

Tool Marks II

Potential questions on Final exam :

- 1) Describe the physical events that take place when a revolver is fired that would result in marks or other evidence on a bullet or casing found at a crime scene. Indicate the type of marks left on the evidence.
- 2) List the process involved in rifling the chamber of a long gun and describe how these would result in marks on a bullet found at a crime scene. Which of the marks formed on the fired bullet would represent class characteristics? And which marks would represent potential individual characteristics?

Think about drilling for the second question

Gun Powder Residue

When firearm is discharged, unburned and partially burned particles of gunpowder in addition to smoke are propelled out of the barrel along with the bullet toward the target can be deposited on target if the target is close enough

The distribution of gunpowder particles and other discharge residues around a bullet hole permits an assessment of the distance from which a handgun or rifle was fired.

The precise distance from which a handgun or rifle has been fired must be determined by means of a careful comparison of the powder-residue pattern located on the victim's clothing or skin against test patterns made when the suspect weapon is fired at varying distances from a target.

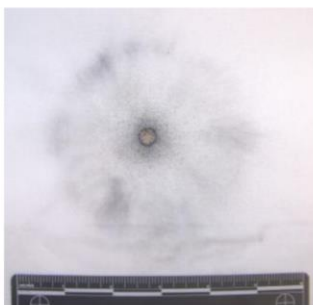
By comparing the test and evidence patterns, the examiner may find enough similarity in shape and density upon which to base an opinion as to the distance from which the shot was fired.

We have the suspect gun, fire at it and look at the pattern, then check with the pattern found.

Distance :

→ ≤ 1 inch : star-shaped(stellate) tear pattern around the bullet hole entrance, surrounded by a rim of smokeless deposit of vaporous lead

→ 12 to 18 inches – a halo of vaporous lead



<https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/distance-proximity-determinations.aspx>

→ up to 25/36 inches : scattered specks of unburned and partially powdered grains without any accompanying soot

→ >=3 feet : will usually not deposit any powder residues, and the only visual indication is a dark ring around the hole, known as a bullet wipe.

Gunpowder residue

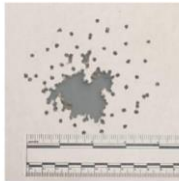
→ When garments or other evidence relevant to a shooting are received in the crime laboratory, the surfaces of all items are first examined microscopically for the presence of gunpowder residue.

→ Chemical tests, such as a modified Griess test (The Griess test is a chemical analysis test which detects the presence of organic nitrite compounds. NO₂-), may be needed to detect gunpowder residues that are not visible, NO₂- is a by product of firing smokeless gunpowder

→ The firing distances involving shotguns must also be related to test firing.

→ The muzzle to target distances can be established by measuring the spread of the discharged shot.

→ The narrowing at the end of the shotgun decides the spread of pellets

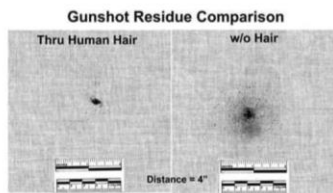


<https://dps.mn.gov/divisions/hca/hca-divisions/forensic-science/Pages/distance-proximity-determinations.aspx>

This is the spread of the pellet.

Without hair, we see the residue.

Influence of hair on GSR



<http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2004/research>

Primer residue on hands

- On firing, weapon propels back too, gunpowder and primer residues are also blown back toward the shooter
- traces of these residues are often deposited on the firing hand of the shooter, and their detection can provide valuable information as to whether or not an individual has recently fired a weapon.
- Examiners measure the amount of barium and antimony on the relevant portion of the suspect's hands, such as the thumb web, the back of the hand, and the palm.
- They may also characterize the morphology of particles containing these elements to determine whether or not a person has fired, handled a weapon, or was near a discharged firearm. Morphology helps us determine who exactly fired, as if I fire from near a person, the person too would have the residue.

Firearm Evidence Collection

- Firearms are collected by holding the weapon by the edge of the trigger guard or by the checkered portions of the grip.
- Before the weapon is sent to the laboratory, all precautions must be taken to prevent accidental discharge of a loaded weapon.
- In most cases, it will be necessary to unload the weapon.
- When a revolver is recovered, the chambers, their positions, and corresponding cartridges must be recorded : which cartridge came from which chamber
- Firearm evidence must be marked for identification (usually a tag on the trigger guard) and a chain of custody must be established
- Bullets recovered at the crime scene are scribed with the investigator's initials, either on the base or the nose of the bullet. :
- The obliteration of striation markings that may be present on the bullet must be scrupulously avoided. don't mess with striation marking on the bullet when we are marking
- The investigator must protect the bullet by wrapping it in tissue paper before placing it in a pillbox or an envelope for shipment to the crime laboratory.
- Fired casings must be identified by the investigator's initials placed near the outside or inside mouth of the shell. : we need to think where marks are to be made
- Discharged shotgun shells are initialed on the paper or plastic tube remaining on the shell or on the metal nearest the mouth of the shell. : mark the plastic or paper and not the metal, as there would be evidential markings on the rest of it.

Serial Numbers And Tool Marks

Serial numbers : are pounded in the metal. They can be removed by grinding or deep grinding, or punching.

Increasingly, the criminalist is requested to restore a serial number when it has been removed or obliterated by grinding, rifling, or punching.

Restoration of serial numbers is possible through chemical etching because the metal crystals in the stamped zone are placed under a permanent strain that extends a short distance beneath the original numbers.

Tool Mark : any impression, cut, gouge, or abrasion caused by a tool coming into contact with another object.

A careful examination of the impression can reveal important class characteristics, such as the size and shape of the tool.

Example, when window was pried open, we can clearly state how it was opened by a tool mark, like by a screwdriver or something else

But it is the presence of any minute imperfections on a tool that imparts individuality to that tool.

The shape and pattern of such imperfections are further modified by damage and wear during the life of the tool.



→ When we have a suspect tool and the mark, use the suspect tool to make a mark and compare it with the mark found on the crime scene and if it matches then that is the tool.

The comparison microscope is used to compare crime scene toolmarks with test impressions made with the suspect tool.

When practical, the entire object or the part of the object bearing the tool mark should be submitted to the crime laboratory for examination.

Under no circumstances must the crime scene investigator attempt to fit the suspect tool into the tool mark.

→ Any contact between the tool and the marked surface may alter the mark and will, at the least, raise serious questions about the integrity of the evidence – trace evidence transfer : no evidence messing

→ Compound microscope helps us for all these analysis

Comparison Microscope



<http://www.aimscope.com/X7B-605%20Comparison%20Microscope.htm>

<http://www.firearmsid.com/Case%20Profiles/ToolmarkID/toolmark.htm>

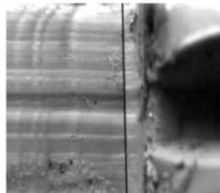


Figure 6. 20X comparison of tool mark standard (left) and questioned tool mark (right).

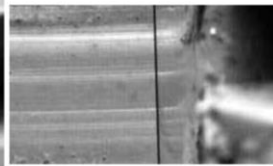


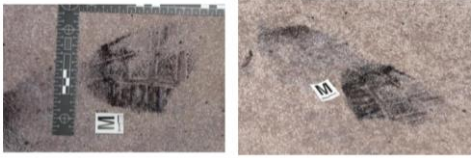
Figure 7. 40X comparison of tool mark standard (left) and questioned mark (right).

Other impressions

Shoes, fibres, tires

- ➔ Any impression must be first photographed : overview, mid-range, close up, close up with scale. Also, this is done to represent in its original state
- ➔ If the impression is on a readily recoverable item, such as glass, paper, or floor tile, the evidence is transported intact to the laboratory.
- ➔ If the surface cannot be submitted to the laboratory, the investigator may be able to preserve the print in a manner similar to lifting a fingerprint.
- ➔ When shoe and tire marks are impressed into soft earth at a crime scene, their preservation is best accomplished by photography and casting.
- ➔ In areas where a bloody footwear impression is very faint (nearly invisible) or where the subject has tracked through blood leaving a trail of bloody impressions, chemical enhancement can visualize latent or nearly invisible blood impressions.

Footprint impressions in blood



"Leucocrystal violet reacts with the heme-group in blood to give a violet color."

<https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/forensic-programs-crime-scene-leuco.aspx>

PHENOLPHTHALEIN

This is THE presumptive test for blood

Points of comparison

We need sufficient numbers of points of comparisons that will support a finding that both the questioned and test impressions originated from one and only one source.

Computer software and web sites may be able to assist in making shoe print and tire impression comparisons.

Also, bite mark impressions on skin and foodstuffs have proven to be important evidence in some homicide and rape cases – recently refuted : however, many times it has proven not liable.