



Toolmarks Examination Test No. 24-5282 Summary Report

Each sample pack contained tool(s) and material(s) with questioned toolmarks, which participants were asked to examine. Data were returned from 116 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

Each sample pack contained tool(s) and material(s) with questioned toolmarks. Participants were asked to determine if any of the questioned toolmarks were made by the submitted tool(s).

SAMPLE PREPARATION: To assist examiners, each piece of copper wire was marked with paint on one end to indicate the side not intended for examination. Before use, each bolt cutter was inspected for defects and then "broken in" by cutting spare copper wire. This removed any manufacturing residue and ensured a clean cut on the test wires.

ELIMINATION ITEMS: The copper wire was cut by a pair of bolt cutters that were not provided for examination.

SAMPLE PACK ASSEMBLY: The questioned material(s) were placed into their respective pre-labeled envelopes and sealed. The tools were labeled and packaged in bubble wrap. One of each of the items was packaged into a pre-labeled sample pack box along with additional material intended for testing purposes.

VERIFICATION: Predistribution results were consistent with each other and the manufacturer's preparation information. In addition, ten randomly selected sample packs were verified by a qualified toolmark examiner who confirmed the manufacturer's preparation information.

Preparation Information			
Item	Known/ Questioned	Identification/ Elimination	Tool/ Material Description
1	Known	---	Doyle bolt cutter
2	Questioned	Elimination	Copper wire with blue paint
3	Questioned	Elimination	Copper wire with white paint

Summary Comments

This test was designed to allow participants to assess their proficiency at a toolmark examination involving pinching cut marks. Participants were supplied with one bolt cutter (Item 1) and two pieces of copper wire containing questioned toolmarks (Items 2 and 3). The Items 2 and 3 copper wire pieces were cut by a tool that was not provided for examination. Refer to the Manufacturer's Information for preparation details.

Among the 116 responding participants, 110 (95%) eliminated the toolmarks on Items 2 and 3 as having been created by the Item 1 tool. Of the six remaining participants, four reported inconclusive results for items 2 and 3, one identified Items 2 and 3, and one identified Item 2 while eliminating Item 3 from having been created by the Item 1 tool.

Examination Results

Did the suspect's bolt cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of copper wire (Items 2 or 3)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
28UFEK	No	No	AHMNCE	No	No
2LD69F	No	No	AQDAGR	No	No
36XJ3V	No	No	AT4BN2	No	No
3DDXA8	No	No	BA7CV8	No	No
3NB3WD	No	No	BCQJWF	No	No
3RC4YW	No	No	BDA7VX	No	No
3WT8B9	No	No	BJJB8	No	No
49E4MP	No	No	BPFJMH	No	No
4B8ZCJ	No	No	BR8ECC	Inc	Inc
4BLLLL	No	No	BZZPM8	No	No
4EHA3T	No	No	CG4JT8	No	No
69DT7D	No	No	CHVFH2	No	No
6JVAYK	No	No	CK3XGW	Yes	Yes
7CQT46	No	No	CN47JL	No	No
83GNQE	Inc	Inc	CPV38F	No	No
8429PH	No	No	D3WX22	No	No
89METK	No	No	D4DAJ8	No	No
8KGX8P	No	No	DCNC68	No	No
8LWXQE	No	No	E6KNQD	No	No
8QQRQ2	No	No	EBA733	No	No
8YZF3E	No	No	ERWM9K	No	No
97VH4Q	No	No	EVAM6C	No	No
9F4CZ4	No	No	EVBKF8	No	No
AEMKJ8	No	No	F2GD9H	No	No
AG932R	No	No	F6GN4H	No	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
FW4R2W	No	No	N8EUZ2	No	No
G3KMGQ	No	No	NKJXLV	No	No
G9X9NC	No	No	NPU422	No	No
GAP6D7	No	No	NTVC7C	No	No
GCR8Y2	No	No	PLPVAW	No	No
GUCWC3	No	No	PZAD6L	No	No
GZ44WW	No	No	Q4P8HX	Inc	Inc
HLCZM3	No	No	QGE8AZ	No	No
HPBCJ3	No	No	QM6EUU	No	No
HURK83	No	No	QVE7XW	No	No
J4TJXF	No	No	QY9ZUX	No	No
JFK9VZ	No	No	RFDQA9	No	No
JWUW9Z	No	No	RQHLQR	No	No
K9GLG6	No	No	RYRB6Q	No	No
KE8VTP	No	No	TCVTFQ	No	No
KGTHKC	No	No	TEXUH9	No	No
KH94UD	No	No	TKQQ8Y	No	No
KJZZJ8	No	No	TTHAL9	No	No
LCGUKF	No	No	TWGKG8	No	No
LDRW7E	No	No	UBGLU9	No	No
LQE7QY	No	No	UEX99E	No	No
LTLNRF	No	No	UHTZEP	No	No
LYB2T4	No	No	UJNK2P	No	No
M3N7ZW	No	No	UPFVBM	Inc	Inc
M6F4EV	No	No	UR2CT9	No	No
MN6F4F	No	No	V4C6YU	Yes	No
N4CWP9	No	No	VAG2KE	No	No
N6MYC8	No	No	VP87N2	No	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
VUNEC2	No	No			
W46HUK	No	No			
XFH2RL	No	No			
XKA4YT	No	No			
Y6RX3J	No	No			
YMAYVZ	No	No			
YZYXM3	No	No			
ZG6HZK	No	No			
ZMPD3A	No	No			
ZZUWEA	No	No			

Response Summary		Total Participants: 116	
<i>Did the suspect's bolt cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of copper wire (Items 2 or 3)?</i>			
	<u>ITEM 2</u>	<u>ITEM 3</u>	
Yes	2 (1.7%)	1 (0.9%)	
No	110 (94.8%)	111 (95.7%)	
Inc	4 (3.4%)	4 (3.4%)	

Conclusions

TABLE 2

WebCode	Conclusions
28UFEK	All evidence and test cuts were physically examined then microscopically compared using light comparison microscopy. Toolmarks observed on Items 1B and 1C (cut copper wires Items 2 and 3) are identified as having been produced by a common source. Tool marks observed on Items 1B and 1C (cut copper wires Item 2 and 3) are eliminated as having been produced by Item 1A (Doyle black and red handled bolt cutter Item 1). There are differences in individual characteristics (cut marks).
2LD69F	Results of Examinations: Item 1 is a Doyle bolt cutter, which employs a pinching action. Items 2 and 3 are copper wires that bear striated toolmarks produced by a pinching action. The toolmarks present on both Item 2 and Item 3 were identified as having been produced by the same tool. Due to a difference in class characteristics, toolmarks present on the Item 2 and 3 wires were excluded as having been produced by the Item 1 bolt cutter.
36XJ3V	Exhibit 2 (Item 2) and Exhibit 3 (Item 3) could have been made by the same tool based on class characteristics; however, insufficient detail precludes a more conclusive determination. Exhibit 2 (Item 2) and Exhibit 3 (Item 3) were not made by Exhibit 1 (Item 1), the submitted Doyle cutters, based on differences in class characteristics.
3DDXA8	a. Toolmark present in piece of wire identified as Item 2 (marked with blue paint), were not produced by bolt cutter identified as Item 1. b. Toolmark present in each paint can lid identified as Item 3 (marked with white paint), were not produced by bolt cutter identified as Item 1.
3NB3WD	The Items 2 and 3 copper wires were excluded as having been cut by the Item 1 bolt cutter.
3RC4YW	This report refers to exhibits by Lab Number. The following results only apply to the items tested. The Exhibit 1 bolt cutter was used to make test toolmarks. The test toolmarks were designated as Exhibit 1.1. The Exhibits 2 and 3 cut segments of copper wire were excluded as having been made by the Exhibit 1 tool. The Exhibits 2 and 3 cut segments of copper wire were identified as having been made by the same tool.
3WT8B9	The copper wires mentioned in item 2 and item 3 were cut by the same tool. However, they were not cut with the tool specified in item 1.
49E4MP	1. Examination of Exhibit 1 revealed one (1) pair of Doyle brand 8" bolt cutters (pinching - center cut type tool), measuring 17mm from tip to pivot, 1.09mm in blade thickness, and 6.38mm in maximum opening width. 2. Exhibit 1.1 (Test standards) was created for comparison and is being retained by the laboratory for potential future comparison and final disposition. 3. Examination of Exhibits 2 and 3 revealed each contains one (1) piece of cut wire consistent with copper measuring 3.20mm in diameter, and having one side painted (Exhibit 2 - Blue Exhibit 3 - White) to distinguish it from the cut end submitted for examination. Microscopic examination of Exhibits 2 and 3 revealed each contains toolmarks suitable for comparison and consistent with damage from a pinching- center cut type tool, such as bolt cutters and cutting pliers. If any tools or additional damaged areas of interest are found that may be linked to these items, please submit the exhibit for comparison. 4. Microscopic comparison revealed toolmarks observed on Exhibits 2 and 3 were not made by Exhibit 1 due to a sufficient disagreement of individual characteristics. 5. Microscopic comparison revealed toolmarks observed on Exhibits 2 and 3 were made by the same tool due to a sufficient agreement of individual characteristics.
4B8ZCJ	Test toolmarks from the submitted bolt cutters were compared microscopically to the toolmarks on Items #2 & 3. There is agreement in class characteristics and sufficient disagreement in individual characteristics for elimination. Items #2 & 3 toolmarks were not made by the submitted bolt cutters, Item #1. Items #2 & 3 The toolmarks on these cut copper wires were compared microscopically to each other. There is agreement in class characteristics and sufficient agreement in individual characteristics for identification. The toolmarks on these wires were made by the same tool.
4BLLLL	It was determined utilizing stereomicroscopic and comparison microscopic examination that the questioned impressions from item 2 and item 3 were not made by the item 1 tool. Therefore, the item 1 tool can be eliminated as creating the questioned toolmark impressions from item 2 and item 3.
4EHA3T	The conclusions I have reached are: 1. The exhibit cutters (Item 1) did not make the cuts on the exhibit copper wire samples (Items 2 and 3). 2. The portions of cut copper wire (Items 2 and 3) were cut by the same, but unknown tool. This unknown tool is different to the supplied cutters (Item 1)

TABLE 2

WebCode	Conclusions
69DT7D	Items 2 and 3 were microscopically examined 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 based on differences in individual characteristics.
6JVAYK	The item 1-2 and 1-3 wire pieces are eliminated as having been cut by the item 1-1 bolt cutters. The item 1-2 and 1-3 wire pieces were not intercompared at this time. However, if a tool is recovered in the future, the items may be resubmitted to the laboratory. The copper wires were not utilized in the examinations and were not sub-itemized. Per the submission receipt, the copper wires were submitted as possible test materials.
7CQT46	The suspect's bolt cutter (Item 1) produced non of the questioned toolmarks (Items 2 or 3).
83GNQE	Items 1B and 1C (copper wires) and test marks from Item 1A (bolt and wire cutters) were physically examined then microscopically compared using light comparison microscopy. Tool marks observed on Items 1B and 1C (copper wires) are identified as having been produced by the same tool. Tool marks observed on Items 1B and 1C (copper wires) are inconclusive as having been produced by Item 1A (bolt and wire cutters). These items share agreement of class characteristics but lack consistent and reproducible individual characteristics. Test marks will be returned to the submitting agency.
8429PH	Item 1 is eliminated from having created the questioned cuts on items 2 and 3. The questioned cuts on items 2 and 3 are identified as having been created by the same unknown tool.
89METK	The toolmarks observed in the cut piece of copper wire (ITEM 2 and ITEM3) have not been produced by the bolt cutter (ITEM 1)
8KGX8P	In my opinion: The copper wire identified as Item 2 was not cut by the exhibit bolt cutters (Item 1). The copper wire identified as item 3 was not cut by the exhibit bolt cutters (Item 1). The copper wire identified as Item 2, and the copper wire identified as Item 3 were both cut by the same tool.
8LWXQE	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 bolt cutter marked as "Item 1".
8QQRQ2	Marks on the piece of copper wire (items 2 and 3) were not made with the questioned bolt cutters (Item 1).
8YZF3E	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 angle of progression.
97VH4Q	1. Exhibit 1 is a Doyle brand bolt cutter which is designed as an opposed blade cutting tool. a. Exhibit 1 was used to create the Exhibit 1.1 test standards. 2. Exhibits 2 and 3 each contain one metal wire with damage to one end that is consistent with being made by an opposed blade cutting tool. a. Microscopic comparison revealed that the damage on the Exhibit 2 and 3 wires was made by the same tool based on an agreement of all discernible class characteristics and a sufficient agreement of individual characteristics. b. Microscopic comparison revealed that the damage on the Exhibit 2 and 3 wires was not made by the Exhibit 1 bolt cutters based on a disagreement of discernible class characteristics.
9F4CZ4	[No Conclusions Reported.]
AEMKJ8	Item 1 is a Doyle brand bolt cutter that uses a pinching-type action. Items 2 and 3 consist of a piece of wire, both bearing toolmarks consistent with being produced by a pinching- or shearing-type tool that are of value for comparison purposes. Toolmarks present on the Items 2 and 3 pieces of wire were identified as having been produced by the same tool. The Items 2 and 3 pieces of wire were excluded as having been cut by the Item 1 bolt cutter.
AG932R	Item 1.1 is a Doyle brand pair of bolt cutters. Test cuts were made in copper wire submitted with Item 1.1. 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 discernible class characteristics, Items 1.2 and 1.3 were eliminated as having been cut by Item 1.1. Based on agreement of all 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.

TABLE 2

WebCode	Conclusions
AHMNCE	A comparison of the tool marks on the two cut pieces of copper wire in items 2 and 3 with test marks made using the suspected boltcutter, item 1 was undertaken. There was no correspondence with the tool marks on items 2 and 3 and the test marks made using the boltcutter. I have considered the proposition that the tool marks on cut pieces of copper wire in items 2 and 3 were made using the suspected boltcutter, item 1; the results of this examination provide no support for this proposition. The tool marks on the cut pieces of copper wire in items 2 and 3 have not been made by the submitted tool, item 1.
AQDAGR	Examinations showed that Item 2 was not cut by the Item 1 bolt cutter. Examinations showed that Item 3 was not cut by the Item 1 bolt cutter.
AT4BN2	[No Conclusions Reported.]
BA7CV8	In my opinion marks on items 2+3 were not made by item 1 (Conclusive Elimination)
BCQJWF	By means of microscopic comparison it was determine that: 1. The tool marks present on the cut pieces of copper, described in Items 2 and 3, were not produced by the bolt cutter described in Item 1 (Elimination). 2. The tool marks present in the cut pieces of copper described in Item 2 and the cut piece of copper described in Item 3, were produced by the same tool (Identification).
BDA7VX	THE TOOL MARKS OBTAINED WITH THE TOOL KNOW AS ELEMENT 1, ARE OBLIQUE TO THE CUT LINE. WHILE THE INSTRUMENTAL TRACES ANALYSED WITH ITEM 2 AND ITEM 3 ARE PERPENDICULAR TO THE CUT LINE
BJJB8	The tool marks observed on the pieces of copper wire identified as (Items 2 and 3), have not been produced by the bolt cutter of the suspect identified as (Item 1).
BPFJMH	1. Examination of Exhibit 1 revealed one pair of bolt cutters (8 ¼ inches long, Doyle brand, with red and black handles) with sharpened opposing jaws that cut with a pinch-pinching action. Exhibit 1.1 (test standards) and Exhibit 1.2 (casts) were created using Exhibit 1 for microscopic comparisons. 2. Examination of Exhibits 2 and 3 revealed that each one is a nonferromagnetic copper color wire, with a cut end displaying toolmarks consistent with those caused by a tool with sharpened opposing jaws (blades) that cut with a pinch-pinching action. These toolmarks are suitable for comparison. a. Exhibit 2 measures: 3.27 mm in diameter and 53.12 mm long. b. Exhibit 3 measures: 3.26 mm in diameter and 49.54 mm long. 3. Test standards and casts created using Exhibit 1 (Exhibit 1.1 and Exhibit 1.2), Exhibit 2, and Exhibit 3 were microscopically compared, revealing the following: a. The toolmarks on Exhibits 2 and 3 were made by the same tool due to sufficient agreement of individual characteristics. b. The toolmarks on Exhibits 2 and 3 were not caused by Exhibit 1 due to sufficient disagreement of individual characteristics. 4. Please note all measurements are approximate.
BR8ECC	Results of Physical/Microscopic Examination: All evidence and test cuts were physically examined then microscopically compared using light comparison microscopy. Tool marks observed on Items 2 and 3 (cut pieces of copper wire) are inconclusive as having been produced by Item 1 (8-inch Doyle bolt/wire cutter). These items share agreement of class characteristics, but some disagreement of the individual characteristics observed in the striated cut marks. The differences observed are insufficient for an elimination. Tool marks observed on Item 2 (cut piece of copper wire with blue end) are inconclusive as having been produced by the same tool as Item 3 (cut piece of copper wire with white end). These items share agreement of class characteristics, but some disagreement of the individual characteristics observed in the striated cut marks. The differences observed are insufficient for an elimination. Conclusion Scale for Microscopic Comparisons: The following descriptions are meant to provide context to the levels of opinions reached in this report. Identification: This is the strongest statement of association that can be expressed. An identification is made to a degree of practical certainty when there is agreement of all discernible class characteristics and sufficient agreement of the individual characteristics of toolmarks. When sufficient agreement exists, in part, this means the likelihood of another tool producing the same marks is so remote it is considered a practical impossibility. Elimination: This is the strongest statement of non-association that can be expressed. An elimination is made when one of the following situations is true: It is a physical impossibility (i.e., there is a clear, demonstrable incompatibility in class characteristics) for the items to have been marked by the same tool/fired in the same firearm. Demonstrable differences in the subclass or reproducible individual characteristics. Inconclusive: An inconclusive is made when one of the following situations is true. Agreement of all discernible class characteristics and some agreement of individual characteristics, but insufficient for identification. Agreement of all discernible class characteristics

TABLE 2

WebCode	Conclusions
	without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility. Agreement of all discernible class characteristics and some disagreement of individual Characteristics but insufficient for elimination. Agreement of all discernible class characteristics and disagreement of individual characteristics, however, reproducibility or variability of individual characteristics cannot be established. Agreement of all discernible class and subclass characteristics. The individuality of the characteristics is not discernible; therefore, the items may have been fired from the same firearm or from another firearm that was machined with the same tool in the approximate same state of wear. Unsuitable: An item is considered unsuitable for comparison when it does not bear any class, subclass, and/or individual toolmarks of value for microscopic comparison. Additional Information: There may be additional evidence associated with this case. Please refer to any previously completed case records for the lab numbers listed above. The interpretation of the data and authorization of the results was performed by the undersigned forensic analyst. Other staff members may have performed laboratory activities concerning evidence associated with this report. For a complete listing of all staff members who performed laboratory activities in this case, please contact the laboratory via the telephone number above. [Phone number not provided]
BZZPM8	Item 1 was examined. Four (4) tests produced using Item 1 are being returned as Item 1T in container 1 and should be maintained for possible future examinations. Toolmarks present on Items 2 and 3 were microscopically examined, compared, 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 microscopically examined, compared, and eliminated as having been produced by the Item 1 tool due to differences in class characteristics.
CG4JT8	The toolmarks present on the Items 1.2 and 1.3 cut copper wires were made by the same unknown pinching type tool. This identification is based on sufficient agreement of the combination of individual characteristics and all discernible class characteristics. The Items 1.2 and 1.3 cut copper wires were not cut by the Item 1.1 bolt cutters. These eliminations are based on differences in subclass and individual characteristics. The Items 1.2 and 1.3 cut copper wires have physical characteristics that indicate they were cut by a pinching action tool such as but not limited to bolt cutters. Note: Any additional recovered tools may be submitted for comparison purposes.
CHVFH2	The questioned toolmarks on the submitted cut pieces of copper wire (Item 2 and Item 3) were not consistent in terms of the class and individual characteristics to those of the test cut toolmarks made by the suspect's bolt cutter (Item 1). Based on the findings, in my opinion, the suspect's bolt cutter (Item 1) did not produce the questioned toolmarks on Item 2 and Item 3.
CK3XGW	item 2 and item 3 were cut by item 1.
CN47JL	Comparison microscope examinations were conducted between unknown impressions and standards made with the submitted tool. The toolmarks found on exhibits 2 and 3 (cut pieces of copper wire) were not made by exhibit 1 (recovered bolt cutter) based on difference in class characteristics. The toolmarks found on exhibits 2 and 3 (cut pieces of copper wire) were made by a second wire cutting tool.
CPV38F	Our examination with a comparison light microscope leads us to the following conclusion: Item 2 (blue) The toolmarks on the copper wire (Item 2) and the comparison marks made by the bolt cutter (Item 1) show no matching marks. The toolmarks (Item 2) weren't caused by the bolt cutter (Item 1). Item 3 (white) The toolmarks on the copper wire (Item 3) and the comparison marks made by the bolt cutter (Item 1) show no matching marks. The toolmarks (Item 3) weren't caused by the bolt cutter (Item 1).
D3WX22	[No Conclusions Reported.]
D4DAJ8	The Item 01-01 Doyle bolt cutter was eliminated as having cut the Items 01-02 and 01-03 wires. The Items 01-02 and 01-03 wires were identified as having been cut by the same unknown tool.
DCNC68	The Items 01-02 and 01-03 pieces of wire were eliminated as having been cut by the Item 01-01 Doyle brand bolt and wire cutter. The Items 01-02 and 01-03 pieces of wire were cut by an unknown pinching type tool(s). Examples of pinching type tools include, but are not limited to, bolt cutters and diagonal cutters.
E6KNQD	The questioned toolmarks on Item 2 and Item 3 were not made by the boltcutter, Item 1.
EBA733	Results of Examinations: Item 1 is a Doyle manufactured bolt cutter that uses a pinching action.

TABLE 2

WebCode	Conclusions
	Toolmarks present on the Items 2 and 3 copper wires are physically constant with being produced by a pinching action, and were identified as having been produced by the same tool. The Item 1 bolt cutter bears working surfaces physically consistent with course and angled toolmarks, and therefore were excluded as having created the toolmarks present on the Items 2 and 3 copper wires.
ERWM9K	The Exhibit 2 and 3 copper wire toolmarks were excluded as having been made by the Exhibit 1 tool. The Exhibit 2 and 3 copper wire toolmarks were identified as having been made by the same tool.
EVAM6C	The tool marks on Item 2 and Item 3 were microscopically compared to each other. Based on agreement of class and sufficient agreement of individual characteristics, I determined that the tool marks present on Item 2 and Item 3 were made using the same tool. The bolt cutter recovered from the suspect (Item 1) was used to make test cuts on the copper wire substrate. These test cuts were then microscopically compared to both Items 2 and 3 and I determined that there was disagreement of class and individual characteristics. The suspect's bolt cutter (Item 1) was excluded as a possible source of the tool marks produced on either of the submitted cut pieces of copper wire (Items 2 or 3).
EVBKF8	On the items 2 and 3 there are marks which doesn't correspond in striation of cut surfaces left by the blades of item 1. Marks on the items 2 and 3 are not left by the item 1.
F2GD9H	In my opinion, the examined set of bolt cutters (Item 1) was not the tool that produced the questioned tool marks on the cut pieces of copper wire (Items 2 and 3). Elimination
F6GN4H	Items 2 and 3 were cut by the same unknown cutter. Item 1 displays different class characteristics to Items 2 and 3.
FW4R2W	Examined the two specimens marked #2 and #3. They are cut portions of copper wire. Examined the specimen marked #1. It is an eight in Doyle bolt and wire cutter. The two portions of copper wire marked #2 and #3 were compared microscopically against test cuts and were eliminated as having been cut by the submitted Doyle bolt and wire cutter (#1). The two portions of copper wire marked #2 and #3 were compared microscopically against each other, however the results of the microscopic comparisons were inconclusive.
G3KMGQ	The given item 1 bolt cutter was used on lead sheet for comparing it with the item (2 & 3) hence concluded that item 1 was not used to cut both item 2 & item 3.
G9X9NC	1. Examination of Exhibit 1 revealed one Doyle brand bolt cutter designed to be used as an opposed jaw center cut pinching type tool. Exhibit 1 was used to created Exhibit 1.1 test standards. 2. Examination of Exhibits 2 and 3 each revealed one cut nonferromagnetic copper wire displaying damage consistent with that caused by an opposed jaw center cut pinching type tool. Both Exhibits are suitable for microscopic comparison. 3. Exhibit 1.1 (test standards) and Exhibits 2 and 3 (Unknown) were microscopically examined and compared to each other. a. Exhibits 2 and 3 were damaged by the same tool based on sufficient agreement of individual characteristics. b. Exhibit 1 (tool) did not cause the damage of Exhibit 2 and 3 based on sufficient disagreement of individual characteristics.
GAP6D7	Toolmarks observed on Items #1.2-1.3 were compared microscopically with tests made by the submitted bolt/wire cutters, Item #1.1. There is agreement of all discernible class characteristics. However, due to sufficient disagreement of corresponding individual characteristics, the toolmarks observed on Items #1.2-1.3 have been eliminated as having been made by the submitted bolt/wire cutters, Item #1.1.
GCR8Y2	[No Conclusions Reported.]
GUCWC3	Items – Description/Visual Examination. Item 1: One (1) Doyle brand wire cutter. Items 2 & 3: Two (2) pieces of cut copper wire with impression/striated toolmarks. Examination Results: Test toolmarks were created on copper wire with Item 1 for microscopic comparison purposes. Microscopic Comparison; Conclusions: Identification - Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Lab Item # 2 & 3 (2) impression/striated toolmarks, were made by the same tool. Elimination - Based upon the difference in individual characteristics, the following eliminations were made: 2 & 3 (2) impression/striated toolmarks, not made by Item 1 (Doyle wire cutter).
GZ44WW	Compared the two pieces of cut copper wire marked #2 and #3 against each other with positive results. The two pieces of cut copper wire marked #2 and #3 were identified as having been cut with the same tool. Test standards were made using the Item #1 Doyle bolt and wire cutter and compared to the striations on the two cut copper wire pieces marked #2 and #3 with negative results. The

TABLE 2

WebCode	Conclusions
	striations on the two cut copper wire pieces marked #2 and #3 were eliminated as having been made by the item #1 Doyle bolt and wire cutter.
HLCZM3	The cut metal pieces found at the crime scene (item 2 and item 3) were determined not to have been cut with the suspected tool (item 1). Additionally, the cut marks on the metal pieces from the crime scene are consistent with each other, indicating that these two metal pieces were cut using the same tool.
HPBCJ3	1-(Item 2) wire (marked with blue paint) & (Item 3) wire (marked with white paint) were cutting by another cutter.
HURK83	The results extremely strongly support that the toolmarks on Item 2 and Item 3 were not produced by the bolt cutter Item 1 (Level -4)
J4TJXF	1. Exhibit 1 is a bolt cutter which is an opposed blade cutting tool. a. Exhibit 1 was used to create the Exhibit 1.1 test standards. 2. Exhibits 2 and 3 are each a cut section of copper wire which were both eliminated from being cut by the Exhibit 1 bolt cutter due to a difference in class characteristics. a. Exhibits 2 and 3 are consistent with having been cut by an opposed blade cutting tool.
JFK9VZ	The submitted severed copper wires, Items 2 and 3, were eliminated as having been cut by the submitted bolt cutter, Item 1. The submitted severed copper wires, Items 2 and 3, were identified as having been cut by the same tool.
JWUW9Z	Examinations showed the toolmarks present on Item 2 and Item 3 were not created by Item 1.
K9GLG6	[No Conclusions Reported.]
KE8VTP	The bolt cutter (Item 1) was not used to produce the questioned toolmarks on the cut pieces of copper wire (Items 2 and 3).
KGTHKC	Tool Mark Analysis: Methodology: Physical (Visual Examination), Caliper Microscopy (Comparison Microscopy). Test marks were made with Item 1, the Doyle bolt cutters, using submitted testing media and lead. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. The tool marks on Items 2 and 3, the copper wires, were not made with Item 1, the Doyle bolt cutters, based upon different class and individual microscopic characteristics.
KH94UD	This report refers to exhibits by Lab Number. The following results only apply to the items tested. The Exhibit 1 boltcutters were used to make test toolmarks. The test toolmarks were designated as Exhibit 1.1 and 1.2. The Exhibit 2 and 3 copper wire toolmarks were identified as having been made by the same tool. The Exhibit 2 and 3 copper wire toolmarks were excluded as having been made by the Exhibit 1 tool.
KJZZJ8	The toolmarks on the wire segments, Lab Items 2 and 3, were eliminated from having been produced by the tool, Lab Item 1, based on disagreement of class characteristics using microscopic comparison. The toolmarks on the wire segments, Lab Items 2 and 3, were identified as having been produced by the same tool based on agreement of class characteristics and corresponding individual detail using microscopic comparison.
LCGUKF	The cut ends of the copper wire segments in items 001-2 and 001-3 were examined and found not to have been cut by the item 001-1 bolt cutter. These exclusions are based on a difference in individual characteristics.
LDRW7E	Items 1, 2, 3 - Item 2 and Item 3 were microscopically identified as having been cut using the same tool. The bolt cutter Item 1 did not cut either Item 2 or Item 3.
LQE7QY	Results of Examinations: Item 1 is a pair of Doyle brand bolt cutters, which use a pinching action. Items 2 and 3 are copper wires, which each have toolmarks produced using a pinching action. Toolmarks present on the Item 2 and 3 copper wires were identified as having been produced by the same tool and were eliminated from having been produced by the Item 1 bolt cutters, due to a difference in class characteristics.
LTLNRF	Item 2 and Item 3 were not made by Item 1.
LYB2T4	The marks on Item 2 and Item 3 were caused by a bolt cutter other than the one we have.
M3N7ZW	Based on the agreement of class characteristics, the Item 2 and Item 3 cut sections of copper wire were microscopically compared to each other. Due to sufficient agreement of individual

TABLE 2

WebCode	Conclusions
	characteristics, Items 2 and 3 were identified as having been cut by the same double edged tool. Item 1 was evaluated stereoscopically and appeared to be in like new condition with traces of apparent black paint on the cutting surfaces. Test cuts were made using known copper wire. Test cuts were microscopically compared to Items 2 & 3. Based on gross differences in class and individual characteristics the Item 1 cutters were eliminated from having cut Items 2 and 3.
M6F4EV	The bolt cutters, Exhibit 1, were eliminated as having cut the pieces of copper wire, Exhibits 2 and 3.
MN6F4F	Items 2 and 3 exhibit similar class characteristics. As a result of microscopic comparison, it was concluded that Items 2 and 3 were identified as having been cut by the same unknown tool. Items 2 and 3 were eliminated as having been cut by Item 1 due to significant disagreement of discernable class characteristics.
N4CWP9	Tool Mark Analysis: Methodology: Physical (Visual Examination) Microscopy (Comparison Microscope) Digital Micrometer Test marks were made with Item 1, the bolt cutters, using submitted 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 made with the same tool based upon corresponding class and individual microscopic characteristics. The tool marks on Items 2 and 3, the copper wire, were not made with Item 1, the bolt cutters, based upon different class and individual microscopic characteristics.
N6MYC8	The recovered cut ends of the copper wires in item 2 and 3 were not made by the bolt cutter in item 1.
N8EUZ2	The Item 1 pair of bolt cutters is in good working condition The Item 2 and 3 wires are identified as having been cut by the same unknown tool. They are eliminated from having been cut by the Item 1 pair of bolt cutters.
NKJXLV	Item 1 was eliminated as having been used to produce the toolmarks on Items 2 and 3.
NPU422	The examination of the set comparison marks of the seized bolt cutter revealed similarities in the shape and size of test cuts and castings of the bolt cutter. The class characteristics of the seized bolt cutter are different to both cuts of copper wire (item 2 and 3). There couldn't be found any similarities among the striation between casting from both sides of the bolt cutter edge compared with the two cuts of copper wire (item 2 and 3.)
NTVC7C	Items 2 and 3 were microscopically compared and they have sufficient corresponding individual marks to conclude that they were made by the same tool. Test cuts were made using the Item 1 tool and were microscopically compared to Item 2. Due to differences in individual marks, the toolmarks on Items 2 and 3 were not made by the Item 1 tool in its present condition.
PLPVAW	The bolt cutter of item #1 was examined and then used to create test toolmarks into lead sheets (from laboratory inventory) and copper wire (submitted for test marking purposes). The toolmarks on items #2 and #3 were microscopically compared to the test toolmarks from item #1. These evidence items were eliminated from having been marked by the bolt cutter of item #1 due to significant differences in class and individual characteristics. The toolmarks on items #2 and #3 were microscopically identified as having been made by the same unknown tool.
PZAD6L	The toolmarks present on the Q1 (Item2) and Q2 (Item3) copper wires were microscopically examined, compared, and eliminated as having been produced by the K1 (Item1) tool due to differences in class characteristics. (Elimination). The toolmarks present on the Q1 (Item2) and Q2 (Item3) copper wires were microscopically examined, compared, and found to exhibit similar general class characteristics; however they could not be identified or eliminated due to the lack of sufficient corresponding microscopic markings. (Inconclusive).
Q4P8HX	Based on microscopic comparisons, in the opinion of the laboratory: Item 1-2-1 (CTS Item 2) and item 1-3-1 (CTS Item 3) copper wires were identified as having been cut by the same unknown tool. Item 1-2-1 (CTS Item 2) copper wire could not be identified or eliminated as having been cut by item 1-1-1 (CTS Item 1) bolt cutter. This inconclusive conclusion was due to insufficient similarities and insufficient differences in the patterns of microscopic markings to effect a conclusion of identification or elimination, respectively.
QGE8AZ	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 pieces of copper wire, Laboratory Items 5 and 6, were identified as having been created by the use of the same tool. Through macroscopic/microscopic examination and based on significant

TABLE 2

WebCode	Conclusions
	disagreement of class characteristics, the toolmarks of interest exhibited on the cut pieces of copper wire, Laboratory Items 5 and 6, could not have been created by the use of the bolt cutters, Laboratory Item 4.
QM6EUU	The questioned toolmarks present on Item 2 and Item 3 were not produced by Item 1 due to differences in the class characteristics.
QVE7XW	No concordance is established between the cut-outs present on ITEM2 and the cut-outs made with the bolt cutter (ITEM1). No concordance is established between the cut-outs present on ITEM3 and the cut-outs made with the bolt cutter (ITEM1).
QY9ZUX	The bolt cutter (Item 1) did not cut the copper wire items 2 and 3. However items 2 and 3 were cut by the same tool different from item 1.
RFDQA9	Item 2 and Item 3 were microscopically identified as having been cut by the same tool; however, neither Item was cut by the Item 1 wire/bolt cutters.
RQHLQR	We produced test marks of both sides of the suspected bolt cutter, and found that there is an obvious angle between the two groups of striations caused by cutting edges. Since it is a significant class characteristic of both side of the cutting edges and different from the questioned toolmarks with straight striations, we had a conclusion that item 2 and item 3 were not made by the suspect's bolt cutter.
RYRB6Q	The two wires (Items 2 and 3) were not cut by the submitted bolt cutters (Item 1).
TCVTFQ	Test toolmarks were made with Item 1, the bolt cutter, using the submitted copper wires. The suspect toolmarks on Items 2 and 3 were not made by Item 1 due to a significant disagreement of class characteristics (elimination). The suspect toolmarks on Items 2 and 3 cannot be identified or eliminated as being made by the same unknown tool based on agreement of discernible class characteristics but insufficient corresponding individual characteristics (inconclusive).
TEXUH9	Examinations showed that the tool marks Item 2 (M-1) and Item 3 (M-2) were not produced by Item 1 (MAP-1). Examinations showed that the tool marks Item 2 (M-1) and Item 3 (M-2) were produced by the same unknown tool.
TKQQ8Y	[No Conclusions Reported.]
TTHAL9	EXAMINATIONS SHOWED ITEM 2 AND ITEM 3 WERE NOT MADE BY ITEM 1.
TWbKGB	The two (2) pieces of cut copper wire marked #2 (blue paint) and #3 (white paint) with toolmarks were microscopically examined and compared to test marks from the submitted pair of bolt cutters, marked #1, with negative results (Elimination). The submitted pair of bolt cutters, marked #1, did not create the toolmarks on the cut copper wires marked #2 (blue paint) and #3 (white paint). The piece of cut copper wire marked #2 (blue paint) with a toolmark was microscopically examined and compared to the piece of cut copper wire marked #3 (white paint) with a toolmark with positive results (Identification). The toolmarks on the two (2) submitted cut pieces of copper wire marked #2 (blue paint) and #3 (white paint) were created using the same unknown tool.
UBGLU9	A microscopic comparison was conducted between Test toolmarks #1-1(A, B, C, D), which were produced by Item #1 and Items #2, and #3. The examinations determined that Items #2 & #3 were not produced by Item #1 due to a disagreement of individual characteristics.
UEX99E	It is highly unlikely that the two tool marks (ITEM 2 and ITEM 3) were caused by the bolt cutters in question. The characteristics of the cutting surfaces (ground at an angle) of the bolt cutter do not match the trace patterns ITEM 2 and 3. The trace pattern on the copper wires ITEM 2 and 3 indicates a well-cutting tool. ITEM 2 and ITEM 3 were compared with each other. It was found that the two wires were most likely cut with the same tool. Various matching individual characteristics were found between ITEM 2 and ITEM 3.
UHTZEP	The two pieces of cut copper wire, Agency Exhibits 2 and 3, were identified as having been cut by the same unknown cutter. They were eliminated as having been cut by the Doyle brand bolt cutters, Agency Exhibit 1. The Doyle brand bolt cutters, Agency Exhibit 1, are functional.
UJNK2P	By comparing side by side the striations from the control sample cut by using the suspect's bolt cutter (Item 1) recovered from the suspect vs the striations from first cut piece of copper wire (Item 2: marked with blue paint) and Item 3: Second cut piece of copper wire (marked with white paint), there is no linearity with a similar continuation of striations that indicate the similarities to be from the suspect's bolt cutter (Item 1): they are originating from different cutter.

TABLE 2

WebCode	Conclusions
UPFVBM	RESULTS OF EXAMINATION: 1. There is agreement of all discernible class characteristics between the items 2 and 3 cut copper wire; however, the comparison of individual characteristics was inconclusive. Therefore, the items 2 and 3 cut copper wire could not be identified or eliminated as having been cut with the same tool. 2. There is agreement of all discernible class characteristics between the items 2 and 3 cut copper wire and test cuts made with the item 1 bolt/wire cutters; however, the comparison of individual characteristics was inconclusive. Therefore, the items 2 and 3 cut copper wire could not be identified or eliminated as having been cut by the item 1 bolt/wire cutters.
UR2CT9	The toolmarks observed on the Exhibit 2 and 3 copper wires were identified as having been produced by the same tool. (Source identification) The toolmarks observed on the Exhibit 2 and 3 copper wires were excluded as having been produced by the Exhibit 1 bolt cutters. (Source exclusion).
V4C6YU	Upon comparison, I found that: i. The characteristics toolmarks on the first cut piece of copper wire (Item 2) to be similar to the characteristics toolmarks produced by the bolt cutter recovered from the suspect (Item 1). ii. The characteristics toolmarks on the second cut piece of copper wire (Item 3) to be dissimilar to the characteristics toolmarks produced by the bolt cutter recovered from the suspect (Item 1). Therefore, I am of the opinion that: i. The questioned toolmarks on the first cut piece of copper wire (Item 2) was produced by the bolt cutter recovered from the suspect (Item 1). ii. The questioned toolmarks on the second cut piece of copper wire (Item 3) was not produced by the bolt cutter recovered from the suspect (Item 1).
VAG2KE	The two copper wires marked #2 and #3 were compared microscopically to test standards and eliminated as having been made by the submitted Doyle brand bolt cutter marked #1.
VP87N2	In my opinion, the microscopic comparison found that the two portions of cut wire (Item 2 and Item 3) were cut by the same unknown tool. This unknown tool is different to the supplied wire cutters (Item 1)" into the conclusions.
VUNEC2	Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope), Digital Micrometer. Test marks were made with Item 1, the bolt cutters, using submitted 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 wires, were not made with Item 1, the wire cutters, based upon different class and individual microscopic characteristics.
W46HUK	Results of Examinations: Item 1 is a set of Doyle bolt cutters which use a pinching action. Item 2 and Item 3 are copper wires that bear toolmarks that are physically consistent with being made by a pinching tool. The toolmarks present on the Item 2 and Item 3 wires were identified as having been produced by the same tool. The Item 2 and Item 3 wires were excluded as having been cut by the Item 1 bolt cutters, due to a difference in class characteristics.
XFH2RL	The toolmarks on Items 2 and 3 were not made by the bolt cutter in Item 1 based on a disagreement of class characteristics.
XKA4YT	The item 2 and 3 sections of copper wire are eliminated as having been cut by the item 1 bolt cutters. The item 2 and 3 sections of copper wire are identified as having been cut by the same unknown tool.
Y6RX3J	The Item 1 Doyle bolt cutters were examined. Toolmarks on Items 2 and 3 were examined microscopically and identified as having been produced by the same tool based on corresponding class and individual characteristics. Items 2 and 3 exhibit toolmarks consistent with having been produced by a pinching type tool. Toolmarks on Items 2 and 3 were eliminated as having been produced by the Item 1 bolt cutters based on sufficient differences in individual characteristics.
YMAYVZ	The toolmarks on items 2 and 3 were eliminated as having been produced by item 1 based on significant disagreement of class characteristics. The toolmarks on items 2 and 3 were identified as having been produced by the same unknown tool based on agreement of all discernible class characteristics and sufficient agreement of individual characteristics.
ZYXM3	Exhibit 1 consists of a pair of Doyle brand bolt cutters, with a red and black polymer handle. The Exhibit 1 bolt cutters were used to make test toolmarks. The test toolmarks were designated as Exhibits 1.1 through 1.3. Exhibits 2 and 3 each consist of one (1) piece of cut, single strand, copper wire. The toolmarks present on the Exhibit 2 and 3 cut wires bear class characteristics consistent with having been produced by a pinching or shearing type tool, such as bolt cutters or diagonal cutting pliers. The toolmarks observed on Exhibits 2 and 3 were identified as having been made by the same tool. (Source identification) The toolmarks observed on Exhibits 2 and 3 were excluded as having been

TABLE 2

WebCode	Conclusions
ZG6HZK	<p>made by the Exhibit 1 tool. (Source exclusion)</p> <p>Items 2 and 3 and test marks from Item 1 were physically examined then microscopically compared using comparison light microscopy. Tool marks observed on Items 2 and 3 (cut copper wire approximately 6 cm in length) are identified as having been produced by the same tool. Tool marks observed on Items 2 and 3 (cut copper wire) are eliminated as having been produced by Item 1 (Doyle brand wire cutters). There are differences in class characteristics (Item 1 produces stria that has deep and wide impressions at regular intervals that are not present on Items 2 or 3) Conclusion Scale for Microscopic Comparisons: All fired evidence and test shots were physically examined then microscopically compared using light comparison microscopy. The following descriptions are meant to provide context to the levels of opinions reached in this report. Identification: This is the strongest statement of association that can be expressed. An identification is made to a degree of practical certainty when there is agreement of all discernible class characteristics and sufficient agreement of the individual characteristics of toolmarks. When sufficient agreement exists, in part, this means the likelihood of another tool producing the same marks is so remote it is considered a practical impossibility. Elimination: This is the strongest statement of non-association that can be expressed. An elimination is made when one of the following situations is true: It is a physical impossibility (i.e., there is a clear, demonstrable incompatibility in class characteristics) for the items to have been marked by the same tool/fired in the same firearm. Demonstrable differences in the subclass or reproducible individual characteristics. Inconclusive: An inconclusive is made when one of the following situations is true. Agreement of all discernible class characteristics and some agreement of individual characteristics, but insufficient for identification. Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility. Agreement of all discernible class characteristics and some disagreement of individual characteristics but insufficient for elimination. Agreement of all discernible class characteristics and disagreement of individual characteristics, however reproducibility or variability of individual characteristics cannot be established. Agreement of all discernible class and subclass characteristics. The individuality of the characteristics is not discernible; therefore, the items may have been fired from the same firearm or from another firearm that was machined with the same tool in the approximate same state of wear. Unsuitable: An item is considered unsuitable for comparison when it does not bear any class, subclass, and/or individual toolmarks of value for microscopic comparison. The interpretation of the data and authorization of the results was performed by the undersigned forensic analyst. Other staff members may have performed laboratory activities concerning evidence associated with this report. For a complete listing of all staff members who performed laboratory activities in this case, please contact the laboratory via the telephone number above. [Phone number not provided]</p>
ZMPD3A	<p>The two pieces of cut copper wire exhibit matching striated data that is consistent with them having been cut by the same tool. The quality and quantity of the matching microscopic information is sufficient to catalog as an identification (to each other) based on the AFTE Theory of Identification. Test cuts with the submitted tool showed toolmarks with reproducible matching striations and could be indexed with sufficient agreement for further comparison. However, the generated test marks from tool 1 could not be indexed (matched) the the cuts on the two unknowns. Different class (angled rather than straight) on the tool and heavy sub-class not seen on the evidence supports that this is not the tool used to cut the wire - elimination.</p>
ZZUWEA	<p>The two questioned cable fragments (Items 2 & 3) were not cut with the suspicious tool (Item 1).</p>

Additional Comments

TABLE 3

WebCode	Additional Comments
2LD69F	<p>Methods: Physical and Visual Examination. Physical and visual examinations compare the observable features and class characteristics of evidence items. A conclusion of "physically consistent with" is reached if the observable features or measurable 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 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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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. 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: Physical and Visual Examination A Physical and Visual 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
49E4MP	All measurements are approximates. TECHNICAL NOTES: Class characteristics are defined as

TABLE 3

WebCode	Additional Comments
	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.
83GNQE	Area of agreement observed between Item 1B and the toolmarks in lead. The submitted copper wire (extra in Container 1) was used to create test marks with the same area of blade B of Item 1A. The test marks in the copper were ID back to the test marks in the lead sheet. The marks that appeared to have agreement between Item 1B and the lead were not sufficient and did not share the agreement observed between the copper test mark with the test mark in lead. The striations in the copper wire test marks appeared to mark more grossly than the toolmarks observed on Items 1B and 1C.
8LWXQE	The comparison has been performed with a comparative microscope using the original material.
8QQRQ2	Marks on the piece of copper wire (items 2 and 3) were made with the same tool.
8YZF3E	Report includes AFTE Glossary definition of 'angle of progression.' ----- Toolmarks on Item 1 blades' surfaces meet in a V pattern, which results in the test cuts' toolmarks to be at an acute angle to the length of the blade. Versus Items 2 & 3, which have the striations running more perpendicular to the blade length. Even when changing the angle of incidence, unable to reproduce angle of progression found on Items 2 & 3.
97VH4Q	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.
BJJB8	The analysis was carried out using the Scanning Electron Microscope (SEM), Brand: JEOL. Model: JSM-IT 500 and Comparison Microscope, Brand: LEICA. Model: FS C.
BPFJMH	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.
D4DAJ8	Elimination was due to differences in class characteristics observed. Tests from the Item 01-01 bolt cutter has good angled striated marks on all cutting surfaces. No angled striated marks were observed on Items 01-02 or 01-03.
EBA733	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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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

TABLE 3

WebCode	Additional Comments
	<p>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. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
GAP6D7	<p>Toolmarks observed 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, the toolmarks observed on Items #1.2-1.3 have been identified as having been made by the same tool.</p>
GCR8Y2	<p>Both copper rods are cut with the same tool.</p>
J4TJXF	<p>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.</p>
LQE7QY	<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</p>

TABLE 3

WebCode	Additional Comments
	<p>evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
M6F4EV	<p>Class characteristic agreement with differences in individual characteristics was observed between toolmarks on the pieces of wire, Exhibits 2 and 3, and the test toolmarks created by the bolt cutters, Exhibit 1.</p>
QVE7XW	<p>Significant matches are established between the cut-outs present on ITEM2 and ITEM3: the cut-outs on ITEM2 and ITEM3 were made by the same tool. Comparison tests were carried out on the entire bolt cutter blade (ITEM1), with 8 cut-outs (with 2 pieces of copper wires): tests were done by hand (3 times). Results are given on condition that the tool has not been used in the meantime: in fact, when the tool is used regularly, the wear modifies its profile over time and prevents any comparison between the cut-outs noted on burglaries spaced out over time. Similarly, improper use of the tool can quickly modify its profile. - Given the discordances observed between tool marks (ITEM2 VS ITEM1 and ITEM3 VS ITEM1), exclusion is supported.</p>
UJNK2P	<p>Item 2: First cut piece of copper wire (marked with blue paint) and Item 3: Second cut piece of copper wire (marked with white paint) were cut by the same cutter as their striations are linear and continuously similar by comparing them side by side.</p>
UPFVBM	<p>Some agreement observed toward 'outside' of items 2 and 3; start to lose agreement as move towards middle of wire - large amount of coarse striae present and that are continuous across the entire surface; possible subclass.</p>
W46HUK	<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,</p>

TABLE 3

WebCode	Additional Comments
ZZUWEA	<p>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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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> <p>The tool used to cut the two questioned cables (Items 2 & 3) is most likely a parallel-bladed tool, not an angled cutter like the tool under study.</p>

-End of Report-
(Appendix may follow)

Collaborative Testing Services ~ Forensic Testing Program

Test No. 24-5282: Toolmarks Examination

DATA MUST BE SUBMITTED BY **Jan. 21, 2025, 11:59 p.m. EST** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: 6LGWR8

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 case involving a burglary. Investigators have recovered two pieces of copper wire with a questioned toolmark from the crime scene. A suspect was apprehended later that same day and a bolt cutter was recovered from his possession. Investigators are requesting that you examine the toolmarks and determine if any were made using the suspect's bolt cutter.

Please note the following:

-Item 2 and Item 3 copper wires are individually packaged in labeled envelopes. It is suggested that when an item is removed, it is marked according to your laboratory's procedure.

-Be careful when handling the bolt cutter, as the blade is sharp.

-The Item 2 and Item 3 copper wires have been marked with paint to assist in distinguishing the side that is NOT to be examined.

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

Items Submitted (Sample Pack T2):

Item 1: Bolt cutter recovered from the suspect.

Item 2: First cut piece of copper wire (marked with blue paint).

Item 3: Second cut piece of copper wire (marked with white paint).

1.) Did the suspect's bolt cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of copper wire (Items 2 or 3)?

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

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

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.

3.) Additional Comments

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.

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

A2LA Certificate No.

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

Authorized Contact Person and Title

Laboratory Name

Location (City/State)