missing, then a physical match may be possible. Carefully collect these areas and protect the edges from further damage.
3. Paint should be collected as close to the damaged area as possible. Remove a sample of paint either by bending the metal back slightly so that the paint will flake off or scrape or chip the paint off using a clean scalpel or knife blade. The blade must be clean prior to collecting each sample of paint, even if it is from the same vehicle. Make sure that all layers of the paint down to the metal (or plastic) are collected as a control sample. In many cases, the control paint sample will consist of a clear coat, colored topcoat and primer layer.
4. Place each sample collected in a separate paper or glassine bindle and label. The label should include the case number, the date and time the sample was collected, who collected the sample, the location on the vehicle, and make/model/ and year of vehicle.
5. Do not collect a control paint sample using a tape lift or other sticky object. The adhesive may interfere with future analysis of the paint sample.
6. The bindle should then be packaged into an envelope. If the information needed to identify the sample will not fit on the inner bindle then it can be placed on the exterior envelope. Do not place control samples directly into an envelope unless large pieces are present. Placing small chips of paint directly into a large envelope may result in a loss of sample.

#### C. Collection and Packaging of Paint Samples from Burglary Scenes

1. Collect a sample of paint from all areas in which a tool may have contacted the scene. Make sure to collect all layers of paint present. Do not destroy an actual tool mark, if present, when collecting a control paint

sample. Carefully remove a paint sample from around the mark. Use a clean blade for every sample collected including those collected from the same item but in different areas.

2. Be aware that the tool itself may be painted and a cross-transfer of paint from the tool may be left at the scene. Collect any cross-transfers by removing the area or by carefully scraping the paint from the surface. Be sure to include the original surface area as well as a control from that surface area.
3. The tool itself may contain other trace evidence other than paint, such as plastic or insulation; therefore care must be taken in transporting the tool. Carefully wrap the area containing the trace in clean paper and seal with tape to prevent loss. (Collect other possible sources of trace evidence such as controls and paint samples.)
4. If the tool is located at the scene and a comparison of any trace evidence on the tool is desired, no attempt should be made to actually match the toolmark at the scene to the tool. This action could cause paint or other trace evidence transfers to occur which would lessen their significance if found at a later date. In addition, this may introduce additional and erroneous tool marks on to the evidence item.
5. Package the paint samples collected from the scene into individual paper bindles and then into larger envelopes. Label with the date, time, case number, initials, and location where sample was collected.

#### D. Other Considerations

1. When collecting paint from non-painted surfaces such as a rubber bumper or wood frame, make sure to collect control material from the underlying material as background material. Collect each sample separately and label accordingly.
2. In some cases, especially when the amount of paint transfer on an object is small, it is best when feasible to collect the entire object containing the paint transfer. If this is not possible, collect all the paint transfer as well as a sample of the underlying material attached to the paint transfer and a control paint sample from the underlying material. Label all items with the location obtained and whether or not it is a control sample or the unknown sample of interest (transfer paint sample).
3. Paint may be transferred to the clothing of a hit and run victim. The area thought to contain a paint transfer can be marked at the scene and collected. Clothing items should be carefully removed from the

victim and wrapped individually in paper before placing in a labeled brown paper bag.

## 6.0 COLLECTION OF CONTROL SOIL SAMPLES

The collection of proper control samples (those from a known location) is essential to the evaluation and comparison of soil samples collected from various items of evidence. Since soil can vary in its vegetative, animal and mineral composition as well its man-made components, such as building materials and asphalts, over a short geographical distance, the collection process must insure that a sufficient number of control samples from various nearby areas are collected.

### 6.1 MATERIALS AND EQUIPMENT

- A. Materials
  - 1. Leak proof glass or plastic containers.
- B. Equipment
  - 1. Small spades or spoon (optional).

### 6.2 PROCEDURE

- A. General collection
  - 1. Collect control samples from various areas near and around the crime scene. A simple change in color can be significant. These samples should be representative of the soil variation within the crime scene area.
  - 2. If the area is open one can collect samples from the initial crime scene then collect additional samples from distances of approximately 10 ft., 50 ft., and 100 ft. in all four compass directions where soil is present.
  - 3. Collect a surface soil sample especially in those cases thought to be involved with casual contact, do not dig down to obtain the soil sample. If the area in question involved excavation, then collect numerous samples from different depths and note the depth.
  - 4. Before packaging, all soil samples should be dry. If the soil is wet or damp when collected, it might develop mold which can cause the organic matter in the soil to decompose.
  - 5. Collect 1 to 8 ounce samples from the various areas in leak proof containers. In most cases, this amount should be adequate for further examination.

6. Mark each container with the appropriate identifiers including case number, date, item number, initials of individual who collected the sample and the location obtained. A note can be made regarding whether or not the sample had to be air-dried before packaging.
7. Make sure that the control soil sample is collected soon after the crime scene is discovered. If the samples are not collected in a timely manner, the soil may have been cultivated, contaminated or altered by natural events. The control soil samples will therefore not be representative of what was present at the time of the incident.

#### B. Special Issues

1. To best enable the person collecting the samples to collect samples from the appropriate geographical areas, basic facts of the case must be obtained from the investigators at the scene before collection begins. This will facilitate the collection of control soil samples from specific locations. You want to be able to collect a control soil sample from the suspected source area.
2. If the crime scene contains shoeprint or tire track impressions, then the control soil samples need to be collected from the area within the impression. However, this must be done after the impressions have been photo-documented.
3. If a cast is made of the entire impression, then the soil remaining on the cast can be used as a control. In addition to this soil sample, supplemental samples close to the impression should be taken as well.
4. If the sample of dirt is firmly attached to an object like a clump of mud on a shoe, do not remove it at this time, but package the entire item in an appropriate container.
5. Soil samples must be collected as soon after the crime scene is discovered. The soil may be altered by cultivation, contamination, or natural events, if the samples are not collected in a timely manner.

## 7.0 REFERENCES

1. "Evidence Collection Guidelines", Forensic Technology for Law Enforcement Telecourse Presented on May 13, 1993, [www.police.ucr.edu/collect.html](http://www.police.ucr.edu/collect.html).

2. Scientific Working Group on Material Analysis (SWGMAT), Trace Evidence Recovery Guidelines, January 1998.
3. Lee, Henry C. (Editor), Physical Evidence, Printed by Magnani & McCormick, Connecticut Insurance Industry.
4. Lee, Henry C., Palmbach, Timothy M. and Marilyn T. Miller. "Henry Lee's Crime Scene Handbook", Academic Press, 2001.

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