



### D25 The Study and Forensic Significance of Drill Bit Use Indicators

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After attending this presentation, attendees will learn how to identify a used drill bit and the forensic significance of tool marks on swarf (shavings and particles) produced during a drilling process.

This presentation will impact the forensic community by showing that a drill bit could be an important piece of information to close a bombing case and broadening Forensic Scientists' knowledge spectrum.

Every piece of the forensic evidence has the potential of supplying a valuable investigative lead, and even the tiniest pieces are examined thoroughly to assist the investigators in solving bombing cases. Drill bits are one piece of evidence that is often overlooked during a case investigation. Most domestic bombs in the United States are pipe bombs using metal or plastic containers filled with low explosive powders. Black steel and galvanized steel pipe with iron end caps are the most common metal containers among metal pipe bombs. Polyvinyl chloride (PVC) and chlorinated PVC (CPVC) are the most common plastic pipe bomb containers used in device making. The majority of these pipe devices are manufactured to be initiated with a length of pyrotechnic fuse through a fuse hole. A functional fuse would initiate the explosives inside these pipe devices. Since electric drills (cord or cordless types) are common household tools, most of the fuse holes are made by using these types of drill with a drill bit. The drill bit used for drilling the fuse holes can provide important forensic values to case investigations. For example, linking a drill bit to a device could directly link a suspect to a particular scene or device. However, no study has been done in the area of drill bits. In this study, the forensic and evidentiary values of a drill bit was investigated. With the results of this study, investigators were able to conclude that there are three indicators for determining if a drill bit is used. If a drill bit is used, one of these three indicators or the combination of all three indicators should be used as a guideline for evaluation. The three indicators are: 1). particulate deposits on the drill bit, especially inside the flute and the tip area; 2). physical damage including chipping, abrasion, and abuses on the drill bit mostly occurred on the flute edge bevels and lip edges; and 3). thermal damage. During this study, the forensic values of tool marks of drill bits were also evaluated. The study concluded that there is no mechanical break-in process like firearms barrel for obtaining reproducible tool marks. The tool marks on swarf were well defined and can be examined and individually associated.

#### **Drill Bit, Tool Marks, Shavings**