Criminalistics Laboratory

OUR VISION STATEMENT

Success through partnership.
Excellence through professionalism.
Truth through science.

Trace Evidence— paint examinations

Forensic paint examinations cover numerous cases

- Automotive hit and run
- Property crimes involving pry tools
- Vandalism with spray paint

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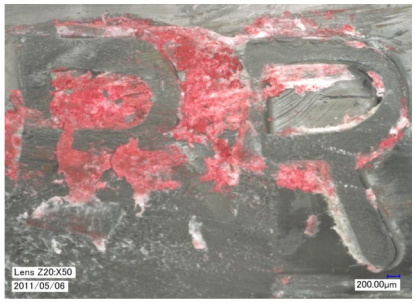
Automotive paint examinations

Trace evidence in the form of automotive paint can be present in a number of cases. These include collisions between two vehicles, collisions between a vehicle and another object (e.g., a building), or collisions between a vehicle and a person. In any of the above scenarios, paint evidence can be left behind in the form of transfers, smears, or broken off paint chips. The image to the right shows the appearance of a paint transfer on a plastic tail light cover.

A transfer occurs when one or more layers of an automotive paint are physically removed from the original vehicle and deposited on a different surface. A full automotive paint system consists of more than the colored layer we see with our eyes. A cross section of a full-layer paint chip is depicted below. Often a transfer will appear to change colors from one side to the other. This is the result of different layers being removed.

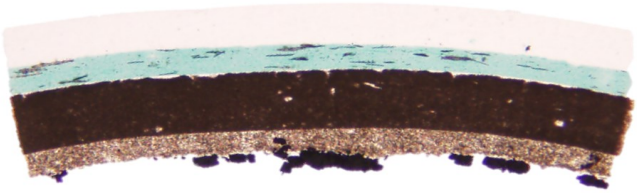


Paint transfer on plastic tail light

Paint transfers don't always have to come from metal surfaces on a vehicle. Bumpers, side mirror housings, and other exterior plastic parts are often painted and can be a source of a paint transfer or chip.

One thing to note is a white colored transfer does not always mean a white colored vehicle was involved. Clear coats will often leave a white colored transfer behind during collisions.

Don't forget to consider the potential for paint transfers when investigating events involving vehicles. This valuable piece of evidence can easily be overlooked. Contact staff from the Trace Evidence Section or the Crime Scene Unit for more information about collecting and submitting this evidence.



Cross section of an automotive paint sample showing, from top to bottom, clear coat, blue-green base coat with effect pigment, and two lower primer layers.

What if the suspect vehicle is not known?

In situations where the suspect vehicle is not known, it is may be possible to examine paint evidence left behind to determine possible source vehicles. Trace evidence examiners can obtain chemical information regarding the paint layers present in the transfer or chip and provide a list of vehicles which could be the source of the transfer. Due to limited variation in paint formulations used from year to year, similarities in paint formulations, and the same paint being used on multiple vehicles painted at the same plant, the list of possible source vehicles can comprise several model years and several models from a single manufacturer. If transfers only involve the clear coat or colored base coat, the candidate list may be too large for any meaningful investigative benefit.

Besides paint transfers, other evidence at the scene, such as plastic side mirror housings, may also contain sufficient information for source determination. Contact the Trace Evidence Section for more information for this type of examination.

A yellow painted pry bar has transfers of gray paint and red paint. A damaged safe was painted gray and also had red paint transfers on it.

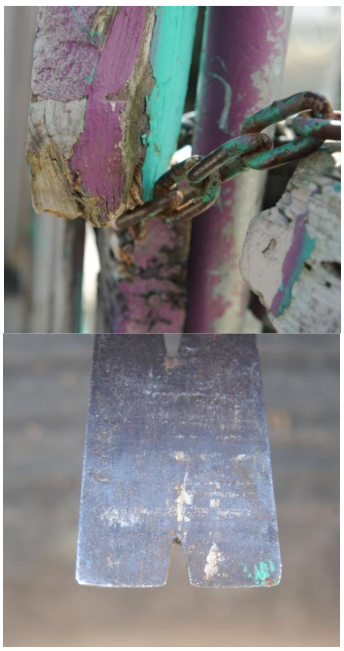
"Forensic paint examinations have the potential to determine if the tool could have made contact with the damaged surface. This adds an additional dimension not possible by latent prints or DNA."

Paint left behind when using tools

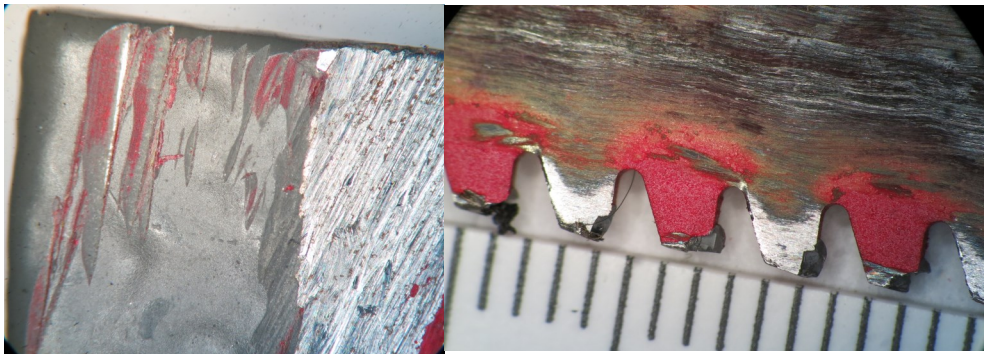
Numerous tools are used to pry open doors during the commission of crimes. Whether prybars, crowbars or screwdrivers, this action routinely leaves paint evidence behind on either the tool, the surface being forced open, or both.

When tools are located which are suspected to be used in prying events, they are often submitted to the crime lab for latent print or DNA analyses. These examinations have the potential to place the tool in a specific individual's hands; however, forensic paint examinations have the potential to determine if the tool could have made contact with the damaged surface. This adds an additional dimension not possible by latent prints or DNA.

Numerous tools besides those used in prying events also have the potential to involve paint transfers. As long as either the tool or the damaged surface is painted, a transfer between one or both is possible. The images below show a section of the same metal safe discussed to the right. This piece had been cut off and a red paint transfer was presented at numerous locations on the cut surface of the metal. Reciprocating saw blades suspected to be associated with the case were painted red. In addition to the paint transfer between the two items, metal pieces were collected between several teeth of the saw blades which were compared to the metal of the safe.



A damaged gate had multiple colors of paint on it. A prybar located near the scene had similar colored paint transfers.



Collecting known automotive paint standards and transfers

Collecting known automotive paint standards is relatively simple as long as a few important points are considered. First, standards must be collected from all damaged areas of the vehicle, even if they appear to be painted the same color. Second, standards must be collected from as close to the damaged area of the vehicle as possible. Finally, the standards must collect the entire layer structure of the paint.

To collect a paint standard from metal, use a razor blade with a straight edge and hold a clean piece of paper below the area to be sampled. Using firm pressure, scrape down to the metal surface and allow the removed paint to fall onto the paper. You must scrape down to shiny metal in order to get the full layer structure. Continue collecting until the amount of material collected is between the size of a nickel and a quarter. Place the razor blade in the paper and safely fold it for packaging.

To collect a paint standard from plastic, simply cut off a section of the painted plastic and submit it.

For paint transfers on an item, submit the entire item, if possible. If not, gently scrape off the entire transfer onto a clean piece of paper using a razor blade. Additionally, collect a standard of the substrate near the original transfer.

What do the conclusions actually mean for paint exams?

Forensic paint examinations involving comparing various features of two different paints. Differences in these features between the questioned paint and the known standard may or may not be found. If a meaningful difference is found during the examinations, it means the questioned paint did not come from the same source as the submitted known standard.

But what if no differences are found? Does this mean the questioned paint absolutely came from the same source as the known standard? Not necessarily.

The techniques used by the Trace Evidence Section are capable of identifying minor differences in paint; however, because paint is a mass produced material using procedures closely controlled by the manufacturer, it is possible for two paints from different sources to have the same features. For example, ten automobiles painted at the same plant, on the same day, using the same paint system may have identical characteristics. The same is true for twenty gallons of architectural paint from the same production lot. While studies have shown this is an uncommon occurrence when the proper techniques are used when testing paints selected at random, it is still possible.

When no differences are found when comparing two paints, the report will state an "Association" has been made. This simply means it is possible for the two paints to have originated from the same source. Even if no differences were found between two different paints, there can still be differences in the significance of these findings. The "significance" relates to the number of other paint sources which could have the same features as the questioned paint. For example, a Type II association means some unusual features were found which are different than those found during the typical manufacturing process. On the other hand, if the transfer is only an automotive clear coat, or if the sample was too small to use all of the appropriate techniques, the candidate pool could be significantly larger than usual. In this case, the examiner would report out a Type IV Association.

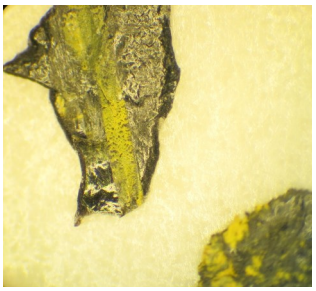
Regardless, the Trace Evidence Section encourages our customers to contact the reporting analyst if there are any questions regarding the actual meaning of the report.

"[An Association] simply means it is possible for the two paints to have originated from the same source. "

Linking cases when there is no known standard

When investigators suspect multiple cases to be related, paint examinations and comparisons can still assist in connecting these cases, even when there is no known standard to submit for comparisons. An example case is discussed below.

Investigators suspected two thefts were being committed by the same individuals. In both situations, there were transfers of yellow paint on objects left behind at the scene. Although investigators suspected the paint transfers were created by prytools, no such tools had been recovered for paint comparisons.

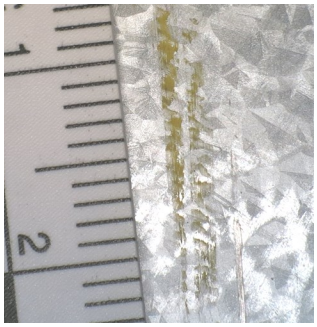


Yellow paint transfer left at scene #1

Samples of the yellow paint, along with other materials, were submitted for analysis. When the two yellow paints were compared to each other, no differences were found and it was determined both transfers could have come from the same source.

This association, even in the absence of a known standard, potentially links two cases. If suspects are developed for one of the cases at a later time using exams from other forensic disciplines, the results of the comparisons of the paint may make it possible to associate the identified individual(s) to the second case.

This case underscores the value of forensic paint examinations even when no known standards are present. Incidentally, this case also involved several other evidence types besides yellow paint transfers. Two yellow paints, one gray paint, one red paint, a white substance, and colorless fibers were also present at both scenes.



Yellow paint transfer left at scene #2

CONTACT JEREMIAH MORRIS, TRACE EVIDENCE TEHCNICAL LEADER, FOR MORE INFORMATION

Johnson County Sheriff's Office
Criminalistics Laboratory
11890 S Sunset Drive
Olathe, Kansas 66061

Phone: 913-826-3230
Fax: 913-826-3286
Email:
jeremiah.morris@jocogov.org

The Trace Evidence Section at the Johnson County Sheriff's Office Criminalistics Laboratory is accredited to perform a number of different examinations involving a wide array of evidence types. These examinations can identify a specific material or compare a questioned material with one from a known source. The types of examinations currently offered by the Trace Evidence Section include fibers, cordage, fabric, paint, tape, hair (characterization and root assessment), fire debris, physical fit, and general chemical unknowns. Please contact staff from the Trace Evidence Section for more information on the various capabilities of the section.

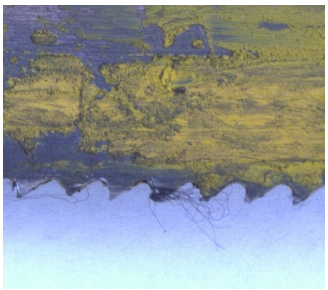
For examinations which are currently not offered by the Sheriff's Office Trace Section, staff members will assist in facilitating the evidence to an appropriate forensic laboratory.

Look for more than just the paint

Often cases which involve paint transfers will also involve transfers of other forms of trace evidence. An example case is discussed on page 3 where the yellow paint transfers were found with other materials like gray plastic and colorless fibers. A few other cases are discussed below.

In 2012 evidence was submitted which involved stealing catalytic converts from vehicles. Yellow painted reciprocating saw blades were found nearby. Yellow paint transfers were collected from the cut exhaust pipe of the victim's vehicle. In addition to the paint transfers, red fibers were also found on the exhaust pipe and teeth of the saw blades.

In 2018, paint transfers and standards for two vehicles were submitted for analysis. In addition to the paint, plastic pieces were found on a damaged section of one vehicle in the same area as the transfer. This plastic was compared to the plastic bumper on the second vehicle.



Yellow painted saw blade with adhering fibers

In one of the cases discussed on page 2, it was suspected a red painted reciprocating saw blade was used to cut off a second of a metal safe. In addition to two way paint transfers on the saw blade and the safe, metal fragments were also observed embedded within the teeth of the saw blade. These metal fragments were compared to the metal from the damaged area of the safe.

In a recent case, a pry tool was found with a blue paint transfer as well as building material debris. A standard of blue paint was submitted as well as the painted surface. This allows the analyst to compare not just the blue paints, but also the building materials.