I. Examinations

Toolmark examinations are performed in order to determine whether or not a particular tool was the source of a particular mark or whether two items (possibly severed or fractured from one another) were once part of a single continuous unit. Some toolmark analysis may be restricted to examination and comparison of manufacturer or design characteristics only, such as saws, files, grinding wheels, and other items that cover or replace toolmarks continuously.

A. Types of Toolmarks:

1. **Impressions** - Marks produced by perpendicular force acting against an object. The tool does not move laterally across the object. For example: punch marks, some hammer blows, pry bar indentations, and some gripping tools.

2. **Scrape marks** - Marks produced by the instrument moving laterally across the object. For example: flat-bladed tools such as screwdrivers, tire irons, crowbars, and pry bars being forced perpendicularly into a crevice.

3. **Pinching or shearing marks** - The object is caught between opposing forces of two cutting edges. For example: scissors, tin snips, bolt cutters, and cutting pliers. Also see "Toolmarks" (page 03-10-3).

B. Toolmark Determinations:

1. Type of tool used.
2. Size of tool used.
3. Whether the toolmark is of value for identification purposes.
4. Comparison of the tool to evidence toolmarks.

C. Comparison Process between Tools and Toolmarks:

1. <u>NEVER INSERT A TOOL BACK INTO A TOOLMARK UNTIL THE COMPARISON HAS BEEN MADE.</u>

a. The unintentional creation of additional impressions or striations by trying to fit the suspect tool into a toolmark at the scene can interfere with laboratory attempts to compare said tools to toolmarks.

2. Examination of tool for foreign deposits of paint, metal, or other substances for comparison with marked object. Also see the chapter on Trace Evidence.

3. Test toolmarks are created with the suspect tool(s) at the Crime Lab.

4. Comparative analysis is performed between the evidence toolmark and laboratory test toolmarks from the relevant tool(s). Also see "Comparison of Knife Blades" at the end of this chapter.

D. Possible Conclusions in Toolmark Comparisons:

1. **Identification** - The toolmark was found to possess characteristics unique to the suspect tool.

2. **Elimination** - The tool was excluded as a possible source of the toolmark(s) (Example: class characteristics disagreement - different design of tool).

3. **Inconclusive** - The tool could not be identified nor excluded as the source of the toolmark (not enough meaningful information to make a definitive conclusion).

4. **Unsuitable** – The toolmarks did not display patterns or design characteristics that could be compared to a tool.

II. Collection and Packaging of Evidence

A. Please pack object bearing the toolmark separate from suspected tool.

B. Where possible, submit the tool and original impressions rather than casts.

C. Indicate which ends of the evidence should and should not to be examined (e.g. evidentiary ends vs. officer cut ends).

D. Protect ends that may contain foreign substances (trace evidence).

E. Silicone based casts of toolmarks may be submitted when original impressions cannot be retrieved from scene. Be sure to indicate orientation of toolmark on cast and send photo of original impression, if possible. Silicone casts must be packaged in a rigid container. Soft sided containers can collapse into the cast and obliterate impression data.

F. Please prepare the laboratory submittal form (NSP 750) as completely as possible.

G. Package all items securely, seal the container, and initial over the seal.

III. Toolmark–only cases (no tools recovered/submitted)

Cases may be encountered where toolmarks are present at the scene, but no tool is recovered. Requests for lab analysis due to these circumstances entail determining the type of tool used and/or comparing evidence toolmarks to other evidence toolmarks in order to determine whether they were produced by the same tool. See the "Collection/Packaging of Evidence" considerations listed above.

Note regarding toolmark-only cases: The comparison of multiple sets of evidence toolmarks created by cutting tools with opposing jaws (e.g. bolt cutters, wire cutters, etc.) can result in inconclusive results when in fact they were cut by the same tool. This can occur when a toolmark-bearing item (wire, lock, etc.) cut by the right side of a set of cutters is compared to a toolmark-bearing item cut by the left side of the cutters, leaving behind different toolmarks from the opposing sides of the tool even though the same tool was used. It is extremely important to gather all possible evidence for examination in order to maximize the potential for meaningful results. (See also Fracture/Physical Fit Comparisons)

IV. Comparison of Knife Blades

Requests involving knives usually involve punctured tires or knife wounds. Variables surrounding these requests are listed below.

A. Comparison of a knife blade with cuts in clothing or skin/tissue is usually due to the desire to determine whether the submitted knife is a possible source of the cuts/wounds.

1. In most cases, an opinion resulting from such an examination will be of little help. It will merely give an explanation of the many variables involved in these situations. Many knife blades taper to a point and can therefore make cuts of various sizes depending on how far the knife blade penetrates. Thus, a long blade that gradually tapers to a point can produce cuts/stab wounds of many different sizes. Further distortion of a cut (e.g. a larger cut than the dimensions of a knife blade) can result from movement of the knife or victim as the knife perforates clothing or skin/tissue.

2. It is suggested that more specific results could possibly be reached if investigators obtained more information from the pathologist or attending physician regarding the size, depth, and location of the wound, in relationship to the clothing.

3. Knife cuts or stab wounds into cartilage or bone can leave behind toolmarks with comparison value. Recent toolmarks encountered during autopsy must be handled in a specific manner to prevent degradation (such as freezing or preservation in Formalin). If knife marks are encountered in dry remains, neither freezing nor Formalin treatment is necessary.

B. Comparison of Suspect Knife to Tire/Rubber Hose Punctures

1. The comparison of a knife to punctured tires or hoses requires that the knife and either the full tire/hose, or a sizeable portion of the tire/hose containing the puncture mark, are submitted for analysis. The knife will be used to make test punctures in portions of the tire/hose that are not of evidentiary value. The evidence puncture (toolmark) will then be compared to the test marks made with the suspect knife to determine whether or not correspondence of class and/or individual characteristics is evident. Standard toolmark conclusions apply to this type of comparison.

V. Fracture/Physical Fit Comparisons

A. Described as toolmark comparisons involving two or more pieces of an object that may have been one continuous unit.

1. Examples include severed pipes, broken tool or knife blades, cut insulation on wires & cables, keys snapped in half in a lock, torn or cut tape, broken vehicle parts (bumpers, lamps, mirrors, etc.) and any other broken/severed metallic, synthetic (plastic, rubber, foam, etc.) or other rigid objects.

B. These types of comparisons require that all possible components of the severed/fractured item be submitted for comparison/physical fit.

1. Examinations include comparison of manufacturer markings, fracture plane analysis, and locating other extraneous toolmarks that continue from one object to the next.

2. Comparison of evidence toolmarks to other evidence toolmarks will make use of fracture/physical fit variables, when possible. In the

absence of a suspect tool, fracture/physical fit exams may be the most effective way of determining whether separate items are linked together.

C. Fracture/Physical Fit evidence is not considered probative when all of the items are located in close proximity to one another at the crime scene. The greatest value of this type of analysis is when one or more pieces of a physical fit comparison are found in different locations (e.g. possession of suspect, in a different house, vehicle, separate scene, etc.).