



## **Toolmarks Examination**

# **Test No. 21-5282 Summary Report**

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Each sample set contained one known diagonal cutter (Item 1) and two pieces of solid bare copper wire containing questioned toolmarks (Items 2 and 3). Participants were requested to examine these items and report their findings. Data were returned from 132 participants and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

# Manufacturer's Information

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Each sample set contained one Stanley 6" diagonal cutter (Item 1) and two pieces of solid bare copper wire containing questioned toolmarks (Items 2 and 3). Participants were requested to determine if any of the questioned toolmarks were made by the submitted tool. The Item 2 and Item 3 copper wire pieces were cut by a different tool that was not provided for examination. Each questioned piece of copper wire contained one blue and one red painted end to assist examiners in determining which side was not intended for examination.

ITEM 2 (ELIMINATION MARKS): The Item 2 copper wire (with blue paint) was cut by a pair of Tekton 8" bolt cutters (not provided) and packaged into a pre-labeled Item 2 envelope. The above process was repeated until all elimination toolmarks had been prepared.

ITEM 3 (ELIMINATION MARKS): The Item 3 copper wire (with red paint) was cut by a pair of Tekton 8" bolt cutters (not provided) and packaged into a pre-labeled Item 3 envelope. The above process was repeated until all elimination toolmarks had been prepared.

SAMPLE PACK ASSEMBLY: Item 1, Item 2, and Item 3 were packaged into a pre-labeled sample pack box. Additional pieces of copper wire substrate were included for testing purposes. This process was repeated until the required number of sample packs were produced.

VERIFICATION: In addition to the sample sets examined and confirmed by predistribution laboratories, ten randomly selected sample sets were examined by a qualified toolmark examiner who also confirmed the expected results.

## **Summary Comments**

This test was designed to allow participants to assess their proficiency at a toolmark examination involving striated toolmarks. Each sample set contained one Stanley 6" diagonal cutter (Item 1) and two pieces of solid bare copper wire containing questioned toolmarks (Items 2 and 3). Participants were requested to determine if any of the questioned toolmarks were made by the submitted tool (Refer to Manufacturer's Information for preparation details).

Of the 132 responding participants, 119 (90.2%) eliminated the toolmarks on Items 2 and 3 as having been created from the Item 1 diagonal cutter. Twelve participants reported inconclusive results, and the remaining participant reported Items 2 and 3 toolmarks as having been created by the Item 1 diagonal cutter.

Some participants who reported inconclusive results stated that a conclusive opinion cannot be reported based on the characteristics present or lack of toolmark reproducibility. Thus, responses of inconclusive are not indicated as outliers for this test in regard to Items 2 and 3.

## Examination Results

*Was the questioned diagonal cutter (Item 1) used to cut either of the copper wire pieces (Items 2 or 3)?*

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
26J6X7	No	No	7XK6TL	No	No
28MW9R	Inc	Inc	8E6D7A	No	No
29JGU7	No	No	8F2V46	No	No
2JH8JK	No	No	8FY6V2	Inc	Inc
4A2EZZ	No	No	8YDHRX	No	No
4CTBM9	No	No	9AP3T7	No	No
4K6KX8	Inc	Inc	9PJWY6	No	No
4UPYTX	No	No	9W4R4E	Inc	Inc
66RCX4	No	No	9Z34ZE	Inc	Inc
6AL9KA	No	No	AH3F9F	No	No
6HC2L9	No	No	AN4UMP	No	No
6M6XF7	No	No	ATYNKQ	No	No
6UARD8	No	No	B4C4AB	Inc	Inc
6W8HB7	No	No	B94EZ2	No	No
76Z7QA	No	No	BAZTMU	No	No
7AXPT9	No	No	BCATT2	No	No
7AY887	No	No	CAGWQ8	Inc	Inc
7GDATY	No	No	CEQHMX	No	No
7L7EM4	No	No	CFK77T	No	No
7M3N2E	No	No	CHRLG6	No	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
CT88D8	No	No	JH7HPW	No	No
D3Q9HZ	No	No	JKB9UQ	No	No
D6JZU7	No	No	JTLGBR	No	No
DPL9NV	No	No	JYVQLV	No	No
DT2M8V	No	No	K9VFYP	No	No
DW7949	No	No	KG9CZQ	No	No
E7LP3T	No	No	KQEDZG	No	No
EJWW7K	No	No	LJAUJ4	No	No
EMV7H8	Inc	Inc	LPWPEF	No	No
EP3TPK	No	No	LUBKYJ	No	No
F2VAEL	No	No	LZF2QT	No	No
F36AJT	No	No	MA2KR6	No	No
FBYKR3	No	No	MC7CDQ	No	No
FPH6BW	No	No	NBTRX3	No	No
GBTMVX	No	No	NNT2RM	No	No
GL9LHT	No	No	P4KXPB	No	No
GMN4GR	No	No	P6H8ZF	No	No
GX6N3A	No	No	PDQ66B	No	No
H24T72	No	No	PJGFEA	No	No
HKCNMR	No	No	PNVTHH	No	No
J3RCDX	No	No	PPKEWQ	No	No
JH6KE2	No	No	PT69PK	No	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
PU2H4W	No	No	VGWCFQ	Inc	Inc
PVW4WM	No	No	VKXF8D	No	No
PYVGHR	No	No	VNDVRD	Yes	Yes
QBLZJX	No	No	VNRG2E	No	No
QH29XY	No	No	VPNQFP	No	No
QV8J6K	No	No	VYEBKN	No	No
QVA2JJ	Inc	Inc	W368JD	No	No
R36EZX	No	No	W76FP9	No	No
RQDRRH	No	No	WD6TPC	No	No
RTEZRL	No	No	WDBWGH	No	No
RUDVLP	No	No	WGL8AC	No	No
RXE23G	No	No	WGMXHF	No	No
T9N4T7	No	No	X4YBRE	No	No
TBVERV	No	No	XEE8N7	No	No
TEXPWQ	No	No	XHF78B	No	No
THDP8H	No	No	XWYTEN	Inc	Inc
U2KC7V	No	No	Y68PUE	No	No
U3TVLH	No	No	YA64LA	No	No
UGFWMH	No	No	YG286D	No	No
UL6HAB	No	No	YKZJZD	Inc	Inc
UNW27P	No	No	YLTDZ3	No	No
UPA47N	No	No	YM3KZB	No	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
Z9286B	No	No			
ZNJUXH	No	No			
ZQKWJD	No	No			
ZVEXH7	No	No			

Response Summary			Total Participants: 132	
<i>Was the questioned diagonal cutter (Item 1) used to cut either of the copper wire pieces (Items 2 or 3)?</i>				
<b>Responses</b>		<u>ITEM 2</u>		<u>ITEM 3</u>
	Yes	<b>1</b> (0.8%)		<b>1</b> (0.8%)
	No	<b>119</b> (90.2%)		<b>119</b> (90.2%)
	Inc	<b>12</b> (9.1%)		<b>12</b> (9.1%)

# Conclusions

## TABLE 2

WebCode	Conclusions
26J6X7	Test standards were made using the (Item #1) STANLEY 6 inch diagonal pliers marked #1 and compared against the two (Items #2 & #3) cut copper wire specimens marked #2 and #3 with negative results (Elimination). The STANLEY 6 inch diagonal pliers marked #1 were eliminated as having cut the two copper wire specimens marked #2 and #3. The two copper wire specimens marked #2 and #3 were compared against each other with positive results (Identification). The two copper wire specimens marked #2 and #3 were identified as having been cut with the same tool. NOT THE ITEM #1 STANLEY 6 INCH DIAGONAL PLIERS MARKED #1.
28MW9R	Item 1-1 was determined to be a pair of diagonal cutters with pinching action. This tool was used to produce test toolmarks using lead sheet and item 1-4 reference copper wire. The test standards were determined to have striated toolmarks. The striated toolmarks were determined to be suitable for microscopic comparisons. Item 1-2-1 was determined to be a copper wire with one cut end and one blue painted end. The cut end was determined to have striated toolmarks that were produced by a cutting tool with pinching action. The cut end was determined to be suitable for microscopic comparisons. Item 1-3-1 was determined to be a copper wire with one cut end and one red painted end. The cut end was determined to have striated toolmarks that were produced by a cutting tool with pinching action. The cut end was determined to be suitable for microscopic comparisons. Due to agreement of all discernible class characteristics, the cut end of item 1-2-1 wire and the cut end of item 1-3-1 wire were microscopically compared to each other and to test toolmarks produced by item 1-1 tool with following conclusions: The cut end of item 1-2-1 copper wire and the cut end of item 1-3-1 copper wire were determined to be inconclusive as having been cut by item 1-1 tool, in the opinion of the laboratory. Although some dissimilarities in the patterns of microscopic markings were observed among the compared items, those dissimilarities were not significant to eliminate item 1-1 tool as having been used to cut items 1-2-1 and 1-3-1 copper wires, leading to the inconclusive conclusions. The cut end of item 1-2-1 and the cut end of item 1-3-1 were identified as having been cut by the same unknown tool, in the opinion of the laboratory. This identification conclusion was based on sufficient similarities in the patterns of microscopic markings observed between the compared items.
29JGU7	[No Conclusions Reported.]
2JH8JK	Toolmarks observed on items 1B and 1C are identified as having been produced by the same tool. Toolmarks observed on items 1B and 1C are eliminated as having been produced by item 1A. There are differences in class characteristics (type of tool – shearing vs. pinching). Note: Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility. Test marks from item 1A will be returned to the submitting agency.
4A2EZZ	[No Conclusions Reported.]
4CTBM9	Item 1 is a Stanley diagonal cutter, Model 84-027, which employs a pinching action. Item 2 and Item 3 are copper wires that contain striated toolmarks created by two opposing cutting edges (e.g., pinching action). Toolmarks present on the Item 2 and Item 3 wires were identified as having been cut by the same tool. Due to a difference in class characteristics, toolmarks present on the Item 2 and Item 3 wires were excluded as having been cut by the Item 1 diagonal cutters.
4K6KX8	Item 1 is one (1) Stanley brand pair of six-inch diagonal cutters, model 84-027. Item 2 and Item 3 are two (2) pieces of cut copper wire with one end cut by unknown means. The cut ends of Item 2 and Item 3 were microscopically compared to each other and to test cuts made by the Item 1 diagonal cutters. The Item 2 and Item 3 wires were identified as having been cut by the same tool. The Item 1 diagonal cutters could not be identified or eliminated as having cut the Item 2 and Item 3 wires, due to agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

TABLE 2

WebCode	Conclusions
4UPYTX	There are sufficient individual markings present to identify Items 2 and 3 (damaged wires) as having been damaged by the same tool. Examination of Items 2 and 3 (damaged wire) revealed damage consistent with that produced by an anvil cutter type tool. Based on class characteristic differences, Item 1 (diagonal cutter) can be eliminated as having damaged either Item 2 or 3 (damaged wires).
66RCX4	1). Examinations showed Items 2 and 3 were not cut by Item 1.
6AL9KA	Items 1B (CTS #2) and 1C (CTS #3) were eliminated as having been cut by Item 1A (CTS #1) based on the differences in class characteristics. The difference being the shape of the cut pinching versus shearing.
6HC2L9	Item 1 is a pair of Stanley Tools brand diagonal cutters, which use a pinching action. Items 2 and 3 are pieces of copper wire which bear toolmarks produced using a pinching action. The toolmarks present on the Item 2 and 3 copper wires were identified as having been produced by the same tool and were excluded from having been produced using the Item 1 diagonal cutters, due to a difference in class characteristics.
6M6XF7	The Exhibit 1 diagonal cutters were visually and microscopically examined. Three (3) test toolmarks were produced using laboratory stock material and were designated Exhibit 1.1. Toolmarks present on the Exhibit 2 and 3 cut wires were microscopically compared to each other and to the Exhibit 1.1 test toolmarks. Based on agreement of class characteristics and sufficient agreement of individual characteristics, the toolmarks present on Exhibits 2 and 3 were identified as having been produced by the same unknown tool. Exhibits 2 and 3 bear class characteristics produced by tools utilizing a pinching or shearing action such as bolt cutters or cable cutters. An identification conclusion indicates the probability that the toolmarks present on Exhibits 2 and 3 were produced by a different tool is so small that it is negligible. Based on differences of class and individual characteristics, the toolmarks present on Exhibits 2 and 3 were excluded as having been produced by the Exhibit 1 diagonal cutters.
6UARD8	Item 1.1 is a brand pair of diagonal cutters. Test cuts were made in copper wire from the laboratory supply. The tests will be returned with the other items of evidence. Items 1.2 and 1.3 are two sections of cut copper wire. They were microscopically compared to the test cuts made using Item 1.1 and to each other. Based on disagreement of all discernible class characteristics, Items 1.2 and 1.3 were eliminated as having been cut by Item 1.1. Based on agreement of discernible class characteristics and corresponding individual detail, Items 1.2 and 1.3 were identified as having been cut by the same unknown tool. Comments: The identification of a toolmark is made to a practical, not absolute, exclusion of all other tools. It is not possible to examine all tools which is a prerequisite for absolute certainty. Sufficient agreement for an identification exists between toolmarks when the likelihood another tool could have made the toolmark is so remote as to be considered a practical impossibility.
6W8HB7	Item 1 is a Stanley, Model 84-027, pair of diagonal cutter that uses a pinching action. Toolmarks present on the Item 2 and Item 3 wires were identified as having been produced by the same tool and excluded as having been produced by the Item 1 cutters due to differences in class characteristics.
76Z7QA	The Item 2 and 3 pieces of wire were examined microscopically and identified as having been cut by the same tool based on corresponding class and individual characteristics. Items 2 and 3 were eliminated as having been cut by the Item 1 tool due to differences in class characteristics.
7AXPT9	Cut tests made by Item #1.1 were compared microscopically with cuts on Items #1.2-1.3. There is agreement of class characteristics, however due to sufficient disagreement of individual characteristics Items #1.2-1.3 have been eliminated as having been made by Item #1.1.
7AY887	Based on microscopic examination and comparison of Item 2 (Blue) and item 3 (Red), revealed matching of the striations (parallel lines), that is to say item 2 (Blue) and item 3 (red) were cut by the same cutting instrument. However when items 1 and 2 were compared with test samples from item 1 (Diagonal cutter) it disclosed disagreement of the striations( diagonal) thus it can be inferred that item one was not the tool used to cut items 2 and 3.
7GDATY	1). Both pieces of copper wire recovered from the crime scene were not cut by the suspect's diagonal cutter. 2). But it was established that both pieces of copper wire recovered from the crime scene were

## TABLE 2

WebCode	Conclusions
	cut with the same tool. Conclusions formulated according to the requirements of the procedures of the [Laboratory]. 1). The fragments of wire extracted from the envelope with the sticker "Test No.21-5282 Item 2" and from the envelope with the sticker "Test No.21-5282 Item 3", were cut not with the diagonal cutter of the suspect, but with another tool with two cutting parts. 2). Traces of cutting on the surface of the wire fragment extracted from the envelope with the sticker "Test No.21-5282 Item 2", and the cutting marks on the surface of the wire fragment extracted from the envelope with the sticker "Test No.21-5282 Item 3 ", were created with the working parts of the same tool which has two cutting parts (such as pliers or scissors for cutting metal).
7L7EM4	There was significant disagreement of discernible class and individual characteristics when Item 1 was compared with Item 2 and also when Item 1 was compared with Item 3. This indicates that the marks on Item 2 and Item 3 were not created by Item 1. However, when Item 2 and Item 3 were compared with each other there was agreement of a combination of individual and all discernible class characteristics. This would indicate that the marks on Items 2 and 3 were created by the same tool.
7M3N2E	The item 1 cutter was functional when tested. The item 1 cutter is eliminated as having cut the item 2 and 3 wires. The item 2 and 3 wires are identified as having been cut by the same unknown tool.
7XK6TL	It was determined utilizing stereomicroscopic examination that item 2 and item 3 each exhibited one partial toolmark impression suitable for comparison with known tools. It was determined utilizing stereomicroscopic examination that the questioned partial toolmark impressions from item 2 and item 3 were not made by the item 1. Therefore, the item 1 tool can be eliminated as being the source of those questioned impressions.
8E6D7A	The Items 01-02 and 01-03 wires were eliminated as having been cut by the Item 01-01 wire cutter. The Items 01-02 and 01-03 wires were identified as having been cut by the same unknown tool.
8F2V46	The Stanley diagonal cutter did not cut Item 2 nor Item 3. The copper segments Item 2 and Item 3 were microscopically identified as having been cut by the same unknown tool.
8FY6V2	The toolmarks on the pieces of copper wire in items 001-02 and 001-3 were microscopically examined in conjunction with each other and with test cuts made from the wire cutters in item 001-01. Based on these comparisons the following was determined: The toolmarks on the pieces of copper wire in items 001-02 and 001-03 were identified as having been produced by the same tool. The toolmarks on the pieces of copper wire in items 001-02 and 001-03 were inconclusive as having been produced by the wire cutters in item 001-01.
8YDHRX	The submitted diagonal cutter (Item 1) was examined and test cuts were microscopically compared to copper wire in Items 2 and 3. It was determined that the toolmark in Items 2 and 3 were not made by the diagonal cutter in Item 1. It was also determined that the toolmark in Item 3 was made by the same tool as the toolmark in Item 2.
9AP3T7	Sufficient disagreement of class characteristics was observed between items 2 and 3 and the test marks made from item 1. Therefore, the diagonal cutter was not used to cut items 2 or 3.
9PJWY6	1). Item 2 and Item 3 were cut by the same tool. 2). Item 2 and Item 3 were not cut by the submitted tool (Item 1) based on differences in class characteristics. The specific type of suspect tool is unknown at this time.
9W4R4E	Tool marks observed on Items 1B and 1C (cut wires) are identified as having been produced by a common source. However, submission of the tool is necessary for further examination due to potential subclass. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility. Tool marks observed on Items 1B and 1C (cut wires) are not identified or eliminated (inconclusive) as having been produced by Item 1A (pliers). The individual characteristics present do not display sufficient agreement.
9Z34ZE	Tool marks observed on Items 1B and 1C (copper wire) are identified as having been produced by the same tool. Identifications are made only to a degree of practical certainty and are based on sufficient

## TABLE 2

WebCode	Conclusions
	agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility. Tool marks observed on Items 1B and 1C (copper wire) are not identified or eliminated (inconclusive) as having been produced by Item 1A (diagonal cutters). The individual characteristics present do not display sufficient agreement.
AH3F9F	The questioned diagonal cutter (Item 1) was not utilized to cut neither copper wire pieces (Items 2 nor 3). Both items 2 and 3 have been cut using the same tool.
AN4UMP	1). The toolmark present on the copper wire described in the item 2 was produced by the tool that produced the toolmark present on the copper wire described in the item 3 (identification). 2). The toolmarks presents on the copper wires described in the items 2 and 3 were not produced by the tool (diagonal cutter) described in the item 1 (elimination).
ATYNKQ	Examined the specimen marked #1. It is a Stanley brand diagonal cutting pliers. Examined the specimen marked #2. It is a cut copper wire (blue). Examined the specimen marked #3. It is a cut copper wire (red). The two copper wires marked #2 and #3 were compared microscopically and identified as having been cut by the same tool. The two copper wires marked #2 and #3 were compared microscopically to test standards and eliminated as having been cut by the submitted Stanley diagonal cutting pliers marked #1.
B4C4AB	Tool marks observed on items 2 and 3 (cut portions of copper wire) are identified as having been produced by the same tool. Tool marks observed on items 2 and 3 are not identified or eliminated (inconclusive result) as having been produced by item 1. The individual characteristics present do not display agreement. However, the characteristics present suggest they were produced by a different tool. Submission of that tool is necessary for further examination. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility.
B94EZ2	Toolmarks present on the Items 2 and 3 copper wires have characteristics consistent with a shearing/pinching type tool, and were identified as having been produced by the same tool. However, the Item 1 cutter was excluded as having created the Items 2 and 3 toolmarks due to differences in class characteristics.
BAZTMU	The questioned diagonal cutter (Item 1) did not cut the copper wire pieces (Items 2 or 3).
BCATT2	Items 2 and 3 were not cut with item 1. The type of cut made by item 1 differs from the cut ends on items 2 and 3. There were also no microscopic tool marks in agreement with the cut ends and therefore, were eliminated. Items 2 and 3 were cut by the same tool as there were sufficient microscopic tool marks in agreement for identification.
CAGWQ8	Comparison showed that the cut pieces of evidence (Items 2 and 3) were cut using the same tool. I was unable to determine if the submitted tool (item 1) was that tool used to cut the evidence items (Items 2 and 3) or not.
CEQHMX	Tests created using Item 1 (Exhibit 1.1) were microscopically compared to Items 2 and 3. Item 1 was eliminated as having produced the toolmarks found on Items 2 and 3 due to differences in class characteristics (angled parallel tooling on Item 1 blade reproduced on tests vs. straight parallel toolmarks found on Item 2 and Item 3).
CFK77T	The cutters (item 1) are excluded from having been used to cut the pieces of copper wire (items 2 and 3). The pieces of copper wire (items 2 and 3) were both cut by the same cutting tool.
CHRLG6	The Items 2 and 3 cut wires were not cut by the Item 1 diagonal pliers. These eliminations are based on differences in class characteristics (different angle machining marks and different shape pinch points). The Items 2 and 3 cut wires were cut by the same unknown tool. This identification is based on sufficient agreement of the combination of individual characteristics and all discernible class characteristics. Items 2 and 3 have physical characteristics that indicate they were cut by a pinching action cutting tool with a flat pinch point, such as (but not limited to) bolt cutters. Any recovered tools

TABLE 2

WebCode	Conclusions
	may be submitted for comparison purposes.
CT88D8	Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope). Test marks were made with Item 1, the Diagonal cutters, using submitted testing media and laboratory standard testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool marks on Items 2 and 3, the copper wire, were not made with Item 1, the Diagonal cutters, based upon different class and individual microscopic characteristics. The tool mark on Items 2 and 3, the copper wires, were made with the same tool based upon corresponding class and individual microscopic characteristics.
D3Q9HZ	Comparison microscope examinations were conducted, and it is the finding of the examiner that: 1). Item 2 and Item 3 were cut by the same tool, possibly a second diagonal cutter. 2). Item 2 and Item 3 were not cut by Item 1, based on differences in class characteristics.
D6JZU7	The cut copper wires, items #2 and 3, were eliminated from having been cut by item 1 based on differences in class and individual characteristics. The cut copper wires, items #2 and 3, were microscopically identified as having been cut by the same unknown tool.
DPL9NV	The two sections of copper wire, Items 01-02 and 01-03, were not cut by the submitted tool, Item 01-01. The two sections of copper wire, Items 01-02 and 01-03, were cut by the same unknown tool.
DT2M8V	The toolmark impressions on the two questioned copper wire pieces recovered from the scene (Items 2 and 3) have inconsistent class and individual characteristics to that of test cut toolmark impressions made by questioned diagonal cutter recovered from suspect (Item 1). Therefore, in my professional opinion, the questioned diagonal cutter recovered from suspect (Item 1) was not used to cut the two questioned copper wire pieces recovered from the scene (Items 2 and 3).
DW7949	Tests made by the submitted diagonal cutters were compared microscopically to the toolmarks on the copper wires, Items #2 & #3. There is agreement in class characteristics and a sufficient disagreement of individual characteristics for an elimination. Item #2 & #3 were not cut by the submitted diagonal cutters.
E7LP3T	The striated marks on items 2 and 3 were examined and compared to each other. A lot of matching individual characteristics were observed. The observations provide extremely strong support for the proposition that the marks on items 2 and 3 were produced by the same object and extremely weak support for the proposition that they were produced by different objects. The questioned diagonal cutter (item 1) was examined and used to produce test marks. These test marks were compared to the marks on items 2 and 3. No agreement of general and individual characteristics was observed. The observations provide extremely strong support for the proposition that the marks on items 2 and 3 were produced by another tool than the questioned diagonal cutter (item 1) and extremely weak support for the proposition that the marks on items 2 and 3 were produced by the questioned diagonal cutter (item 1).
EJWW7K	The microscopic tool marks of the test cuts made with the recovered wire cutters (item 1) could not be matched to the evidence pieces of cut wire. The submitted cutters could not completely sever the sample wire and had diagonal class characteristics which support it is not the tool used to cut the two wires. The two sample wires (items 2 and 3) have matching tool marks to each other that support they were cut by the same tool and can be compared if additional tools are submitted.
EMV7H8	Tool marks observed on Items 2 and 3 (copper wires) are identified as having been made by the same tool. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility. Tool marks observed on Items 2 and 3 (copper wires) are not identified or eliminated (inconclusive) has having been made by Item 1 (diagonal wire cutter). The individual characteristics present do not display agreement.
EP3TPK	The questioned diagonal cutter (Item1) were not used to cut neither of the copper wire pieces labeled Item 2 and Item 3.

TABLE 2

WebCode	Conclusions
F2VAEL	The two cut pieces of wire marked #2 and #3 were compared microscopically against each other and identified as having been cut by the same tool. The two cut pieces of wire marked #2 and #3 were compared microscopically against test cuts made by item #1, the Stanley diagonal cutter, and eliminated as having been cut by the submitted Stanley diagonal cutter (#1).
F36AJT	Examinations showed the tool marks present on Item 2 and Item 3 were not created by Item 1. Examinations showed the tool marks present on Item 2 and Item 3 were created by the same unknown tool.
FBYKR3	Items A1-1, A1-2, and A1-3: Toolmarks on A1-2 and A1-3 are consistent in class characteristics with each other. Items A1-2 and A1-3 were not consistent in class characteristics with the submitted tool item A1-1. Item A1-1 was compared to items A1-2 and A1-3. Because of a difference in class characteristics, the Items A1-2 and A1-3 toolmarks were eliminated as having been produced by the Item A1-1 diagonal cutting pliers.
FPH6BW	Item 1: One (1) Stanley brand diagonal cutter. Item 2: One (1) blue cut copper wire. Item 3: One (1) red cut copper wire. The submitted specimen marked as Item 1 was examined and identified as one (1) Stanley brand diagonal cutter. The submitted specimens marked as Item 2 and Item 3 were examined and identified as two (2) pieces of copper wire exhibiting toolmarks on one end. Toolmarks observed on Item 2 and Item 3 were microscopically inter-compared and compared to test toolmarks created using Item 1. As a result of microscopic comparison, Item 2 and Item 3 were identified as having been cut by the same unknown tool based on agreement of all discernible class characteristics and sufficient agreement of individual characteristics. Item 2 and Item 3 were eliminated as having been cut by Item 1 due to differences in class characteristics.
GBTMVX	Items 2 and 3 were eliminated as having been cut by Item 1. This eliminated is based on differences in class characteristics. The difference being the tool action type; Items 2 and 3 were cut with a shearing action while Item 1 cuts with a pinching action.
GL9LHT	The copper wires from the scene, that is, items two and three were not cut by the diagonal cutter. This conclusion was arrived at after microscopic comparisons were done on these items. Microscopic comparisons revealed that items two and three displayed significant disagreement in striations when compared to item one. This disagreement eliminated the diagonal cutter as the tool used to cut items two and three. Items two and three showed significant agreement of striations that is to say, items two and three were cut by the same tool. However, this tool was not submitted for analysis.
GMN4GR	1). Examination of Exhibit 1 revealed one Stanley brand diagonal cutter designed to be used as an opposed blade clipper cut pinching tool. Exhibit 1.1 test standard was created and is being returned with Exhibit 1. 2). Examination of Exhibits 2 and 3 each revealed one .124mm thick cut copper wire with one damaged area consistent with having been caused by an opposed blade center cut tool such as bolt cutters. a). Microscopic comparison revealed Exhibits 2 and 3 were damaged by the same tool based on an agreement of class characteristics and sufficient agreement of individual characteristics. b). Microscopic comparison revealed Exhibits 2 and 3 were not damaged by the Exhibit 1 tool based on disagreement in class characteristics. 3). All measurements are approximate. TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.
GX6N3A	The marks on Items 2 and 3 had sufficient matching striae to indicate that both items were produced by the same tool. Sufficient matching striae were not observed during comparison of the marks on Items 2 and 3 with the test marks made in the unmarked copper wire pieces. Therefore, Items 2 and 3 were eliminated as having been produced by Item 1.

## TABLE 2

WebCode	Conclusions
H24T72	The results extremely strongly support that the toolmarks on Item 2 were produced by another cutting tool (Level -4). The results strongly support that the toolmarks on Item 3 were produced by another cutting tool (Level -3).
HKCNMR	1). Exhibit 1 consist of one pair of Stanley brand diagonal cutters. Exhibit 1 is designed to be used as a pinching type clipper cut opposed blade cutting tool. Exhibit 1 was used to make Exhibit 1.1 (Test Standards) which will be returned with Exhibit 1. 2). Exhibit 2 and 3 each consists of one copper wire with damage on one end consistent with being from a pinching type opposed blade cutting tool. Each wire has an approximate diameter of 0.128 in. 3). Microscopic comparisons revealed: a). The toolmarks on Exhibit 2 and 3 were made by the same tool due to agreement of class characteristics and a sufficient agreement of individual characteristics. b). Exhibit 1 did not make the toolmarks on Exhibit 2 and 3 due to a disagreement of class characteristics.
J3RCDX	The toolmarks on the items 2 and 3 are not left by the Diaconal cutter on the item 1.
JH6KE2	Items 2 and 3 are identified as having been cut by the same unknown tool. Item 1 is eliminated from having cut items 2 and 3.
JH7HPW	The Items 01-02 and 01-03 wires were eliminated as having been cut by the Item 01-01 Stanley diagonal pliers. The Items 01-02 and 01-03 wires were identified as having been cut by the same unknown pinching type tool. Pinching type tools include, but are not limited to, bolt cutters and diagonal cutters.
JKB9UQ	A microscopic comparison was conducted between test tool marks #1 through #5, which were produced by Item #1 and Items #2 and #3. The examinations determined that Items #2 and #3 were not produced by Item #1 due to disagreement of individual characteristics. A microscopic comparison was conducted between Items #2 and #3. The examinations determined that Items #2 and #3 were produced by the same tool due to a sufficient agreement between striations/impressions.
JTLGBR	Microscopic comparison conducted on ITEM 2 and ITEM 3, revealed significant agreement of individual characteristics and all discernible class characteristics; that suggests that both items were cut by the same tool. Further comparison conducted on aforementioned items (ITEM 2 and ITEM 3) along with test cut wires (wires cut by ITEM 1), revealed significant disagreement of individual characteristics and all discernible class characteristics; that suggests that ITEM 1 was not the tool used to cut ITEM 2 nor ITEM 3, that is to say that ITEM 2 and ITEM 3 were not cut by ITEM 1.
JYVQLV	The toolmarks on Items 1.2 and 1.3 were compared microscopically with each other. There is agreement of all discernible class characteristics and sufficient agreement of individual characteristics for identification. They were made by the same tool. Item 1.1 is eliminated as having made the toolmarks on Items 1.2 and 1.3 due to differing class characteristics.
K9VFYP	This report refers to exhibits by Lab Number. The following results only apply to the items tested. Test cuts were made with the Exhibit 1 cutter and laboratory supply lead sheet and copper wire. The tests were retained as Exhibits 1.1 and 1.2 respectively. The test cuts were microscopically compared to the Exhibit 2 and 3 wires. Based on a disagreement of class characteristics, Exhibits 2 and 3 were excluded as having been cut by the Exhibit 1 cutter. The Exhibit 2 and 3 cut wires were microscopically intercompared. Based on an agreement of class characteristics and sufficient agreement of individual characteristics, Exhibits 2 and 3 were identified as having been cut by the same tool. The probability that the toolmarks on Exhibits 2 and 3 were made by a different source is so small that it is negligible.
KG9CZQ	Microscopic comparison of Items 2 and 3 revealed that they were cut by the same tool. However, microscopic comparison of item 2 and 3 with test cut wires made using item 1 revealed differences in class and individual characteristics; That is to say, item 2 and item 3 were not cut by item 1.
KQEDZG	Test toolmarks were created using the Stanley diagonal cutters, Laboratory Item 1, and macroscopically/microscopically compared to the pieces of copper wire, Laboratory Items 2 and 3. Through macroscopic/microscopic examination and based on significant disagreement of class characteristics, the toolmarks of interest exhibited on the pieces of copper wire, Laboratory Items 2 and 3, could not have been created by the use of the Stanley diagonal cutters, Laboratory Item 1. Through

TABLE 2

WebCode	Conclusions
	macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the pieces of copper wire, Laboratory Items 2 and 3, were identified as having been created by the same tool.
LJAUJ4	[No Conclusions Reported.]
LPWPEF	Test toolmarks were created using the diagonal cutter, Laboratory Item 1, and macroscopically/microscopically compared to the cut portions of wire, Laboratory Items 2 and 3. Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the cut portions of wire, Laboratory Items 2 and 3, were identified as having been created by the same tool. Through macroscopic/microscopic examination and based on significant disagreement of class characteristics, the toolmarks of interest exhibited on the cut portions of wire, Laboratory Items 2 and 3, could not have been created by the use of the diagonal cutter, Laboratory Item 1.
LUBKYJ	Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope), Digital Micrometer. Test marks were made with Item 1, the Stanley diagonal cutting pliers, using submitted/laboratory testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool marks on Items 2 and 3, the copper wire, were not made with Item 1, the Stanley diagonal cutting pliers, based upon different class and individual microscopic characteristics.
LZF2QT	Item 1 is a pair of Stanley diagonal cutters, Model 84-027, that uses a pinching type action. Item 2 and Item 3 consists of two 8-gauge copper wires, bearing toolmarks of value from a pinching/shearing type tool. Toolmarks present on the Item 2 and Item 3 wires were identified as having been produced by the same tool. Due to a difference in class characteristics, the Item 2 and Item 3 wires were excluded as having been cut by the Item 1 diagonal cutters.
MA2KR6	The copper wires in Items #1-2 and #1-3 were microscopically compared to each other and found to have areas of corresponding individual characteristics. They were identified as having been cut by the same tool. Test cuts made by the diagonal cutters in Item #1-1 were microscopically compared to the toolmarks on the wires in Items #1-2 and #1-3 and found to have different class characteristics. They were eliminated as having been cut by the diagonal cutters in Item #1-1.
MC7CDQ	1). Item (2) and Item (3) were cutting by same tools. 2). Item (1) diagonal cutter didn't use for cutting Item (2) and Item (3).
NBTR3	Our examination with a comparison light microscope leads us to the following conclusion: Item 2 (blue): The toolmark on the copper wire piece (Item 2) and the comparison marks made by the diagonal cutter (Item 1) show no matching marks. The toolmark (Item 2) wasn't caused by the diagonal cutter (Item 1). Item 3 (red): The toolmark on the copper wire piece (Item 3) and the comparison marks made by the diagonal cutter (Item 1) show no matching marks. The toolmark (Item 3) wasn't caused by the diagonal cutter (Item 1).
NNT2RM	The toolmarks displayed on Lab Items 2 and 3 were not made by Lab Item 1, based on microscopic comparison and significant disagreement of class characteristics. The toolmark displayed on Lab Item 2 was made by the same unknown tool as the toolmark displayed on Lab Item 3, based on microscopic comparison and agreement of discernible class characteristics and sufficient matching individual detail.
P4KXPB	Examined the specimen marked #1. It is a pair of Stanley brand (Model: 84-027) six inch diagonal cutting pliers. Examined the two specimens marked #2 and #3. They are pieces of cut solid copper wire. The two pieces of wire marked #2 and #3 were compared microscopically and identified as having been cut by the same tool. The two pieces of wire marked #2 and #3 were compared microscopically against test cuts made by Item #1 and eliminated as having been cut by the submitted tool.
P6H8ZF	The toolmarks on items 2 and 3 were identified as having been produced by the same unknown tool based on the significant agreement of class and individual characteristics. The toolmarks on items 2

## TABLE 2

WebCode	Conclusions
	and 3 were eliminated as having been produced by item 1 based on the significant disagreement of class/subclass and individual characteristics.
PDQ66B	The two copper wires #2 (blue) and #3 (red) were compared microscopically. Tool marks examined on both copper wires were identified as having been cut by the same tool. The two copper wires #2 (blue) and #3 (red) were compared microscopically against test standards produced from the submitted cutting tool and were eliminated as having been produced by the submitted cutter. The two wires (#2 and #3) were not cut by the submitted tool.
PJGFEA	PART I: Examined the two specimens marked #2 and #3. They are cut segments of copper wire. The two specimens marked #2 and #3 were compared microscopically and identified as having been cut by the same unknown cutting tools. PART II: Examined the specimen marked #1. It is a pair of Stanley brand diagonal cutting pliers. The two pieces of wire marked #2 and #3 were compared microscopically to test standards and eliminated as having been cut by the submitted pair of Stanley brand diagonal cutting pliers marked #1.
PNVTHH	In my opinion, Item 1 was not used to cut either Item 2 or Item 3; CONCLUSIVE ELIMINATION.
PPKEWQ	Items 2 and 3 were microscopically examined and, based on corresponding class and individual characteristics, identified as having been cut by the same tool. Due to differences in class characteristics, Items 2 and 3 were eliminated as having been cut by Item 1.
PT69PK	The tool marks on Items 2 and 3, the cut copper wire pieces, were not made by the Item 1, the diagonal cutters based on different individual characteristics (elimination). Items 2 and 3, the cut copper wire pieces, were cut by the same unknown tool due to corresponding class and individual characteristics (identification).
PU2H4W	None of the copper wires (neither item 2-"blue" nor item 3-"red") were cut with the diagonal cutter (item 1). However, the copper wires Item 2-"blue" and Item 3-"red" were cut with the same cutter, but not with Item 1.
PVW4WM	ELIMINATION: The questioned toolmark (Item 2) was not created using the suspect tool (Item 1). ELIMINATION: The questioned toolmark (Item 3) was not created using the suspect tool (Item 1).
PYVGHR	Toolmarks present on Items 2 and 3 were microscopically examined and identified as having been produced by the same tool based on corresponding class and individual characteristics. Toolmarks present on Items 2 and 3 were eliminated as having been produced by the Item 1 tool due to differences in individual characteristics.
QBLZJX	The shapes of the cut ends of the two pieces of copper wire (items 2 and 3) were compared to tests cuts made using the diagonal cutter (item 1). The shapes of the test cuts made using the diagonal cutter were different to the shapes of the cut ends on both pieces of wire. Therefore, in my opinion, the diagonal cutters did not cut either piece of wire.
QH29XY	Visual and microscopic analyses of the evidence cut copper wire pieces (item 2 and item 3) and test cut wires made with item 1 were performed starting October 14, 2021 and the results of the comparisons and evaluations are as follows: Based on agreement of discernible class characteristics and sufficient agreement of individual characteristics, the item 2 (blue) and item 3 (red) cut copper wire pieces are identified as having been cut with the same unknown cutter. Based on significant disagreement of individual microscopic markings as well as disagreement of discernible class characteristics, the item 2 (blue) and item 3 (red) cut copper wire pieces are eliminated as having been cut with the item 1 (diagonal cutter). evidence analyzed dates: 10/14, 10/19, 10/21 and 10/25/2021.
QV8J6K	Item 1 is one (1) pair of Stanley brand diagonal cutting pliers, model 84-027. Item 2 is one (1) cut length of .127 diameter solid copper wire with painted blue tip. Item 3 is one (1) cut length of .127 diameter solid copper wire with painted red tip. Items 2 and 3 were microscopically compared to each other and identified as having been cut by the same tool. Test cuts from the Item 1 tool were microscopically compared to Items 2 and 3, and Item 1 was eliminated as having cut Items 2 and 3 due to a significant disagreement of individual characteristics.

## TABLE 2

WebCode	Conclusions
QVA2JJ	The wires were cut by the same tools but could not be identified nor excluded from being cut by the submitted tool.
R36EZ	[No Conclusions Reported.]
RQDRRH	1). Exhibit 1 is designed to be used as a pinching action cutting tool. Exhibit 1.1 (Test toolmark standards) was created for comparisons and is being retained with Exhibit 1. Exhibit 1.1 is suitable for microscopic comparison. 2). Exhibit 2 and Exhibit 3 display damage consistent with having been caused by a pinching action cutting tool. Exhibits 2 and 3 were visually examined and microscopically compared to the test toolmarks from Exhibit 1. a). As a result of microscopic comparison, it was concluded that due to a sufficient disagreement of class and individual characteristics the damage displayed on Exhibits 2 and 3 were not caused by Exhibit 1. b). Exhibits 2 and 3 were identified as having been damaged by the same tool due to an agreement of class characteristics and a sufficient agreement of individual characteristics.
RTEZRL	Item 1 is a pair of Stanley Tools brand diagonal cutters, which use a pinching action. Items 2 and 3 are pieces of copper wire that bear toolmarks created using a pinching action. The toolmarks present on the Item 2 and 3 wires were produced by the same tool. The toolmarks present on the Item 2 and 3 wires were eliminated from having been produced by the Item 1 diagonal cutters, due to a difference in class characteristics.
RUDVLP	The two (2) toolmarks, items 1.2 and 1.3, were each eliminated as having been made by the diagonal cutters, item 1.1, based on a difference in class characteristics (direction of marks and width of cutting edge). The two (2) toolmarks, items 1.2 and 1.3, were identified as having been made by the same tool. Note: Identifications are based on the agreement of all discernable class characteristics and agreement of corresponding individual microscopic markings.
RXE23G	Examinations showed the tool marks on Items 2 and 3 were not created by Item 1. Examinations showed the tool marks on Item 2 and 3 were created by the same unknown tool.
T9N4T7	The pieces of copper wire identified Item 2 and item 3 have not been cutted using the suspect's diagonal cutter identified item 1. The questioned diagonal cutter identified 2021-4142 (Item 1), WERE NOT used to cut the recovered copper wire pieces E2A-21-4142 (Item 2) and E3A-21-4142 (Item 3).
TBVERV	Observed toolmarks on item 2 and item 3 have not been produced by item 1.
TEXPWQ	The toolmarks on Items 2 and 3 were not made by the tool in Item 1.
THDP8H	The submitted copper wire segments, Items 2 and 3, were not cut by the submitted diagonal cutter, Item 1. The submitted copper wire segments, Items 2 and 3, were cut by the same tool.
U2KC7V	Visual and microscopic analyses between the evidence Item 2 (Q1) cut copper wire piece (Blue), the evidence Item 3 (Q2) cut copper wire piece (Red), and the test cuts from Item 1 (K1) diagonal cutter, were initiated on October 12, 2021. The results of the comparisons and evaluations are as follows: Based on agreement of discernible class characteristics and sufficient agreement of individual characteristics, cut copper wire piece Item 2 (Q1) and cut copper wire piece Item 3 (Q2), were cut with the same unknown cutting tool. Based on disagreement of class characteristics (parallel versus diagonal) and significant disagreement of individual characteristics, cut copper wire pieces Item 2 (Q1) and Item 3 (Q2) were not cut with the Item 1 (K1) diagonal cutter.
U3TVLH	Item 1 is a pair of Stanley brand diagonal pliers. The Item 2 and Item 3 wires bear toolmarks consistent with tools such as diagonal pliers or lineman's pliers. The toolmarks present on Item 2 and Item 3 were identified as having been produced by the same tool; however, they were excluded as having been produced by the Item 1 pliers.
UGFWMH	Toolmarks on the cut end of copper wire in both Item 2 and Item 3 were not caused by the diagonal pliers in Item 1. These exclusions were based on differences in class and individual characteristics.
UL6HAB	The pieces of wire, Items 2 and 3, were not cut using the diagonal cutters, Item 1.

TABLE 2

WebCode	Conclusions
UNW27P	Toolmark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscopy). Test marks were made with Item 1, the Stanley diagonal cutters, using submitted testing media and laboratory standard testing media. Item 1A, the test marks, were sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Items 2 and 3, the cut wires, were not made with Item 1, the diagonal cutters, based upon different class and individual microscopic characteristics. The tool marks on Items 2 and 3, the cut wires, were made with the same tool based upon corresponding class and individual microscopic characteristics.
UPA47N	Items: Description/Visual Examination: Item 1: One (1) Stanley brand diagonal cutter tool. Items 2 & 3: Two (2) cut copper wires with striated toolmarks. Examination Results: Test toolmarks were created on lead standards with Item 1 for microscopic comparison purposes. Microscopic Comparison Conclusions: Elimination: based upon the difference in class characteristics, the following eliminations were made: Items 2 & 3 Two (2) striated toolmarks (copper wires) not made by Item 1 (Stanley diagonal cutter).
VGWCFQ	Tool marks observed on Item 2 (copper wire with blue painted tip) and Item 3 (copper wire with red painted tip) are identified as having been produced by the same tool. Tool marks observed on Item 2 (copper wire with blue painted tip) and Item 3 (copper wire with red painted tip) are not identified or eliminated as having been produced by Item 1 (Stanley wire cutters). The individual characteristics present do not display agreement.
VKXF8D	Examinations showed the tool marks present on Item 2 and Item 3 were not made by Item 1.
VNDVRD	Item 2 and Item 3 were cutting using Item 1.
VNRG2E	Item 1 did not cut Items 2 or 3 based on differences of class and individual characteristics. Items 2 and 3 were cut by the same tool based on an agreement of class and individual characteristics.
VPNQFP	The diagonal cutter item 1 did not cut the two copper wires item 2 and 3. The two copper wires item 2 and 3 were cut by the same tool which is different from the cutter item 1.
VYEBKN	As a result of the microscopic comparison it can be excluded, that the toolmarks on the copper wires marked as "Item 2" and "Item 3" have been produced by the Diagonal cutter marked as "Item 1".
W368JD	A microscopic comparison was conducted between Exhibits 2 and 3 and the test cuts from Exhibit 1. There exists agreement of all discernible class characteristics and sufficient agreement of individual characteristics to identify the Exhibit 2 and 3 wires as having been cut by the same tool. Due to a disagreement of class and individual characteristics, the Exhibit 1 diagonal cutters were excluded as having cut the Exhibit 2 or 3 wires.
W76FP9	Tool Mark Analysis: Methodology: Physical (Visual Examination, Microscopy (Comparison Microscopy). Test marks were made with Item 1, the Stanley wire cutters, using submitted and laboratory testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. The tool mark on Items 2 and 3, the copper wires, were not made with Item 1, the Stanley wire cutters, based upon different class and individual microscopic characteristics. Items 2 and 3, the copper wires, were made by the same tool based upon corresponding class and individual microscopic characteristics.
WD6TPC	The two submitted pieces of cut copper wire, Agency Exhibits 2 and 3, were both cut by the same unknown pair of wire cutters. They were eliminated as having been cut by the submitted Stanley diagonal wire cutters, Agency Exhibit 1, due to differences in both class and individual characteristics. The submitted Stanley diagonal wire cutters, Agency Exhibit 1, are functional.
WDBWGH	Item 1 is a Stanley diagonal wire cutter that uses a pinching type action. Toolmarks present on the Item 2 and Item 3 wires were identified as having been produced by the same tool. Due to a difference in class characteristics, the Item 2 and Item 3 wires were excluded as having been cut by the Item 1 cutters.
WGL8AC	The diagonal cutter (Item 1) was not used to cut the two copper wire pieces (Items 2 and 3).

TABLE 2

WebCode	Conclusions
WGMXHF	The Stanley diagonal cutter (Item A1) is capable of reproducing identifiable toolmarks. The Stanley diagonal cutter (Item A1) did not produce the cuts in Item A2 or Item A3. The cuts in Item A2 and Item A3 were produced by the same, unknown tool.
X4YBRE	Specimens QC 1 & 2 (Items 002 & 003) are an identification. This means Specimens QC 1 & 2 were cut with the same unknown tool. Specimens QC 1 & 2 and TKT-1 (test cut from Item 001) are an elimination. This means Specimens QC 1 & 2 were not cut by Specimen KT-1 (Item 001).
XEE8N7	Microscopic examination and comparison of the tool marks on the copper wire pieces (items # 2 and # 3) with test tool marks produced with the diagonal cutter (item # 1) reveals sufficient microscopic differences to conclude that the tool marks on the wire pieces (items # 2 and # 3) were not made with the diagonal cutter (item # 1). Microscopic examination and comparison of the tool marks on the copper wire piece (item # 2) with the tool marks on the copper wire piece (item # 3) reveals sufficient microscopic evidence to conclude that these two copper wire pieces (items # 2 and # 3) were cut by the same tool (unknown origin).
XHF78B	Item 2 and Item 3 were not made by Item 1. Item 2 and Item 3 were made by the same unknown tool.
XWYTEN	Toolmarks observed on Items #2 and #3 (cut copper wires) are identified as having been produced by the same tool. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. When sufficient agreement exists, in part, this means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility. Toolmarks observed on Items #2 and #3 are not identified or eliminated (inconclusive) as having been produced by Item #1 (diagonal cutting pliers). The individual characteristics present do not display agreement.
Y68PUE	1). Exhibit 1 is a Stanley brand diagonal cutter, model 84-027. a). Examination disclosed that it is designed as an opposed blade cutting tool. b). Exhibit 1 was used to create the Exhibit 1.1 test standards, which are being returned with Exhibit 1. 2). Exhibit 2 and Exhibit 3 are two copper wires, which were microscopically compared to the Exhibit 1 test standards. a). Examination disclosed damage that is consistent with an opposed blade cutting tool such as a bolt cutter or similar tool. b). Microscopic comparison disclosed sufficient disagreement of class and individual characteristics to conclude that Exhibit 2 and Exhibit 3 were not cut by the Exhibit 1 diagonal cutters. c). Microscopic comparison also disclosed sufficient agreement of class and individual characteristics to conclude that Exhibit 2 and Exhibit 3 were cut by the same tool.
YA64LA	Examinations showed that the tool marks on Item 2 were not produced by the Item 1 diagonal cutting pliers. Examinations showed that the tool marks on Item 3 were not produced by the Item 1 diagonal cutting pliers.
YG286D	The tool marks at both items (blue item 2 and red item 3) differs to the test marks made by the diagonal cutter item 1. Both tool marks at item 2 and item 3 have plane horizontal areas, made by the tool cutting edge. The diagonal cutter item 1 is not able to create such plan horizontal areas, because of the shape of its blades. tool marks at item 2 and item 3 looks as made by an tool like a bolt cutter.
YKZJZD	Unable to eliminate or identify Item 1 as being used to cut Items 2 and 3 due to agreement in class characteristics but a lack of consistent and reproducible individual marks.
YLTDZ3	Test toolmarks were created using the diagonal cutter, Laboratory Item 1, and macroscopically/microscopically compared to the toolmarks of interest exhibited on the cut wires, Laboratory Items 2 and 3. Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the cut wires, Laboratory Items 2 and 3, were identified as having been created by the use of the same tool. Through macroscopic/microscopic examination and based on significant disagreement of class characteristics, the toolmarks of interest exhibited on the cut wires, Laboratory Items 2 and 3, could not have been created by the use of the diagonal cutter, Laboratory Item 1.
YM3KZB	The microscopic comparison test from item 1 (cutter) against item 2 and 3 revealed that item 1 (cutter) was NOT used to cut either Item 2 nor Item 3. That is to say item 1 can be eliminated from the

TABLE 2

WebCode	Conclusions
	comparison process.
Z9286B	Microscopic comparison of item #1 test tool marks with tool marks from item #2 and item #3 revealed that there were significant disagreements of all discernible class characteristics and individual characteristics; that is to say, the tool marks observed on item #2 and item #3 were not created by item #1. However, when compared the tool marks of item #2 and item #3, one against the other revealed that there were significant agreements of all discernible class characteristics and individual characteristics; that is to say, the tool marks on item #2 and item #3 were created by the same tool that was not submitted for testing.
ZNJUXH	Items: Description/Visual Examination: Item 1: One (1) pair of Stanley brand diagonal cutters (black & yellow handles), approximately 6 1/2" in length. Item 2: One (1) piece of copper wire approximately 2" in length with cut type (striated) toolmarks present. Item 3: One (1) piece of copper wire approximately 2 11/16" in length with cut type (striated) toolmarks present. Examination Results: Test toolmarks were created on lead standards & lead wire with Item 1 for microscopic comparison purposes. Microscopic Comparison Conclusions: Elimination: Based upon the difference in class characteristics, the following eliminations were made: The cut type (striated) toolmarks on Items 2 & 3 were not created by Item 1 (Stanley brand diagonal cutters).
ZQKWJD	1). Exhibit 1 is a Stanley brand diagonal cutter which is designed to be used as an opposed blade cutting tool. Exhibit 1 was used to create the Exhibit 1.1 test standards which will be retained with Exhibit 1. 2). Exhibit 2 and Exhibit 3 each consist of one piece of copper wire with a cut end. Examination of Exhibits 2 and 3 disclosed damage consistent with an opposed jaw cutting tool such as bolt cutters, diagonal cutters, or similar tools. Microscopic comparison revealed the following: a). Exhibits 2 and 3 were cut by the same tool based on sufficient agreement of class and individual characteristics. b). Exhibit 1 was eliminated as having cut Exhibits 2 and 3 due to agreement of class characteristics and sufficient disagreement of individual characteristics. Observing this amount of disagreement from the same source is considered extremely remote.
ZVEXH7	The wires given for the examination have not been cut by the suspect's diagonal cutter.

# Additional Comments

## TABLE 3

WebCode	Additional Comments
28MW9R	The cut end of item 1-2-1 copper wire and the cut end of item 1-3-1 copper wire were determined to be inconclusive as having been cut by item 1-1 tool, in the opinion of the laboratory. Although some dissimilarities in the patterns of microscopic markings were observed among the compared items, those dissimilarities were not significant to eliminate item 1-1 tool as having been used to cut items 1-2-1 and 1-3-1 copper wires, leading to the inconclusive conclusions.
4CTBM9	<p>Methods: Physical and Visual Examinations: Physical and visual evaluations compare the physical and class characteristics of evidence items. A conclusion of "physically consistent with" is reached if the observable or measurable physical dimensions and/or design features of two items are in agreement or are "physically consistent." If these dimensions and features are clearly different, an elimination conclusion is reached. If there is a lack of observable design features or measurable dimensions, the result is inconclusive. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Physical and Visual Examinations: A Physical and Visual Evaluation examination is unsuitable for determining a source identification conclusion. A conclusion of "physically consistent with" signifies a restricted group source, based on class characteristics and/or observable features, from which evidence may have originated. Post-manufacture features cannot be used for elimination purposes. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
4K6KX8	Reasons for Inconclusive results: The test cuts made in the supplied wire could only be made using the back portion of the diagonal cutters (the area farthest from the tip) due to hardness of the wire. This inhibited the ability to make complete comparison cuts from the entire length of the tool working

TABLE 3

WebCode	Additional Comments
6AL9KA	<p>surface. The test cuts that were obtained, shared class characteristics consistent with that of the Item 2 and Item 3 tool marks however, there were distinct differences in the individual characteristics produced, that were more diagonal with irregularly spaced striations. These markings could not be reproduced. Due to the inability to make reproducible comparison cuts using the full length of the working surface of the tool, the tool could not be eliminated from making the tool mark(s) present on Item 2 and Item 3.</p> <p>I was not able to cut the copper test wires by hand using the submitted tool. I was able to make test cuts by placing the pliers in a vice and using it to apply additional pressure. Per [Laboratory] policy, Items 1B (CTS#2) and 1C (CTS#3) were not compared to each other.</p>
6HC2L9	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
6W8HB7	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being</p>

## TABLE 3

WebCode	Additional Comments
	<p>compared. Pattern Examination Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
7AXPT9	Cuts on Items #1.2-1.3 were compared microscopically with each other. Based on the agreement of all discernible class characteristics and sufficient agreement of corresponding individual characteristics, they have been identified as having been made by the same tool.
7L7EM4	When the surface of the tool of Item 1 was observed, the marks were diagonal. When the test marks were made with Item 1, it created diagonal marks. The marks on Item 2 and 3 were parallel, hence, there was disagreement with the class characteristics.
8FY6V2	Insufficient agreement or disagreement of individual characteristics for identification or elimination of items 001-02 and 001-03 to the tool in item 001-01.
9AP3T7	Items 1-3 were examined using a stereomicroscope. Exemplar toolmarks were made by cutting a lead sheet with item 1. Mikrosil casts of the exemplar toolmarks and the toolmarks on items 2 and 3 were compared using a toolmark microscope. Additional exemplar toolmarks were made by cutting solder wire with item 1. Photomicrographs of the items and the casts are stored on a DVD in the case package. Currently the interpretation of individualization/identification is subjective in nature, founded on scientific principles and based on the examiner's training and experience. Opinions of common origin are made when toolmarks are in significant agreement.
9Z34ZE	Two sides of the diagonal cutters produce lines diagonal to the cut edge, while the other two sides of the diagonal cutters produce lines both diagonal and perpendicular to the cut edge. Both pieces of copper wire have lines perpendicular to the cut edge, with no diagonal lines. There was not sufficient

TABLE 3

WebCode	Additional Comments
	agreement observed in the individual characteristics.
AN4UMP	1). Identification: Based on the agreement of individual characteristics observed by microscopic comparison examination. 2). Elimination: Based on the disagreement of subclass and individual characteristics observed by microscopic comparison examination.
ATYNKQ	The submitted Stanley brand diagonal cutting pliers makes cuts exhibiting diagonal striated marks. The copper wires marked #2 and #3 have parallel striated marks.
B4C4AB	Items 2 and 3 appear to have been cut with a pinching type tool which is consistent with the tool type for item 1. Since the tool types are similar between items 1, 2, and 3, an inconclusive result was made. Differences in characteristics would suggest a different tool produced the tool marks exhibited on items 2 and 3.
CAGWQ8	I was unable to take sample cuts to enable a meaningful comparison. The cuts I did make resulted in a poor transfer of striae making comparison unviable.
CEQHMX	Item 1 was examined, and is a hinged opposed blade cutting plier type tool, ~16cm in overall length, with yellow and black colored grips, and corresponding STANLEY embossed markings on the grip portions. The working portion is marked: STANLEY 84-027. Product description as listed by the manufacturer: "Stanley Brand #84-027, 6" Diagonal Pliers". The working surface of Item 1 presents grinding/tooling marks which are arranged in an angled parallel pattern related to the blade edges. These markings are consistent on all visible working surfaces. The Item 1 Stanley pliers were used to create Exhibit 1.1 (test standards). Exhibit 1.1 consists of: five (5) test cuts (#1 – 5) created using laboratory supplied lead wire, six (6) additional test cuts (#6 – 11) were created using the supplied copper wire.
CFK77T	The pieces of copper wire (items 2 and 3) were both cut by the same cutting tool.
CT88D8	The newest edition of the AFTE glossary should also be consulted as to the various tool action types when creating the Toolmark CTS.
DPL9NV	The item numbers 01-01 through 01-03 used to identify the items of evidence were assigned by our laboratory information management system (LIMS). Item 1 = Item 01-01. Item 2 = Item 01-02. Item 3 = Item 01-03.
EP3TPK	The copper wire pieces labeled Item2 and Item3 were cut with the same tool.
FBYKR3	Item A1-2 was compared to item A1-3. The Items A1-2 and A1-3 toolmarks were examined, compared microscopically, and identified as having been produced by the same tool, a cutting tool with one ground edge.
GBTMVX	Per lab policies, Items 2 and 3 were not inter-compared. (Can only compare toolmarks to known test cuts from tools.)
GX6N3A	The extra wire provided for test marks were very hard to cut through with the diagonal cutters.
JTLGBR	There was an identification of ITEM 2 and ITEM 3 with each other. However, there was an elimination of ITEM 1 as the (suspect tool) tool used to cut ITEM 2 and ITEM 3.
KG9CZQ	The gross toolmarks created by item 1 are almost perpendicular to those on item 2 and 3 instead of parallel. Therefore an elimination can be made due to this difference in class characteristics.
LZF2QT	Methods: Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is

TABLE 3

WebCode	Additional Comments
	<p>an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes. Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline.</p>
NNT2RM	Items 2 & 3 identified to each other and eliminated from Item 1. Item 1 exhibits class characteristics of a shear-type tool.
PJGFEA	<p>NOTES: PART I: Examined the two specimens marked #2 and #3. They are cut segments of copper wire. Both have paint on one end to show which end is not to be examined (#2 blue paint, #3 red paint). PART II: Examined the specimen marked #1. It is a pair of Stanley brand diagonal cutting pliers. No copper residue visible on tools cutting surface as received. Test standards taken in copper and lead. Copper wire left visible copper residue on tools cutting surface after tests taken. Diagonal toolmarks present on tools cutting surface. COMPARISONS LEEDS LCF3 #484995. All Power Utilized. #2 vs #3 – Pos (+) Identification: Agreement of parallel striations on both sides. QCMS ok. #1 T1 through T4 – Pos (+) Identification: Agreement of parallel striations on both sides. QCMS ok. #1 T1 through T4 vs #2 &amp; #3 – Neg (-) Elimination: Disagreement of class characteristics. Diagonal striations present on #1 T1 through T4 vs parallel striations on #2 &amp; #3.</p>
PNVTHH	Items 2 and 3 were cut by the same tool.
PYVGHR	Seven (7) tests produced using Item 1 are being returned as Item 1T in Sample Pack T2 and should be maintained for possible future examinations.
QH29XY	<p>SUFFICIENT AGREEMENT: Sufficient agreement exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours.</p>
RQDRRH	<p>TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or</p>

TABLE 3

WebCode	Additional Comments
RTEZRL	<p>irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.</p> <p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
T9N4T7	Item 2 + Item 3.
TBVERV	Observed toolmarks on item 2 and item 3 have been produced by the same tool.
U2KC7V	Should another suspected cutting tool be recovered, submit, and refer to the above [refer to table 2: Conclusions]. Sufficient agreement exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours.
UL6HAB	Class characteristics were not in agreement between test cuts made using the diagonal cutter, Item 1,

TABLE 3

WebCode	Additional Comments
	and the cut ends of the pieces of wire, Items 2 and 3.
VYEBKN	The comparison has been performed with a comparative microscope using the original material.
WDBWGH	<p>Methods: Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes. Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline.</p>
X4YBRE	The two unknown cuts (Items 002 & 003) were cut using the same unknown tool and were microscopically compared and identified to each other prior to comparing the unknown cuts to known cuts from the submitted tool (Item 001).
XWYTEN	Agency policy prevents elimination based on individual characteristics.
Y68PUE	<p>TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to</p>

TABLE 3

WebCode	Additional Comments
	examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.
YKZJZD	Items 2 and 3 were identified as having been cut by the same tool.
YM3KZB	The microscopic comparison of items 2 and 3 one against the other disclosed agreement of a combination of individual characteristics and all discernable class characteristics. That is to say items 2 and Item 3 were cut by the same tool.
Z9286B	The machining tool marks observed on the cutting surface of item #1 were observed to be diagonal which were transferred to the test sample. Contrary, the tool marks observed on item # 2 and item #3 were parallel which were clearly out of class with item #1.
ZQKWJD	TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm or tool, which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm or tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm or tool surfaces. These random imperfections or irregularities can be either produced incidental to manufacture or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm or tool are not to the absolute exclusion of all other firearms or tools, because it is not feasible to examine all firearms or tools in the world. However, observing this amount of agreement between different sources is considered extremely remote.

**-End of Report-**  
**(Appendix may follow)**

## Test No. 21-5282: Toolmarks Examination

DATA MUST BE SUBMITTED BY **Nov. 15, 2021, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: 63Y9V4

The Accreditation Release section can be accessed by using the "Continue to Final Submission" button above. This information can be entered at any time prior to submitting to CTS.

### Scenario:

Police are investigating a theft at a construction site. Two spools of copper wire were believed to be cut and large sections taken. A suspect was apprehended later that day and a pair of diagonal cutters were recovered from his possession. Investigators have removed the cut end of each spool and are requesting that you examine the wire sections and determine if any were cut using the suspect's diagonal cutter.

*Please note the following:*

*-Paint has been applied to one end of the copper wire for Item 2 (blue) and Item 3 (red) to assist in distinguishing which end is NOT to be examined.*

*-Two pieces of copper wire have been included for possible test mark purposes.*

### Items Submitted (Sample Pack T2):

Item 1: Diagonal cutter recovered from suspect.

Item 2: Cut copper wire piece recovered from scene. (blue)

Item 3: Cut copper wire piece recovered from scene. (red)

**1.) Was the questioned diagonal cutter (Item 1) used to cut either of the copper wire pieces (Items 2 or 3)?**

	Yes	No	Inconclusive*
<b>Item 2:</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Item 3:</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\*Should an item(s) be marked "Inconclusive", please document the reason in the Additional Comments section of this data sheet.

*Please note: Any additional formatting applied in the free form space below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.*

**2.) What would be the wording of the Conclusions in your report?**

**3.) Additional Comments**

## RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section below must be completed.)
- This participant's data is **not** intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

Have the laboratory's designated individual complete the following steps **only if your laboratory is accredited in this testing/calibration discipline** by one or more of the following Accreditation Bodies.

**Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory.**

ANAB Certificate No.   
(Include ASCLD/LAB Certificate here)

A2LA Certificate No.

**Step 2: Complete the Laboratory Identifying Information in its entirety.**

Authorized Contact Person and Title

Laboratory Name

Location (City/State)