Chapter 17 Tool Marks

By the end of this chapter you will be able to:

17.1 Describe how forensic investigators analyze evidence from tools and tool marks to help solve crimes.

17.2 Describe variations in tool surfaces that could be used to identify specific tools.

17.3 Compare and contrast the three major types of tool marks and provide examples of tools that produce those types of marks.
Chapter 17 **Tool Marks**

By the end of this chapter you will be able to:

17.4 Provide examples of foreign materials found in tool marks, and elaborate on how this evidence can be used to link a suspect to a crime scene.

17.5 Analyze and process a crime scene at which tools were used to commit the crime.

17.6 Outline the sequence of procedures for photographing, documenting, casting, and collecting evidence from tools and tool marks.
Chapter 17 **Tool Marks**
By the end of this chapter you will be able to:

17.7 Justify the claim that tool-mark evidence is usually considered circumstantial evidence, supporting your claim with facts from the chapter.

17.8 Discuss the role of technology in crime-scene analysis of tools and tool marks.

17.9 Describe the roles of the Scientific Working Groups (SWGs) and Organization of Scientific Area Committees (OSAC) in the improvement of evidence reliability.
Chapter 17

Vocabulary

- abrasion mark
- cutting mark
- indentation mark
- tool mark
Introduction

- The surface of a tool leaves distinctive marks when it is forced against another surface.
- The impressions made by any tool could link the tool to a crime scene and ultimately to the tool’s owner.
- Tool marks are circumstantial evidence.
Tools and Crime Scenes

- Possession of a tool consistent with one used in the commission of a crime does not establish the suspect’s presence at the time of the crime.
Indentation Marks

- An indentation mark is an impression made by a tool when it is pressed against a softer surface.

- It is the negative impression of the tool.
Abrasions Marks

- Abrasion marks are made when surfaces slide across one another.
- The harder surface leaves scratches on the softer surface.

Figure 17-3 Abrasion: This door strike plate shows scratch marks made by a screwdriver.
Cutting Marks

- Cutting marks are produced along the edge of a surface as it is cut.
- The type of saw blade used to dismember a body can be determined by examining the cut surface of the bone.

Figure 17-4 Cutting: Hacksaws leave striations (stripes) on a surface they cut.
### Figure 17-5 Saw marks on bones.

<table>
<thead>
<tr>
<th>Type of Saw</th>
<th>Cut Characteristics</th>
<th>Teeth-Mark Pattern</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stryker</td>
<td>Circular areas of short radii; some overlapping marks</td>
<td>Few teeth marks</td>
<td></td>
</tr>
<tr>
<td>Band saw</td>
<td>Very smooth; seldom overlapping marks</td>
<td>Few teeth marks; straight fine cut</td>
<td></td>
</tr>
<tr>
<td>Hacksaw</td>
<td>Overlapping marks</td>
<td>Like a tiny tic-tac-toe board with thousands of squares</td>
<td></td>
</tr>
<tr>
<td>Chain saw</td>
<td>Messy cut</td>
<td>Rough-edged</td>
<td></td>
</tr>
<tr>
<td>Table saw</td>
<td>Parallel, curved striations</td>
<td>Ridged grooves</td>
<td></td>
</tr>
<tr>
<td>Handsaw</td>
<td>Rough cut with overlapping marks</td>
<td>Irregular cut</td>
<td></td>
</tr>
<tr>
<td>Circular saw</td>
<td>Parallel, curved striations</td>
<td>Ridged grooves</td>
<td></td>
</tr>
</tbody>
</table>
Tool Surface Characteristics

- Tools change over time as they are used repeatedly.
- Oxidation, or rusting of tools, as well as uneven sharpening, are additional characteristics that help distinguish a tool mark.

Figure 17-6 Unique markings such as nicks and ridge marks can be seen on the striking surface of these hammers.
Tool Mark Evidence

- Tool evidence includes both the mark left at the scene and the tool.
Documenting the Evidence

- Photographing tools
- Photographing tool marks
Casting Impressions

Figure 17-8 *Types of casting material.*

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AccuTrans auto-mix casting system</td>
<td>Silicone base material applied by extruder gun</td>
</tr>
<tr>
<td>Mikrosil (Forensic Sil) casting material</td>
<td>Putty that requires a separate catalyst to harden; applied by spatula</td>
</tr>
<tr>
<td>Powdered sulfur</td>
<td>Melted sulfur is quickly poured into impressions left in snow and allowed to harden.</td>
</tr>
<tr>
<td>Liquid silicone</td>
<td>Applied by extruder gun or from tube</td>
</tr>
<tr>
<td>Room-temperature silicone vulcanizing rubber</td>
<td>Silicone mold rubber; requires a separate catalyst to harden at room temperature</td>
</tr>
<tr>
<td>Dental store or plaster of Paris</td>
<td>Compound hardens when water is added</td>
</tr>
</tbody>
</table>
Casting Impressions (continued)

Figure 17-9  Hammer and crowbar impressions cast in plaster of Paris.
Collecting and Preserving a Sample

- All tool evidence is collected and packaged separately and submitted to a laboratory for analysis.
- If possible, the object containing the impression is removed and sent directly to the lab.
- Information to be recorded includes:
  - The case number
  - Date
  - Name
  - Signature of the evidence collector
  - Description of where and when the evidence was located
  - Why the evidence was collected
Analyzing Tool-Mark Evidence

- Crime-scene tool marks and suspect tools are never fitted together. This may compromise the integrity of the evidence.

- Instead, impressions from the crime scene and impressions made from the suspected tool are compared.

- Serial numbers can possibly reveal the store where the tool was purchased.
Tool-Mark Identification Technology

- The Ames Laboratory is building a tool-mark image database and developing an algorithm to statistically analyze the images.
- A forensic comparison microscope is used to compare tool marks found at a crime scene with the images of tool marks found in the database.
- Another project involves using three-dimensional characterization methods and statistical methods to distinguish tool marks.
  - This technology reduces the subjective nature of tool-mark comparison.
Tool-Mark Evidence in the Courtroom

- Whenever possible, original evidence, such as a tool or an actual tool mark, is presented in court.
- Casts and magnified images of tool-mark comparisons are presented at a trial.
- As tool-mark analysis technology continues to advance, forensic experts will be even better able to link a tool and its impression.
Tools have major and minor surface differences that can help differentiate one tool’s impression from another’s.

Tool marks are categorized into one of three categories: indentation marks, abrasion marks, and cutting marks.

The marks made by tools can link a tool to a crime scene and ultimately link the owner of the tool to a crime.
Tool-mark evidence should be photographed, documented, collected, or cast.

Advancing technology for distinguishing tool marks is helping forensic experts link tools to tool marks and convict criminals.

Organizations such as the Scientific Working Groups and Organization of Scientific Area Committees are establishing guidelines and protocols that will improve evidence reliability.