

## Section 4 Toolmarks Physical Exam and Classification

### History Page

Revision #	Effective date	History
0	1/12/07	This is an original procedure this procedure has been completely reformatted and updated from the previous procedure that was adopted from the Washington State Patrol.

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## Section 4 Toolmarks Physical Exam and Classification

### 4.0 Scope and Background

The basic objective in evaluating a questioned toolmark is to determine the suitability and classification of the toolmark. In order to compare a questioned toolmark with a suspect tool or another toolmark it is necessary to conduct a physical examination and classification of the toolmark and tool, which will determine what course the rest of the examination should follow.

In order to compare a question toolmark with a questioned tool, test standards or marks are usually made with the suspect tool. The basic objective in preparing test standards is to attempt to duplicate the manner in which the tool was used to reproduce the evidence or questioned toolmark.

#### 4.1. Equipment (refer to section 9 for details on calibration and maintenance of equipment).

Comparison microscope  
Stereo microscope  
Ruler or tape measure  
Micrometer/Caliper  
Dusting tool

#### 4.2 Reagents

Methanol  
Acetone  
10% bleach solution (mix bleach with water at about 1:10 prepare fresh)  
Dish soap and water  
Magnesium ribbon  
Casting material

#### 4.3. General, visual and physical examination

The initial examination of a tool or a toolmark includes documentation of the physical description of the tool or toolmark.

The tool and/or toolmark will be visually and/or microscopically examined for the presence of any trace material.

##### 4.3.1 Trace Material

Evidence is often submitted with debris that may cover its characteristics. In order to determine class characteristics or compare individual characteristics of the tool or toolmark evidence the debris may need to be removed. The debris may

consist of blood, tissue, paint, fibers, glass, etc. The value of the debris as trace evidence should be considered during examination. The examiner may choose to forward the item to another section for testing or to collect the trace evidence and create a new evidence submission. The examiner will note the finding in his or her case notes. After an assessment and appropriate actions have been taken to collect or forward trace evidence the evidence may need to be cleaned to allow for proper examination of the evidence. The examiner will choose an appropriate cleaning solvent or solution. Typically methanol, acetone, a 10% solution of bleach and water or dish soap and water will be used.

#### 4.3.2 Tool Examination

The tool examination is generally used to establish the following

- Brand and type of tool
- Size and condition
- Class characteristics of the tool
- Areas of use on the tool
- The medium used for testing
- The type of tests to be conducted (if any)
- Indexing of test standards/marks

#### 4.3.3 Toolmark Examination

##### 4.3.3.1 The toolmark examination is generally used to establish:

- The suitability of the toolmark for comparison purposes
- Class of tool that made the toolmark
- Type of toolmark (striated, impressed, combination)
- Direction of the toolmark
- If the toolmark is not suitable for comparison or does not have the same class characteristics as the suspect tool, then the tool can be eliminated as having produced the toolmark
- If the toolmark is suitable for comparison, or the toolmark has the same class characteristics as the suspect tool, the examination should continue.

##### 4.3.3.2 Methods used to enhance toolmarks for further examination

Dusting the tool with fingerprint powder

Magnesium smoking to reduce the glare on shiny surfaces

**Warning ! UV protective safety glasses must be worn**

Short pieces of magnesium ribbon are lit by a flame

The object to be smoked is passed over the smoke

If the object collects too much smoke wipe it off and repeat the process.

#### 4.4 Casting

Casting is a procedure used in toolmark examination to make a reverse image of a tool or toolmark, which can then be used for comparative microscopic examination purposes. It may be necessary to make a cast of a tool or toolmark. If an item received for a toolmark

examination is too large to be conveniently placed on the microscopes stage, a cast may be made of the tool or toolmarks in question. There are also occasions when a cast of a toolmark might be received as evidence. In either case, any test standards made will also have to be cast in order to perform a comparison. Silicon rubber or similar products are used and manufactures instruction shall be followed.

#### **4.4.1 Procedure**

- 4.4.1.1 Mix the casting material according to manufactures directions.
- 4.4.1.2 Apply the casting material over the tool or toolmark to be cast
- 4.4.1.3 When the casting material is set or cool, gently tap to loosen the cast from the tool or toolmark and then lift to remove the cast
- 4.4.1.4 Consideration must be given to placing identifying marks as well as orientation marks on the back of the cast, or scribe identifying marks and/or orientation marks onto the tool or toolmark.

#### **4.5 Toolmark Tests Produced**

In order to perform a microscopic comparison of a submitted tool with a toolmark, test toolmarks must be produced with the suspect tool. The initial test media must be soft enough to prevent alterations of the tool's working surface, and lead is often used. Additional test marks might require the use of the material used in the original toolmark. Toolmark tests used in for comparison in identifications will be retained and logged into the evidence tracking system.

#### **4.6 Microscopic comparison (Refer to section 5)**

#### **4.7 Interpretation of results**

- The toolmark(s) were identified as having been produced by the same tool or with the submitted tool
- The toolmark(s) were not produced by the submitted tool
- It was not possible to determine whether or not the toolmarks were made by the submitted tool or the same tool.
- Class characteristics of the tool may be identified from the toolmark.

#### **4.8 Safety Considerations**

This procedure involves hazardous materials, operations and equipment. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered to avoid exposure to hazardous conditions. Consult the appropriate MSDS for each chemical prior to use.

#### 4.9 References

Firearms And Toolmarks Technical Procedures Manual, Washington State Patrol

"Physical Examination and Classification of Firearms" Firearms and Toolmarks Procedures Manual , Virginia Division of Forensic Science Amendment C.

"Mikrosil Casting Material Information". AFTE Journal. Vol. 15 No. 2, pg. 80.

Janneli, R., and Geyer G. "Smoking a Bullet". AFTE Journal. Vol. 9, No. 2, pg. 128.

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