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Toolmarks Examination Test No. 19-529 Summary Report

Each sample set contained a bolt cutter (Item 1) and two pieces of solder wire containing questioned toolmarks (Items 2 and 3). Participants were requested to examine these items and report their findings. Data were returned from 123 participants and are compiled into the following tables:

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 set contained a bolt cutter (Item 1), two pieces of solder wire containing questioned toolmarks (Items 2 and 3) and additional pieces of solder wire for testing purposes. Participants were requested to determine which, if any, of the questioned toolmarks were made by the submitted tool. The Item 3 piece of solder wire was cut by the Item 1 bolt cutter. The Item 2 piece of solder wire was cut by a different bolt cutter that was not provided for examination.

ITEM 2 (ELIMINATION MARKS): The Item 2 solder 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 and assembled into the sample pack box as described below. The above process was repeated until all elimination toolmarks had been prepared.

ITEM 3 (IDENTIFICATION MARKS): The Item 3 solder (with red paint) was cut by a pair of Pro-Grade 8" bolt cutters (Item 1) and packaged into a pre-labeled Item 3 envelope. The above process was repeated until all identification toolmarks had been prepared.

SAMPLE SET ASSEMBLY: Item 1, Item 2 and Item 3 were packaged into a pre-labeled sample pack box along with additional pieces of solder wire for testing purposes. This process was repeated until the required number of sample sets were produced. Once verification was completed, the sample sets were sealed with evidence tape and initialed "CTS".

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 type toolmarks caused by a pinching action tool. Each sample set consisted of one bolt cutter (Item 1) and two pieces of solder wire (Items 2 and 3) containing the questioned toolmarks. Participants were requested to determine if the recovered bolt cutter had cut either of the questioned pieces of wire. The Item 3 piece of solder wire was cut by the Item 1 bolt cutter. The Item 2 piece of solder wire was cut by a bolt cutter that was not provided for examination. (Refer to Manufacturer's Information for preparation details.)

Of the 123 responding participants, 114 (93%) identified the Item 1 bolt cutter as having cut the Item 3 solder wire and either eliminated (74) or were inconclusive (40) as to it having cut the Item 2 solder wire. Four participants identified both Items 2 and 3 as being cut by the Item 1 bolt cutter, and three participants eliminated Item 2 and were inconclusive as to Item 3 having been cut by the Item 1 bolt cutter. The remaining two participants identified Item 2 and either eliminated or were inconclusive as to Item 3 having been cut by the Item 1 bolt cutter.

Regarding Item 2, as a matter of policy, many labs will not eliminate without access to the tool or when class characteristics match. Thus, responses of inconclusive are not indicated as outliers for elimination items.

Examination Results

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

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
23EMWZ	Inc	Yes	8HND69	No	Inc
29YMBR	No	Yes	94KAKE	No	Yes
2DUG9T	No	Yes	9GVNUR	Inc	Yes
2YEC2Z	Inc	Yes	9JD23U	Inc	Yes
2Z936U	No	Yes	9LNTKB	No	Yes
34HQTV	No	Yes	9XBF23	No	Yes
379TYJ	No	Yes	ABLUBG	Inc	Yes
3GNMCX	No	Yes	AF77UB	No	Yes
3JTF4B	Inc	Yes	AFATCP	No	Yes
3UEJBA	No	Yes	AHFBAK	Yes	Yes
4D9KTY	No	Yes	AZ2MBR	No	Yes
4G9QEW	Inc	Yes	B4BJYZ	No	Yes
4JAYFL	No	Yes	BDLP8N	No	Inc
67VDFY	No	Yes	BPYMCT	No	Yes
6FK2DM	Inc	Yes	C2ZRT4	No	Yes
6N2LPZ	Inc	Yes	CZ8473	Inc	Yes
6U6GFL	Yes	Yes	DJDXDY	Yes	Yes
6VKPW3	No	Yes	DQXUHA	No	Yes
6WEEZV	No	Yes	E9HTCE	No	Yes
724C3R	No	Yes	EH39PG	No	Yes
7PR8VV	No	Yes	ELKG7T	No	Yes
7WM3LE	No	Yes	EUCNY8	Inc	Yes
83CX3C	Inc	Yes	F32VUH	No	Yes
83UNCW	Inc	Yes	F4DVPQ	No	Yes
8CYWTH	Yes	Yes	FL2U8B	No	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
FWL4XQ	Inc	Yes	PAV4H8	Inc	Yes
G3MZUV	No	Yes	PMJ4CV	No	Yes
G3XV62	No	Yes	PQYQV2	No	Yes
GFLXPE	No	Yes	PXG4LD	Inc	Yes
GP9WEY	No	Yes	Q4HUF4	Inc	Yes
GR2K22	No	Yes	R67QFG	Inc	Yes
HFAAEF	No	Yes	RBWZPF	Inc	Yes
HMY7NV	No	Yes	RCQLKR	No	Yes
HPTRK8	No	Yes	RFBJYA	No	Yes
HRBYZU	No	Yes	RN7NTB	Inc	Yes
HX63ZD	Inc	Yes	T3FNAT	No	Yes
J2DUF6	Yes	No	T4V4JN	No	Yes
JA77BX	Inc	Yes	T7FZX7	No	Inc
JAUDRG	No	Yes	T9N6JG	Inc	Yes
JNPRVR	Inc	Yes	TAHT4X	No	Yes
JPR48N	No	Yes	TVJTJA	No	Yes
JT4DWB	Inc	Yes	TWVL3Q	No	Yes
KRQ2TZ	No	Yes	UAWMAQ	No	Yes
KY9KNY	Inc	Yes	UET4U8	No	Yes
LG4DAX	Yes	Inc	UMJQJH	No	Yes
LM8GVP	No	Yes	UNUNWY	Inc	Yes
LVK9M9	Inc	Yes	UZWXQ4	No	Yes
LWX3ZN	Inc	Yes	V232GX	No	Yes
MGLVUH	No	Yes	V3B3BH	No	Yes
NJGX6C	No	Yes	V637B6	No	Yes
NMKTNE	No	Yes	VT8WNW	Inc	Yes
NNWDP2	Inc	Yes	WAPCCK	Inc	Yes
PA9MBR	No	Yes	WCVW37	Inc	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
WFYFE7	No	Yes			
WJXU3V	Inc	Yes			
WK726N	No	Yes			
WTP6EC	Inc	Yes			
XF9WYW	No	Yes			
XHDGPH	No	Yes			
XVL6ZZ	No	Yes			
XXPZJ4	No	Yes			
YAF9GW	No	Yes			
YM8RK3	Inc	Yes			
YVG83A	Inc	Yes			
YWPF8N	Inc	Yes			
Z23KEH	No	Yes			
Z9JVWP	No	Yes			
ZBCXNY	Inc	Yes			
ZU6YJ2	No	Yes			
ZWAFMY	Inc	Yes			

Response Summary

Total Participants: 123

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

		ITEM 2	ITEM 3
Responses	Yes	**6** *(4.9%)*	**118** *(95.9%)*
	No	**77** *(62.6%)*	**1** *(0.8%)*
	Inc	**40** *(32.5%)*	**4** *(3.3%)*

Conclusions

TABLE 2

WebCode	Conclusions
23EMWZ	Test toolmarks produced by the bolt cutters in Item 1 were microscopically examined in conjunction with the toolmarks present on Items 2 and 3. Based on these comparative examinations, it was determined that: A. There is sufficient agreement of class and individual characteristics to identify the toolmark on Item 3 as having been produced by Item 1. B. There is no agreement of individual characteristics to link the toolmark present on Item 2 to test toolmarks produced by Item 1. The class characteristics present on Item 2 are consistent with being produced by a double-bladed tool, similar to the bolt cutters in Item 1.
29YMBR	There were marks on a cut surface of the length of wire (item 2), that in my opinion could be due to damage to the leading edge of the tool used to cut the wire. I observed no correspondence between this cut surface of item 2 and test cuts made with the pair of boltcutters (item 1). Therefore in my opinion, the boltcutters had not been used to cut this length of wire (item 2). I observed an excellent correspondence of microscopic features between both sides of the cut surfaces of the length of wire (item 3) and test cuts made with the pair of boltcutters. In my opinion, this correspondence means that the boltcutters had made the cut in this length of wire (item 3)
2DUG9T	The toolmarks on the cut ends of the wires, Items 2 and 3, were microscopically compared to exemplar toolmarks made by the eight inch Pro-Grade brand, model 15408, bolt cutters, Item 1. The toolmarks on the cut end of the second wire, item 3, were identified as having been made by the bolt cutters, Item 1, based on sufficient corresponding individual markings observed. Specifically, made by the jaws on the side of the bolt cutters bearing the brand name and model number. The toolmarks on the cut end of the first wire, item 2, were excluded as having been made by the bolt cutters, Item 1, based in differences observed in individual characteristics.
2YEC2Z	Test toolmarks from Item 1 were microscopically examined in conjunction with the toolmarks present on Item 2 and Item 3. Based on these comparative examinations and observed class and individual characteristics, it was determined that: A) Item 2 bears the same class characteristics as test cuts from Item 1; however, no similar individual characteristics were found to link Item 1 with Item 2. B) Item 3 had been cut by Item 1 due to the presence of sufficient agreement of class and individual characteristics with those present on tests from Item 1.
2Z936U	1. Examination of Exhibit 1 revealed one Pro-Grade model 15408 bolt cutter. Exhibit 1.1 test standards were created for comparison and are being retained with Exhibit 1. 2. Examination of Exhibits 2 and 3 revealed that each Exhibit contains one silver colored non-ferromagnetic wire with a diameter of 2.90 mm. Exhibit 2 is 37.00mm long and Exhibit 3 is 41.80mm long. Each Exhibit has one damaged end consistent with being cut by an opposed jaw cutting type tool such as bolt cutters. A. Toolmarks observed on Exhibit 2 were not made by Exhibit 1 tool due to agreement of class characteristics and a sufficient disagreement of individual characteristics. Observing this amount of disagreement from the same source is considered extremely remote. B. Toolmarks observed on Exhibit 3 were made by Exhibit 1 tool due to agreement of class and a sufficient agreement of individual characteristics observed. 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.
34HQTV	Item 1 is a pair of bolt cutters bearing the trade name of Pro-Grade. The toolmarks present on the Item 3 wire were identified as having been produced by the Item 1 tool. The Item 1 tool was excluded as having created the toolmarks present on the Item 2 wire due to a discernable difference in class characteristics.

TABLE 2

WebCode	Conclusions
379TYJ	Item #2 possessed differing individual characteristics of the striated tool marks than the reference material from Item #1 and were determined to have been cut by a different cutting tool than the Pro-Grade bolt cutters, Item #1. Item #3 possessed sufficient agreement of individual characteristics in the striated tool marks and reference material and were determined to have been made by the Pro-Grade bolt cutters, Item #1.
3GNMCX	Toolmarks present on the cut end of the Item 3 piece of wire were identified as having been created by the Item 1 bolt cutters. Toolmarks present on the cut end of the Item 2 piece of wire were excluded as having been created by the Item 1 bolt cutters. Toolmarks present on the cut ends of the Item 2 and item 3 pieces of wire were excluded as having been created by the same tool.
3JTF4B	Observed toolmarks on item 3 have been produced by item 1. Results from examining the observed toolmarks on item 2 are inconclusive.
3UEJBA	MICROSCOPIC COMPARISON EXAMINATIONS OF THE Q1 AND Q2 (ITEM 2 AND 3) CUT WIRES WITH TEST MARKS PRODUCED WITH THE K1 (ITEM 1) BOLT CUTTERS REVEALED THE FOLLOWING: SUFFICIENT AGREEMENT OF INDIVIDUAL CHARACTERISTICS EXISTS TO IDENTIFY THE Q2 (ITEM 3) CUT WIRE AS HAVING BEEN CUT WITH THE K1 (ITEM 1) BOLT CUTTERS. IT IS NOT POSSIBLE FOR THE K1 (ITEM 1) BOLT CUTTERS TO PRODUCE THE ANGLED IMPRESSED MARKS PRESENT ON THE Q1 (ITEM 2) CUT WIRE; THEREFORE, THE Q1 (ITEM 2) CUT WIRE WAS ELIMINATED AS HAVING BEEN CUT WITH THE K1 (ITEM 1) BOLT CUTTERS. SHOULD ANY OTHER SUSPECT TOOL(S) BE RECOVERED, PLEASE SUBMIT AND REFERENCE THE ABOVE CC#. 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 evidence by a pattern or combination of patterns of surface contours.
4D9KTY	Test toolmarks obtained from the 1.1 bolt cutters were compared to the questioned toolmarks observed on the 1.2 and 1.3 pieces of wire. Differences of individual characteristics confirmed the 1.2 wire had not been cut by the 1.1 bolt cutters. Sufficient agreements of class and individual characteristics confirmed the 1.3 wire had been cut by the 1.1 bolt cutters.
4G9QEW	Examination of Items 2 and 3 revealed that they had been cut by a double bladed cutting tool. Test toolmarks produced using the bolt cutter in Item 1 were microscopically examined in conjunction with the wire in Items 2 and 3. Based on these comparative examinations, it was determined that: A) Item 2 bears the same class characteristics as Item 1. However, there are no marks to link item 2 as having been produced by Item 1. B) Based on sufficient agreement of class and individual characteristics, the toolmarks present on Item 3 had been produced by Item 1.
4JAYFL	The bolt cutter (Item 1) was examined. The bolt cutter was used to make test cuts in lead and aluminum. The toolmarks in these test cuts were then microscopically compared with the toolmarks in the cuts on the pieces of wire of Item 2 and Item 3. Item 2: Significant disagreement of class characteristics was observed between test cut toolmarks and the toolmarks on Item 2. The bolt cutter (Item 1) was not used to cut the piece of wire (Item 2). Item 3: Sufficient agreement in class and individual characteristics was observed between test cut toolamarks and the toolmarks on Item 3 to conclude that the bolt cutter (Item 1) was used to cut the piece of wire (Item 3).
67VDFY	The toolmarks on the item 2 are not left by the bolt cutters on the item 1. The toolmarks on the item 3 are left by the bolt cutters on the item 1.
6FK2DM	Test cuts from the Item 1 bolt cutters were examined and microscopically compared to the Item 2 and Item 3 wires with the following results: The Item 2 wire was inconclusive as having been cut by the Item 1 bolt cutters due to insufficient agreement or disagreement of individual characteristics. The Item 3 wire was identified as having been cut by the Item 1 bolt cutters.
6N2LPZ	The Item 01-02 wire was unable to be identified or eliminated as having been cut by the Item 01-01 bolt cutter or the same tool as the Item 01-03 wire due to a lack of reproducible marks. The Item 01-03 wire was identified as having been cut by the Item 01-01 bolt cutter.

TABLE 2

WebCode	Conclusions
6U6GFL	Positive and conclusive result. After examining the elements, both pieces of wire (item 2 and item 3) have been cut using the cutter recovered (item 1).
6VKPW3	The Item 01-02 wire was eliminated as having been cut by the Item 01-01 Pro-Grade bolt cutter. The Item 01-03 wire was identified as having been cut by the Item 01-01 Pro-Grade bolt cutter.
6WEEZV	Item 3 was microscopically compared with test specimens produced by the Item 1 tool, revealing correspondence of class characteristics and individual distinguishing characteristics. It was concluded that Item 3 was cut by the Item 1 tool blades. Item 2 was microscopically compared with test specimens produced by the Item 1 tool, revealing class characteristic differences (Item 2 displays characteristics indicative of being cut with a shear-type cutter, while Item 1 is a pinch-type cutter). It was concluded that Item 2 was not cut by the Item 1 tool.
724C3R	The Item 2 wire was not cut by the Item 1 bolt cutter. The Item 3 wire was microscopically identified as having been cut by the Item 1 bolt cutter.
7PR8VV	Examinations, showed that Item 2 was not cut by Item 1. Examinations, showed that Item 3 was cut by Item 1.
7WM3LE	[No Conclusions Reported.]
83CX3C	Test toolmarks were created using the Pro-Grade bolt cutters, Item 1, and microscopically compared to the wire segments, Item 2 and 3. Based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks exhibited on the wire segment, Item 3, were identified as having been created by the Pro-Grade bolt cutters, Item 1. The toolmarks exhibited on the wire segment, Item 2, exhibit similar class characteristics as those exhibited on test toolmarks created by the Pro-Grade bolt cutters, Item 1. However, due to the lack of corresponding individual detail, Item 2 could neither be identified nor eliminated as having been created by the Pro-Grade bolt cutters, Item 1. The results of these examinations are inconclusive.
83UNCW	The Item 3 piece of wire was cut by the Item 1 bolt cutters. This identification is based on sufficient agreement of the combination of individual characteristics and all discernible class characteristics. The Item 2 piece of wire could not be identified or eliminated as being cut by the Item 1 bolt cutters. This inconclusive result is due to insufficient agreement or disagreement of individual characteristics being observed during the comparison process. Item 2 has a cutting profile that is indicative of a shearing action tool and Item 1 is a pinching action tool that typically leaves a different profile cut. However, during testing of the Item 1 bolt cutters, they could produce a shearing action type cut profile on some tests which precluded elimination of the Item 1 tool with regards to the cut end of Item 2.
8CYWTH	The suspect's bolt cutters (Item 1) produced SIMILAR INDIVIDUAL MARKS when compared to tool marks on submitted pieces of wire (Items 2 or 3).
8HND69	The microscopic examinations do not allow me to establish whether the marks on the item 3 were made by the bolt cutter Item 1, or not. The bolt cutters Item 1 has not produced the questioned toolmarks of the wire Item 2.
94KAKE	[No Conclusions Reported.]
9GVNUR	Examination of Items 2 and 3 revealed the presence of toolmarks (cuts) that had been produced by a double-bladed cutting tool. Test cuts from the bolt cutters in Item 1 were microscopically examined in conjunction with the toolmarks present on Items 2 and 3. Based on these comparative examinations and observed class and individual characteristics, it was determined that: A. The toolmarks present on Item 3 had been produced by the bolt cutters in Item 1. B. The toolmarks produced by Item 1 and the toolmarks present on Item 3 bear similar class characteristics as the toolmarks present on Item 2. However, these similarities are insufficient for a more conclusive determination.
9JD23U	The toolmarks on the piece of wire in Item 3 were made by the bolt cutters in Item 1, based on agreement observed in individual characteristics. The toolmarks on the piece of wire in Item 2 bear class characteristics consistent with those produced by the bolt cutters in Item 1. However, due to insufficient reproducible individual characteristics, the toolmarks on the piece of wire in Item 2 could

TABLE 2

WebCode	Conclusions
	not be positively included or excluded as having been made by the bolt cutters in Item 1 to the exclusion of all other bolt cutters bearing the same class characterstics.
9LNTKB	I conducted a toolmark examination using a comparison microscope. I compared the toolmarks of Items 2 & 3 with test cuts produced from Item 1. In my opinion Item 2 was not cut by the tool Item 1 (bolt cutters) and is eliminated. Also in my opinion Item 3 was a positive identification and is a match to the toolmarks produced by Item 1 (bolt cutters).
9XBF23	MICROSCOPIC COMPARISON EXAMINATIONS OF THE TOOLMARK IMPRESSIONS ON SUBMITTED ITEM 2 (Q1), FIRST CUT PIECE OF WIRE (PAINTED BLUE), AND ITEM 3 (Q2), SECOND CUT PIECE OF WIRE (PAINTED RED), AGAINST THE TOOLMARK IMPRESSIONS FROM SUSPECTED RECOVERED BOLT CUTTERS ITEM 1 (K1), REVEAL THAT SUFFICIENT AGREEMENT OF INDIVIDUAL CHARACTERISTICS EXISTS TO IDENTIFY THE FOLLOWING: SUSPECTED RECOVERED BOLT CUTTERS ITEM 1 (K1) PRODUCED THE TOOLMARK IMPRESSIONS THAT ARE ON THE SECOND CUT PIECE OF WIRE PAINTED RED, ITEM 3 (Q2). THE TOOLMARK IMPRESSIONS OBSERVED ON THE FIRST CUT PIECE OF WIRE (PAINTED BLUE), ITEM 2 (Q1), WERE NOT PRODUCED BY SUSPECTED BOLT CUTTERS ITEM 1 (K1), DUE TO THE DIFFERENCES OF THE INDIVIDUAL CHARACTERISTIC MICROSCOPIC MARKINGS PRESENT BETWEEN ITEM 2 (Q1) AND ITEM 1 (K1).
ABLUBG	Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope): Test marks were made with Item 1 the bolt cutters, using submitted standard testing media. The tool mark on Item 3, the piece of wire, was made with Item 1, the bolt cutters, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the wire, to Item 3 and to test marks made with Item 1, the bolt cutters, were inconclusive due to insufficient corresponding class and individual microscopic characteristics. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence for possible future analysis.
AF77UB	Sufficient disagreements of individual characteristics confirmed the toolmarks on the item 2 wire were not made by the item 1 boltcutters. Sufficient agreements of class and individual characteristics confirmed the toolmarks on the item 3 wire were made by the item 1 boltcutters.
AFATCP	in the result of examination we conclude that toolmark at item 3 was produced by the suspect bolt cutter (item 1). The toolmark at item 2 shows different structures to item 1, so it can be conclude, that these toolmark was not produced by the bolt cutter item 1.
AHFBAK	The microscopic details on the wires item 2 and 3 matched those on the bolt cutters item 1 thus the bolt cutters were the one that were used to cut the submitted wires.
AZ2MBR	Toolmarks on the cut end of section of metal wire in Item 3 (red) were caused by the bolt cutter tool in Item 1. This identification was based on agreement of both class and individual characteristics. Toolmarks on the cut end of section of metal wire in Item 2 (blue) were not caused by the bolt cutter tool in Item 1 in its submitted condition. This exclusion was based on differences in individual characteristics.
B4BJYZ	Item 1: Bolt cutters which recovered from the suspect used to cut Item (3) (wire painted red). Item (2) (wire painted blue)was cutting by another cutter.
BDLP8N	Item 1 is a pair of bolt cutters, Pro-Grade ® brand, model 15408. Item 2 is one (1) length of 3mm gauge wire (approximately 37mm long), silver in color with one end painted blue, exhibiting toolmarks on one end. Item 3 is one (1) length of 3mm gauge wire (approximately 44mm long), silver in color with one end painted red, exhibiting toolmarks on one end. Items 2 and 3 were microscopically compared to each other and could not be identified or eliminated as having been cut by the same tool or a different tool due to insufficient markings. Item 2 was microscopically compared to test cuts from the Item 1 tool and it was eliminated as having been cut by that tool due to a difference in class characteristics. Item 3 was microscopically compared to test cuts from the Item 1 tool and it could not be identified or eliminated as having been cut by that tool due to insufficient agreement of markings.
BPYMCT	Exhibit 1 is a pair of 8 1/2" Pro-Grade bolt cutters. This tool utilizes a pinching action. Exhibit 2 is a

TABLE 2

WebCode	Conclusions
	cut piece of wire measuring approximately 1 5/8" long and 0.114" wide having a striated toolmark on one end. This exhibit was cut with a tool that utilizes a pinching action. Exhibit 3 is a cut piece of wire measuring approximately 1 7/8" long and 0.114" wide having a striated toolmark on one end. This exhibit was cut with a tool that utilizes a pinching action. The cut wires (Exhibits 2 and 3) were microscopically compared to each other. Based on an agreement of class characteristics and an insufficient agreement of individual characteristics, Exhibits 2 and 3 could not be identified nor excluded as having been cut by the same pinching tool. Test toolmarks were made using the submitted bolt cutters (Exhibit 1) and laboratory supply lead wire and sheet. The tests were retained with the evidence as Exhibits 1.T1-1.T4. The test toolmarks were microscopically compared to each other and to the cut wires (Exhibits 2 and 3). Based on a disagreement of individual characteristics, Exhibit 2 was not cut by Exhibit 1. Based on an agreement of class characteristics and sufficient agreement of individual characteristics, Exhibit 3 was cut by Exhibit 1. The probability that the toolmarks on Exhibit 3 were made by a different source, other than Exhibit 1, is so small that it is negligible. These conclusions conform with the [Laboratory] policy available at [Website].
C2ZRT4	The questioned toolmark, from the piece of wire “Items 3”, was produced by the suspect's bolt cutters “Item 1” . The questioned toolmark, from the piece of wire “Items 2”, wasn´t produced by the suspect's bolt cutters “Item 1”
CZ8473	Item 1-1 (CTS item 1) are bolt cutters that work by pinching action and make striated toolmarks. Item 1-1 was used to make toolmarks in both lead and the submitted reference wire. Item 1-2-1 (CTS item 2) is a piece of wire with blue paint at one end and a striated toolmark at the other end. The toolmark was made by a tool that works by pinching action. The toolmark is suitable for microscopic comparison. Item 1-3-1 (CTS item 3) is a piece of wire with red paint at one end and a striated toolmark at the other end. The toolmark was made by a tool that works by pinching action. The toolmark is suitable for microscopic comparison. Based on agreement of all discernible class characteristics, the toolmarks on items 1-2-1 and 1-3-1 were microscopically compared to test toolmarks made with item 1-1 bolt cutters. The toolmarks on item 1-2-1 could neither be identified nor eliminated as having been made by item 1-1 bolt cutters. The inconclusive conclusion is based on an absence of either similarities or differences in the patterns of microscopic markings observed between item 1-2-1 toolmarks and the test toolmarks sufficient to effect a conclusion of identification or elimination, respectively. The toolmarks on item 1-3-1 were identified as having been made by item 1-1 bolt cutters based on sufficient similarities in the patterns of microscopic markings observed between the compared items.
DJDXDY	Upon comparison, I found that the characteristics fine marks on Item 2 wire to match with those on the test cut wire marks made by bolt cutter Item 1. Upon comparison, I found that the characteristics fine marks on Item 3 wire to match with those on the test cut wire marks made by bolt cutter Item 1. Therefore, I am of the opinion that Item 2and Item 3 wires was cut by the bolt cutter Item 1.
DQXUHA	The first cut piece of wire which is painted blue (Item 2) was not cut using the bolt cutters recovered from the suspect. The second cut piece of wire which is painted red (Item 3) was cut using the bolt cutters recovered from the suspect.
E9HTCE	I conducted a comparative microscopic examination between the set of boltcutters (Item 1) and the two pieces of cut wire (Items 2 and 3). This revealed that: The boltcutters (Item 1) were not responsible for cutting the piece of cut wire (Item 2). The boltcutters were responsible for cutting the piece of wire (Item 3), approximately in the middle of the two blades.
EH39PG	Based on the results obtained. According to stage 1 of the assessmentscale: The toolmarks on the wire, item 3 have been caused by the bolt cutter, item 1. The toolmarks on the wire, item 2 have not been caused by the bolt cutter, item 1.
ELKG7T	The submitted wire (Item 2) was not cut by the submitted bolt/wire cutter (Item 1). The submitted wire (Item 3) was cut by the submitted bolt/wire cutter (Item 1).
EUCNY8	The item 2 cut piece of wire bears similar in nature but insufficient microscopic marks to permit identification to the item 1 cutters. The item 3 cut piece of wire was cut by the item 1 cutters.

TABLE 2

WebCode	Conclusions
F32VUH	Item 1 is a Pro-Grade 15408 bolt cutter that was identified as having produced the toolmarks present on the Item 3 piece of wire. Due to a discernible difference in class characteristics, the toolmarks present on the Item 2 piece of wire were excluded as having been produced by the Item 1 bolt cutter. Tools that could have produced the toolmarks present on the Item 2 piece of wire include other bladed tools that employ a shearing/pinching action.
F4DVPQ	As a result of the microscopic comparison it is certain, that the toolmarks on "Item 3" have been produced by the tool marked as "Item 1". Furthermore there was no parity between "Item 2" and the tool marked as "Item 1".
FL2U8B	The results strongly support that the toolmarks on Item 3 were produced by another cutting tool (Level -3). The results extremely strongly support that the toolmarks on Item 3 were produced by Item 1 (Level +4)
FWL4XQ	The mini bolt cutter (Item 1) is operational with no malfunctions observed during testing. One wire (Item 2) was not identified or eliminated as being cut by the mini bolt cutter (Item 1). There is agreement in discernable class characteristics and a lack of agreement or disagreement in the individual characteristics and pattern areas. One wire (Item 3) was cut by the mini bolt cutter (Item 1).
G3MZUV	Examination of Item #1 revealed one (1) Pro-Grade brand bolt cutter, gray and black in color. Examination of Item #2 revealed one (1) portion of wire, approximately 1 1/2 inches in length, with toolmarks observed. Reportedly, the end painted blue is not for examination. Examination of Item #3 revealed one (1) portion of wire, approximately 2 1/16 inches in length, with toolmarks observed. Reportedly, the end painted red is not for examination. Tests were obtained by using Item #1 and were microscopically compared to the observed toolmarks on Item #2 & Item #3 with the following results: The bolt cutter (Item #1) was not used to cause the toolmarks on Item #2. The bolt cutter (Item #1) was used to cause the toolmarks on Item #3.
G3XV62	The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the first cut piece of wire in item 2 were determined not to have been made by the bolt cutters in item 1. Further analysis of the first cut piece of wire in item 2 is pending submission of another tool for additional comparison. The toolmarks present on the second cut piece of wire in item 3 were determined to have been made by the bolt cutters in item 1.
GFLXPE	Item 1 are bolt cutters consistent with Pro-Grade brand, model 15408 that uses a pinching tool action. Item 3 is a piece of wire. Toolmarks present on the Item 3 piece of wire were identified as having been produced by the Item 1 bolt cutters. Item 2 is a piece of wire. Due to differences in class characteristics, the Item 1 bolt cutters were excluded as having created the toolmarks present on the Item 2 piece of wire.
GP9WEY	FINDINGS & OPINIONS: (The findings and opinions below are based upon standard firearms identification and examination procedures.) The submitted evidence was visually and microscopically examined, compared, and its characteristics noted. The cut on the piece of wire, item #1-2, and test cuts from the bolt cutter, item #1-1, display some different class characteristic markings. Item #1-2 was eliminated as having been cut by the submitted bolt cutter. The cut on the piece of wire, item #1-3, and test cuts from the bolt cutter, item #1-1, display similar class characteristics and areas of matching individual characteristics. Item #1-3 was identified as having been cut by the submitted bolt cutter. One (1) of the two (2) submitted pieces of loose wire was used for producing test cuts and is being returned with the evidence.
GR2K22	The suspect's bolt cutter item 1 produced the questioned toolmark on the wire item 3. The toolmark on the wire item 2 where not produced with the bolt cutter item 1.
HFAAEF	1.Exhibit 1 is a pair of “Pro-Grade” brand bolt cutters. Exhibit 1.1 test cuts were created for comparison and are being returned with Exhibit 1. 2.Exhibit 2 is a non-ferromagnetic piece of wire with one end painted blue and one end with damage consistent with that caused by an opposed jaw cutting tool. The overall length is ~36.03 mm and the diameter is ~2.89 mm. 3.Exhibit 3 is a non-ferromagnetic piece of wire with one end painted red and one damaged end. The overall length is ~43.59 mm and the diameter is ~2.89 mm. 4.Exhibit 1 test cuts were microscopically compared to

TABLE 2

WebCode	Conclusions
	Exhibits 2 and 3. a. Exhibit 2 was eliminated from being cut by Exhibit 1 based on agreement of class characteristics and a sufficient disagreement of individual characteristics. Observing this amount of disagreement from the same source is considered extremely remote. b. Exhibit 3 was identified as being cut by Exhibit 1 due to an agreement of class and sufficient agreement individual characteristics.
HMY7NV	A comparison of the cut ends on items 2 and 3 with test marks made with the bolt cutters item 1. Good correspondence was noted with the cut end of item 3 and the test marks. No correspondence was noted with the cut end of item 2 and the test marks. I have considered the proposition that the bolt cutters item 1 were used to cut the wire in item 3; the results of this examination provide conclusive support for this proposition. The results of the examination provide no support for the proposition that the bolt cutters were used to cut the wire in item 2.
HPTRK8	The cutting parts of the bolt cutter (item 1) are grinded and though contain individual characteristics. We compared the 2 incriminated pieces of wire (Items 2 + 3) with the bolt cutter (item 1). For this cause we compared the incriminated wires directly with the cutting edges of the bolt cutter as with comparison cuts that we produced by cutting pieces of Aluminium. We couldnt find any matching striaes between Item 2 and item 1. It is certain, that the striaes on item 3 have been made by the bolt cutter (item 1).
HRBYZU	Red painted (ITEM 3) contacted Blue painted (ITEM 2) contact failed
HX63ZD	The following submitted evidence was visually and microscopically examined: Exhibit 1: Wire cutter; eight inches long, Pro-Grade brand. Exhibit 2: Cut wire; approximately 1.5 inches long with one blue painted tip. Exhibit 3: Cut wire; approximately 1.75 inches long with one red painted tip. 1. Exhibit 1 is consistent with being used as an opposed blade cutter. Test standards were created for comparison and are being returned with the tool. 2. The wires in Exhibits 2 and 3 have characteristics similar to those caused by an opposed blade cutting tool such as a wire cutter. The unpainted ends of Exhibits 2 and 3 were microscopically compared to test toolmarks from Exhibit 1. a. Agreement of the observed class and individual characteristics was sufficient to conclude that the Exhibit 3 wire was cut by Exhibit 1. b. Due to similarities in class characteristics and some disagreement of individual characteristics which were insufficient for elimination, it could not be determined whether or not the Exhibit 2 wire was cut by Exhibit 1. TECHNICAL NOTES: Class characteristics are defined as measureable 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.
J2DUF6	The item 2 tool mark was produced by item 1 tool. The item 3 tool mark was not produced by item 1 tool.
JA77BX	Test toolmarks were made using the bolt cutters, Item 1, and microscopically compared to the cut pieces of wire, Items 2 and 3. Based on agreement of discernible class characteristics and sufficient corresponding individual detail, the cut on the piece of wire, Item 3, was identified as having been made using the bolt cutter, Item 1. The cut on the piece of wire, Item 2, exhibits similar class characteristics as those displayed on test toolmarks made using the bolt cutter, Item 1. However, due to the lack of corresponding individual detail, the cut on the piece of wire, Item 2, could neither be identified nor eliminated as having been made using the bolt cutter, Item 1. The results of these examinations are inconclusive.
JAUDRG	1. Examinations showed Item 2 was not cut by Item 1. 2. Examinations showed Item 3 was cut by Item 1.
JNPRVR	Tool marks observed on the submitted cut wire (Item 3) are identified as having been produced by the submitted mini bolt cutters (Item 1). Identifications are made only to a degree of practical certainty and

TABLE 2

WebCode	Conclusions
	are based on sufficient agreement of the individual characteristics of tool marks. Sufficient agreement, in part, 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 cut wire (Item 2) are not identified or eliminated (Inconclusive) as having been produced by the submitted mini bolt cutters (Item 1). The individual characteristics present do not display agreement.
JPR48N	The submitted cut piece of wire, Item 2, was eliminated as having been cut by the same pair of wire cutters as the submitted cut piece of wire, Item 3, and/or cut with the submitted wire cutters, Item 1. The submitted cut piece of wire, Item 3, was cut by the submitted wire cutters, Item 1.
JT4DWB	1. Exhibit 1 (Pro-Grade 15408 bolt cutters) is designed to be used as a pinching action cutting tool. Exhibit 1.1 (Test toolmark standards) was created for comparison and is being returned with Exhibit 1. 2. Exhibit 2 (1 portion of non-ferromagnetic wire) and Exhibit 3 (1 portion of non-ferromagnetic wire) 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 Exhibit 3 was identified as having been cut by Exhibit 1 due to an agreement of class characteristics and a sufficient agreement of individual characteristics. b. Exhibit 2 could not be identified or eliminated as having been cut by Exhibit 1 due to an agreement of class characteristics and insufficient disagreement of individual characteristics.
KRQ2TZ	Comparison of the piece of cut wire (Item 2) with test cuts taken using the exhibit bolt cutters (Item 1) resulted in an elimination - that is the exhibit bolt cutters did not cut the wire (Item 2). Comparison of the piece of cut wire (Item 3) with test cuts taken using the exhibit bolt cutters (Item 1) resulted in an identification - that is the exhibit bolt cutters were used to cut the wire (Item 3).
KY9KNY	Test toolmarks were created using the bolt cutter, Item 1, and microscopically compared to the cut portions of wire, Items 2 and 3. Based on agreement of discernible class characteristics and sufficient corresponding individual detail, the cut portion of wire, Item 3, was identified as having been created using the bolt cutter, Item 1. The cut portion of wire, Item 2, exhibits similar class characteristics as those displayed on test toolmarks created from the bolt cutter, Item 1. However, due to the lack of corresponding individual detail, the toolmarks exhibited on Item 2 could neither be identified nor eliminated as having been created by the bolt cutter, Item 1. The results of these examinations are inconclusive.
LG4DAX	Microscopic examination and comparison of the toolmarks on the cut wire (item # 2) with test toolmarks made with the bolt cutters (item # 1) reveals sufficient microscopic evidence to conclude that the wire (item # 2) was cut by the bolt cutters (item # 1). Microscopic examination and comparison of the toolmarks on the cut wire (item # 3) with test toolmarks made with the bolt cutters (item # 1) reveals insufficient microscopic evidence to conclude that the wire (item # 3) was cut by the bolt cutters (item # 1). The results are therefore inconclusive.
LM8GVP	Sufficient agreement of individual characteristics exits to identify the toolmarks on the piece of metal wire with the red paint on one end, Q2 (Item 3) as having been made with the Pro Grade mini bolt cutters, K1 (Item 1). The toolmarks on the piece of metal wire with the blue paint on one end, Q1 (Item 2) can be eliminated as having been made with the Pro Grade mini bolt cutters, K1 (Item 1) due to differences in the individual markings on the test items from K1 (Item 1) and Q1 (Item 2). Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours. “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.
LVK9M9	Tool marks present on Items 001-02 and 001-03 were microscopically compared to one another and to test tool marks produced from the Item 001-01 Mini Bolt Cutters with the following results: The Item 001-03 tool mark was identified as having been produced by the Item 001-01 tool due to a sufficient agreement of individual characteristics. The Item 001-02 tool mark has similar class characteristics as test tool marks, however was without agreement or disagreement of individual characteristics due to an absence or insufficiency and was inconclusive as having been produced by the Item 001-01 tool. The Item 001-01 tool mark could neither be identified nor eliminated as having been produced by the

TABLE 2

WebCode	Conclusions
	Item 001-01 tool.
LWX3ZN	Toolmarks observed on item 3 (cut wire) are identified as having been produced by item 1 (bolt cutters). Toolmarks observed on item 2 (cut wire) are not identified or eliminated (inconclusive result) as having been produced by item 1. The individual characteristics do not display sufficient agreement. NOTE: identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. Sufficient agreement, in part, means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility.
MGLVUH	Item 3 was microscopically examined and identified as having been cut by Item 1. Item 2 was microscopically examined and eliminated as having been cut by Item 1.
NJGX6C	In my opinion, the cutters in Item 1 were used to cut the wire in item 3 (conclusive association). In my opinion, the cutters in Item 1 were NOT used to cut the wire in item 2 (conclusive elimination).
NMKTNE	The toolmark on item 2 was not made by the bolt cutters, item 1. The toolmark on item 3 was made by the bolt cutters, item 1.
NNWDP2	Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope): Test marks were made with Item 1, the Pro-Grade brand 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. Comparisons between the tool mark on Item 2, the piece of wire, and test marks made with Item 1, the Pro-Grade brand bolt cutters, were inconclusive due to insufficient corresponding individual microscopic characteristics. The tool mark on Item 3, the piece of wire, was made with Item 1, the Pro-Grade brand bolt cutters, based upon corresponding class and individual microscopic characteristics.
PA9MBR	It was determined utilizing stereomicroscopic examination that the partial toolmark impressions observed on the item 2 and item 3 pieces of wire exhibit sufficient microscopic characteristics to enable a comparison with known tools. It was determined utilizing comparison microscopic examination that the item 2 partial toolmark impression and known tool from item 1 exhibit dissimilar microscopic characteristics. Therefore, the known tool from item 1 can be eliminated as being the source of the questioned impression. It was determined utilizing comparison microscopic examination that the item 3 partial toolmark impression was positively made by the item 1 known tool. An identification determination is centered on the existence of sufficient class and individualizing characteristics in agreement between a questioned and known, as well as being founded on the examiner's training, knowledge, skill and experience.
PAV4H8	Comparison microscope examinations were conducted on the evidence listed above. The findings of this examiner are the following: 1. Exhibit 3 was made by the submitted Pro-Grade bolt cutter (Exhibit 1) based on sufficient agreement of individual characteristics. 2. Exhibit 2 could have been made by the submitted Pro-Grade bolt cutter (Exhibit 1) based on agreement of class characteristics; however, there is no agreement of individual characteristics to suggest it was.
PMJ4CV	1: The exhibit bolt cutters, Item "1" was identified within the limits of practical certainty as having been used to cut one piece of wire painted red, Item "3". 2: The exhibit bolt cutters, Item "1" was eliminated as having been used to cut one piece of wire painted blue, item "2".
PQYQV2	By means of microscopic exam and microscopic comparaison of tool traces he/it has been determined that: The bolt cutters recovered from suspect described in Item 1, was the tool produced toolmarks present in the second cut piece of wire painted red (Item 3). Bolt cutters recovered from the suspect, described in Item 1, was not the tool produced toolmarks present in the first cut piece of wire painted blue (Item 2).
PXG4LD	The toolmark(s) on Item 3 (a piece of cut wire) was identified* as having been produced by Item 1 (bolt cutters). It could not be determined if Item 1 produced the toolmarks on Item 2 (a piece of cut wire)**. *Source Identification is reached when the discernible class and individual characteristics have corresponding detail and the examiner would not expect to see the same arrangement of details

TABLE 2

WebCode	Conclusions
	repeated in another source. **Because of a lack of corresponding individual characteristics, the comparative examinations were inconclusive.
Q4HUF4	Tool marks present on the cut pieces of wire in Items 001-02 and 001-03 were microscopically examined in conjunction with one another and with test tool marks produced by Item 001-01 with the following results: Item 001-02 was inconclusive as having been produced by Item 001-01 due to an insufficient amount of corresponding individual characteristics. Item 001-03 was identified as having been produced by Item 001-01. Items 001-02 and 001-03 were inconclusive as having been produced by the same tool due to an insufficient amount of corresponding individual characteristics. Item 001-04 was used to produce test tool marks from the submitted tool in Item 001-01.
R67QFG	Tool marks observed on the submitted cut piece of wire with one end painted red (Item #3) are identified as having been produced by the submitted bolt cutters (Item #1). Tool marks observed on the submitted cut piece of wire with one end painted blue (Item #2) are not identified or eliminated (inconclusive) as having been produced by the submitted bolt cutters (Item #1). The individual characteristics present do not display sufficient agreement. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. Sufficient agreement, in part, means that the likelihood of another tool producing the same marks is so remote that it is considered a practical impossibility.
RBWZPF	The cut sections of wire in items #2 and #3 were microscopically compared to test cuts made using the cutters submitted as item #1. The following conclusion was reached: The toolmark observed on the wire of item #2 was found to have the same class characteristics; however, the results of the comparison are inconclusive due to a lack of sufficient agreement or disagreement of individual characteristics. Item #2 cannot be identified or eliminated as having been cut by the cutters of item #1. The wire of item #3 was microscopically identified as having been cut by the cutters of item #1.
RCQLKR	In all probability - This Expression is used when the result of the examination is Beyond reasonable doubt. There is thus room for only a hypothetical reservation.
RFBJYA	Test impressions made from Item 1 were microscopically compared to Items 2 & 3 with the following results: Item 1 and Item 2 are an elimination, therefore, Item 2 could not have been cut by Item 1. Item 1 and Item 3 are an identification, therefore, Item 3 was cut by Item 1.
RN7NTB	Item 2 is inconclusive as having been cut with item 1. The characteristics of the cut are similar, however there was no microscopic tool marks in agreement, but insufficient to eliminate. Item 3 was cut with item 1. There was sufficient agreement of microscopic tool marks for an identification.
T3FNAT	The bolt cutter recovered from the suspect (Item 1)did produce the toolmarks on the second submitted piece of wire (Item 3). Regarding the toolmarks on he first piece of wire (Item 2)the recovered bolt cutter (Item 1) can be excluded as having produced those toolmarks.
T4V4JN	The wire submitted as item 3 (red painted) was identified as having been cut buy the submitted bolt cutter (item 1). The wire submitted as item 2 (blue painted) exhibits a different shape of cut and was not cut at this end by the submitted wire cutter (item 1).
T7FZX7	Item 1 is one (1) pair of Pro-Grade brand 8 ½ inch long bolt cutters, model: 15408. Item 2 is one (1) piece of 0.11 inch diameter silver colored metal wire, approximately 1 ½ inches long, cut at both ends with the known cut mark painted blue. Item 3 is one (1) piece of 0.11 inch silver colored wire, approximately 1 ½ inches long, cut at both ends with the known cut mark painted red. The unknown cut ends of Item 2 and Item 3 were microscopically compared to each other and to test cuts made by the Item 1 bolt cutters. Item 2 was eliminated as having been cut by the Item 1 bolt cutters, due to a difference in class characteristics. Item 3 could not be identified or eliminated as having been cut by the Item 1 bolt cutters due to an insufficient agreement on individual markings. Items 2 and 3 could not be identified or eliminated as having been cut by the same tool due to insufficient markings.
T9N6JG	The tool marks observed on item 3 are identified as having been produced by the Pro-Grade wire cutter, Item 1. Identifications are made only to a degree of practical certainty and are based on sufficient agreement of the individual characteristics of tool marks. Sufficient agreement, in part,

TABLE 2

WebCode	Conclusions
	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 the piece of silver wire w/ blue tip, Item 2, are not identified or eliminated (Inconclusive) as having been produced by the submitted Pro-Grade cutters, Item 1. The individual characteristics present do not display sufficient agreement.
TAHT4X	The bolt cutter item 1 produced the toolmarks on item 3 but it did not produce the toolmarks on item 2.
TVJTJA	1. Examinations showed the tool marks on Item 2 were not produced by Item 1. 2. Examinations showed the tool marks on Item 3 were produced by Item 1.
TWVL3Q	The bolt cutter, ITEM 1, has been used to cut the piece of aluminium wiere with red paint, ITEM 3. (Positive identificaction); The piece of aluminium wire with blue paint, ITEM 2, has not been cut with the ITEM 1 tool. (Elimination)
UAWMAQ	I have compared test cut samples using the exhibit bolt cutters Item 1 with the samples of cut wire contained in Items 2 and 3. My examination showed class characteristics contained in the cut patterns of Items 2 and 3 were not the same. This examination showed reoccurring patterns of individual characteristics identified to the test from Item 1 and the sample of cut wire Item 3. The identification means the exhibit bolt cutters had been used to cut the exhibit sample of wire Item 3.
UET4U8	The bolt cutter from the suspect (Item 1) is to eliminate for the first cut piece of wire (Painted blue – Item 2). The bolt cutter from the suspect (Item 1) is identified for the second cut piece of wire (Painted red – Item 3).
UMJQJH	[No Conclusions Reported.]
UNUNWY	The toolmarks on the pieces of wire in items 001-02 and 001-03 were microscopically examined in conjunction with test toolmarks from the bolt cutters in item 001-01. Based on these comparisons the following was determined: The toolmarks on the piece of wire in item 001-02 was inconclusive as having been made by the bolt cutters in item 001-01 based on the insufficient agreement or disagreement of individual characteristics. The toolmarks on the piece of wire in item 001-02 could not be identified or eliminated as having been made by the bolt cutters in item 001-01. The toolmarks on the piece or wire in item 001-03 was identified as having been made by the bolt cutters in item 001-01 due to the sufficient agreement of individual characteristics. The pieces of wire in item 001-04 were used for test mark purposes.
UZWXQ4	Items #1, #2, #3: The wire segment Item #3 was microscopically identified as having being cut by the bolt cutter Item #1. The wire segment Item #2 was not cut by the bolt cutter Item #1.
V232GX	The cut marks on the wire in Item 3 were found to agree in fine striation patterns with the control cut marks made by the pair of bolt cutters in Item 1, indicating that the wire in Item 3 was cut by the pair of bolt cutters in Item 1. The cut marks on the wire in Item 2 were found to disagree in indentations and fine striation patterns with the control cut marks made by the pair of bolt cutters in Item 1, indicating that the wire in Item 2 was not cut by the pair of bolt cutters in Item 1.
V3B3BH	The questioned toolmarks on Item 2 was not made by the suspect's bolt cutter. The questioned toolmarks on Item 3 was made by the suspect's bolt cutter.
V637B6	Examinations showed the tool marks within Item 2 were not created by Item 1. Examinations showed the tool marks within Item 3 were created by Item 1.
VT8WNW	Toolmark Analysis: Methodology – Physical (Visual Examination), Microscopy (Comparison Microscopy): Test marks were made with Item 1, the Pro-Grade bolt cutter, using submitted testing media. These items were sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Item 3, the wire fragment, was made with Item 1, the Pro-Grade bolt cutter, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the wire fragment, to Item 3, the wire fragment, and test marks made with Item 1, the Pro-Grade bolt cutter, were inconclusive due to insufficient individual microscopic characteristics.

TABLE 2

WebCode	Conclusions
WAPCCK	Item 2 (damaged wire) could neither be identified nor eliminated as having been damaged by item 1 (bolt cutters). There are sufficient individual markings present to identify item 1 (bolt cutter) as having damaged item 3 (damaged wire).
WCVW37	Item 2 was inconclusive to Item 1 due to a lack of disagreement of individual characteristics in the striated toolmark; however, all observable class characteristics were in agreement. Item 3 was identified to Item 1 based on the agreement of class characteristics, and individual characteristics observed in the striated toolmark.
WFYFE7	Item 1.1 is a pair of Pro Grade brand bolt cutters. Test cuts were made using the provided material. Items 1.2 and 1.3 are two sections of cut wire. The areas of damage were microscopically compared to the tests from Item 1.1. Based on agreement of all discernable class characteristics and sufficient corresponding individual detail, Item 1.3 was identified as having been cut by Item 1.1. Based on disagreement of all discernable class characteristics, Item 1.2 can be eliminated as having been cut by Item 1.1.
WJXU3V	Toolmark Analysis: Methodology – Physical (Visual Examination), Microscopy (Comparison Microscopy): Test marks were made with Item 1, the Pro-Grade bolt cutters, using submitted testing media. These items were sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Item 3, the cut wire, was made with Item 1, the Pro-Grade bolt cutters, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the cut wire, to Item 3, the cut wire, and to test marks made with Item 1, the Pro-Grade bolt cutters, were inconclusive due to insufficient individual microscopic characteristics.
WK726N	1. The exhibit bolt cutters (Item 1) were eliminated as having cut the exhibit piece of wire (Item 2). 2. The exhibit bolt cutters (Item 1) were identified as having cut the exhibit piece of wire (Item 3).
WTP6EC	Due to the lack of corresponding patterns of individual characteristics, the submitted bolt cutter, Item 1, was unable to be eliminated or identified as having produced the severing toolmarks observed on the submitted aluminum wire, Item 2. The submitted bolt cutter, Item 1, produced the severing toolmark observed on the submitted aluminum wire, Item 3.
XF9WYW	The test cuts made with the bolt cutters (Item 1) and the first cut piece of wire (Item 2) were microscopically examined and compared. Based on these comparative examinations, it was found that the test cuts of Item 1 and the cut on Item 2 had similarities in class characteristics as one another; however, no individual characteristics were observed. Therefore, the toolmarks in Item 2 were not produced by the tool in Item 1. The test cuts made with the bolt cutters (Item 1) and the second cut piece of wire (Item 3) were microscopically examined and compared. Based on these comparative examinations, it was found that the test cuts of Item 1 and the cut on Item 3 had similarities in class and individual characteristics as one another. Therefore, the toolmarks in Item 3 were produced by the tool in Item 1. Based on the above findings, in my professional opinion, the bolt cutters (Item 1) is eliminated as the tool used to cut Item 2. Whereas, the bolt cutters (Item 1) is identified as the tool used to cut Item 3.
XHDGPH	The cut present in piece of wire identified E2-19-4360, was not made by the cutting tool identified in the section as 2018-4360, Pro-Grade brand, with two edges. The cut present in piece of wire identified E3-19-4360, was made by the cutting tool identified in the section as 2018-4360, Pro-Grade brand, with two edges.
XVL6ZZ	Item 1 is an Allied International bolt cutter, that uses a pinching type action. Toolmarks present on the Item 3 wire were identified as having been cut by the Item 1 bolt cutters. Due to a difference in class characteristics, the Item 2 wire was not cut by the Item 1 bolt cutters.
XXPZJ4	Item 2 wire was not cut with Item 1 bolt cutters. Item 3 wire was cut with Item 1 bolt cutters.
YAF9GW	Item 1 is a pair of Pro-Grade brand hand bolt/wire cutters, which uses a pinching action. Items 2 and 3 are pieces of wire that were cut using a pinching/shearing action. The Item 3 wire was identified as having been cut by the Item 1 cutters. The Item 2 wire was eliminated as having been cut by the Item 1

TABLE 2

WebCode	Conclusions
	cutters, due to a difference in class characteristics.
YM8RK3	The cut piece of wire marked #3 was microscopically compared to test cuts from the submitted bolt cutters, marked #1 with positive results (Identification). The submitted bolt cutters, #1, cut the submitted wire marked #3. The cut piece of wire #2 was microscopically compared to test cuts from the submitted bolt cutters, marked #1 with inconclusive results.
YVG83A	Tool marks observed on Item 3 (piece of wire [red painted tip] are identified as having been produced by Item 1 (Mini bolt cutter). Tool marks observed on Item 2 (piece of wire [blue painted tip] are not identified or eliminated (inconclusive) as having been produced by Item 1 (Mini bolt cutter). The individual characteristics present do not display agreement.
YWPF8N	Item 1 can be identified as the source of the questioned marks on item 3. Item 1 is probably not the source of the questioned marks on item 2. An exclusion can not be done for sure.
Z23KEH	The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the first cut piece of wire in item 2 were determined not to have been made by the bolt cutters in item 1. Further analysis is pending submission of another tool for additional comparison. The toolmarks present on the second cut piece of wire in item 3 were determined to have been made by the bolt cutters in item 1.
Z9JVWP	Tools, like the blades of the submitted bolt cutters, have individual surface-features, due to their manufacturing process and use. These surface-features can be transferred onto objects that are worked with the tool. If toolmarks show sufficient details that were caused by the corresponding individual structures of the tool, the tool can be identified to have caused the toolmarks. Due to the individual features in the submitted toolmarks, it is proven that: The toolmarks on Item 2 were not caused by the blades of the bolt cutters Item 1. The toolmarks on Item 3 were caused by the blades of the bolt cutters Item 1.
ZBCXNY	Test standards were made using the Pro-Grade model 15408 bolt cutters (Item #1) and microscopically compared against the cut piece of wire (Item #3). The cut piece of wire (Item #3) was Identified as having been cut by the Pro-Grade model 14508 bolt cutters (Item #1). Test standards were made using the Pro-Grade model 15408 bolt cutters (Item #1) and microscopically compared against the cut piece of wire (Item #2). The results of the microscopic comparisons were inconclusive.
ZU6YJ2	Examinations, showed that Item 2, was not cut by the Item 1 bolt cutters. Examinations, showed that Item 3, was cut by the Item 1 bolt cutters.
ZWAFMY	Item 1 is a compact bolt cutter bearing the trade name of “Pro-Grade.” The Item 2 wire bears toolmarks of value for future comparison purposes that are consistent with a pinching/shearing action. Due to a lack of sufficient corresponding microscopic marks of value, no conclusion could be reached as to whether the toolmarks present on the Item 2 wire were created by the Item 1 compact bolt cutters. Toolmarks present on the Item 3 wire were identified as having been produced by the Item 1 compact bolt cutters.

Additional Comments

TABLE 3

WebCode	Additional Comments
23EMWZ	The class characteristics of the toolmark present on Item 2 are similar to test toolmarks from Item 1 and the toolmark present on Item 3. However, there were no areas of similarities found in the individual characteristics between Item 2 and test toolmarks from Item 1 or the toolmark present on Item 3.
2YEC2Z	There are obvious similarities between the marks on Item 2 and those on tests from Item 1. Both bear parallel striae down the sides of the cut and impressed striae on the bottom surface of the cut. But microscopic comparison did not reveal any significant agreement of individual characteristics between Item 1 tests and Item 2.
34HQTV	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. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. 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 toolmarksto 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. The basis for a source exclusion conclusion is an Examiner's decision that two toolmarks can be differentiated by their class characteristics. A source exclusion based on general differences does not require a verification. However, a source exclusion based on a minor difference in a measured class characteristic requires a verification. 2) Source Identification: Source Identification is an Examiner's conclusion that two toolmarks originated from the same source. Conditions for a source identification include the degree of similarity being greater than the Examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and the degree of similarity being equivalent to that normally observed in toolmarks known to have been created by the same tool. The basis for a source identification conclusion is an Examiner's decision that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources. Before being reported, a source identification requires a verification to be completed. 3) Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and 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. The basis for an inconclusive conclusion is an Examiner's decision 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. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.
3JTF4B	From observations of the test toolmarks from item 1 with item 2, there are similarities betwen class characteristics and some individual characteristics. However, the latter are insufficient in terms of number for identification.
4G9QEW	Marks present on Item 2 were created by a pinching tool and bear the same class as Items 1 and 3; however, no marks were found to link Item 2 to Items 1 or 3.

TABLE 3

WebCode	Additional Comments
6N2LPZ	Item 01-02 was microscopically compared to Item 01-03 and to tests from the Item 01-01 bolt cutter. Similar class characteristics were noted (pinching); however, differences were also noted. Where the two cutting surfaces meet, a third surface with good marks was noted. On Item 01-02, the third surface had parallel with crosshatched marks. No crosshatched marks were observed on the tests from the Item 01-01 bolt cutter or the Item 01-03 wire. Due to a small surface area and a lack of information regarding what may have occurred to the tool surface after the toolmark was made, differences were insufficient. Due to the lack of agreement or disagreement of individual characteristics, Item 01-02 was unable to be identified or eliminated as having been cut by the Item 01-01 bolt cutter or the same tool as Item 01-03.
83UNCW	Inconclusive result*. During the comparison process multiple areas of similar individual characteristics were noticed when comparing to one cut side of Item 2. Having multiple areas of similarities lessened the significance of this agreement that was observed in these areas. None of the areas observed were sufficient enough for identification. However, there were insufficient differences in the individual characteristics for me to eliminate due to not having an additional piece of evidence that reproduced with the same pattern of individual characteristics as Item 2. Had another piece of evidence that had been cut by the same tool (and same area of the tool) as Item 2 been submitted then having that reproducible pattern would have potentially led to an elimination.
9GVNUR	The toolmarks present on test cuts from Item 1 and the toolmarks present on Item 3 bear similar class characteristics as the toolmarks present on Item 2 and cannot be eliminated as having been cut by the same tool. The toolmarks present on Item 2 lack sufficient agreement of individual characteristics to identify them as having been cut by Item 1.
9JD23U	The toolmarks on the piece of wire in Item 2 bear class characteristics consistent with those produced by the bolt cutters in Item 1, gross parallel striations on cut surface. However, due to insufficient reproducible individual characteristics, the toolmarks on the piece of wire in Item 2 could not be positively included or excluded as having been made by the bolt cutters in Item 1 to the exclusion of all other bolt cutters bearing the same class characterstics.
9XBF23	SHOULD ANY ADDITIONAL SUSPECTED TYPE OF BOLT CUTTERS BE RECOVERED, SUBMIT, AND REFER TO THE ABOVE CASE#. "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.
ABLUBG	Inconclusive given for Item 2 due to same class characteristics observed with Item 3, the additional piece of wire, and Item 1, the bolt cutters, and the small surface area of the tool marked item with individual characteristics present.
BDLP8N	Item 3 was inconclusive to the Item 1 tool due to agreement of class with insufficient agreement of individual characteristics.
CZ8473	The toolmarks on item 1-2-1 could neither be identified nor eliminated as having been made by item 1-1 bolt cutters. The inconclusive conclusion is based on an absence of either similarities or differences in the patterns of microscopic markings observed between item 1-2-1 toolmarks and the test toolmarks sufficient to effect a conclusion of identification or elimination, respectively.
E9HTCE	The test to test cut comparison showed clear matching striae and good correspondence from all four blade surfaces. The identification of the cut wire Item 3 to test cuts made with the boltcutters was reasonably straightforward and was found approximately halfway along the cutting blades. When comparing the test cuts to Item 2, it was noted that one side of the cut displayed a slightly finer pattern of striae than was typically seen in the test cuts made by the boltcutters, which were a little coarser and more prominent in nature. Given the test to test comparison displayed good quality and quantity of matching striae but no promising or even suggestive areas of matching striae beyond what was seen by chance could be found in the Item 2 cut wire, it was eliminated as having been cut by the boltcutters.
EUCNY8	The item 2 cut piece of wire bears similar in nature but insufficient microscopic marks to permit identification to the item 1 cutters.

TABLE 3

WebCode	Additional Comments
F32VUH	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. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. 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 toolmarksto 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. The basis for a source exclusion conclusion is an Examiner's decision that two toolmarks can be differentiated by their class characteristics. A source exclusion based on general differences does not require a verification. However, a source exclusion based on a minor difference in a measured class characteristic requires a verification. 2) Source Identification: Source Identification is an Examiner's conclusion that two toolmarks originated from the same source. Conditions for a source identification include the degree of similarity being greater than the Examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and the degree of similarity being equivalent to that normally observed in toolmarks known to have been created by the same tool. The basis for a source identification conclusion is an Examiner's decision that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources. Before being reported, a source identification requires a verification to be completed. 3) Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and 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. The basis for an inconclusive conclusion is an Examiner's decision 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. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.
F4DVPQ	The comparsion has been performed with a comparative microscope and accutrans casting material.
FWL4XQ	Item 2 was inconclusive as to being cut by the tool because there was agreement in discernable class characteristics and a lack of agreement or disagreement in the individual characteristics and pattern areas. An identification was not found, and there was a lack of data to support an elimination based on individual characteristics.
GFLXPE	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. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. If the class characteristics of the toolmarks are not clearly different, the examination

TABLE 3

WebCode	Additional Comments
	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 toolmarksto 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. The basis for a source exclusion conclusion is an Examiner's decision that two toolmarks can be differentiated by their class characteristics. A source exclusion based on general differences does not require a verification. However, a source exclusion based on a minor difference in a measured class characteristic requires a verification. 2) Source Identification: Source Identification is an Examiner's conclusion that two toolmarks originated from the same source. Conditions for a source identification include the degree of similarity being greater than the Examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and the degree of similarity being equivalent to that normally observed in toolmarks known to have been created by the same tool. The basis for a source identification conclusion is an Examiner's decision that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources. Before being reported, a source identification requires a verification to be completed. 3) Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and 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. The basis for an inconclusive conclusion is an Examiner's decision 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. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.
HRBYZU	Contact images were filed by us.
HX63ZD	Ex 2 displays diagonal striations on the impressed portion of the cut that may be damage obscuring some of the original impressed toolmark, or may be impressed striations from the original tool. Also, there was not another toolmark for comparison to Ex 2 to verify that these marks are repetitive. Due to the inability to identify the origin of these marks, the Ex 1 tool cannot be eliminated as having made the cut.
J2DUF6	Two methods were followed to compare item 2 and item 3. method 1: We used lead sheet as a control to compare both items. method 2: we cut the control wire(given within the test)in small pieces to compare both items. Both methods gave similar results and there was an agreement that item 1 was used to cut item 2 whereas item 3 wasn't.
JA77BX	Item 2 was inconclusive to the bolt cutter, Item 1, due to corresponding class characteristics with a lack of corresponding individual detail.
LG4DAX	The toolmarks on the wire (Item # 3) cannot be identified to the toolmarks made with the bolt cutters (item # 1), but they cannot entirely be excluded by their class characteristics. Therefore, the results are inconclusive.
LM8GVP	Several test cuts were made with the bolt cutters, described as follows: The first set of test cuts were taken from a flat lead sheet. Cut #1 was with the Pro Grade label to the left and the #15408 to the right; Cut #2 was taken with the Pro Grade label to the right and the #15408 to the left. A second set of cuts were also taken, in the same manner as described above, from a piece of rolled lead that was flattened. The test cuts and the evidence pieces of wire were microscopically compared and once an area of correspondence was noted, the bolt cutter was marked and a test cut using the supplied metal wire was taken. This was again microscopically compared and the results are as described below.
LWX3ZN	The individual characteristics observed on item 2 lacked sufficient agreement for identification to test

TABLE 3

WebCode	Additional Comments
	cuts from item 1.
NNWDP2	All discernible class characteristics between Item 2 and tests marks made with Item 1 matched. There was neither sufficient agreement nor disagreement between Item 2 and the test marks made with Item 1 to reach a conclusions of identification or elimination, therefore the conclusion reported was inconclusive.
PAV4H8	Exhibit 2 exhibited agreement of class characteristics; however, showed no agreement of individual characteristics. Due to variability in how toolmarks may reproduce and the agreement observed in the class characteristics a determination of Elimination was not reached.
PXG4LD	**Because of a lack of corresponding individual characteristics, the comparative examinations were inconclusive.
R67QFG	In reference to the above inconclusive statement pertaining to Item #2, [Laboratory] Firearm & Tool Mark procedures strictly prohibits elimination of evidence based solely on differences in individual characteristics. [Laboratory] FA/TM procedures only allows elimination of evidence when they exhibit differences in class characteristics.
RBWZPF	When compared to test cuts made with item #1, some agreement of individial stria was noted as was some disagreement. Neither the agreement or disagreement observed was sufficient to render an identification or elimination conclusion. Therefore, the result was inconclusive.
T7FZX7	Item 3 was inconclusive to Item 1 due to agreement of class and insufficent agreement of individual markings.
T9N6JG	Item 2 does not exhibit class differences from test marks of Item 1 (machining marks, dimensions, opposed jaw tool,etc). Per departmental policy, eliminations cannot be concluded solely based on individual characteristics, only if class characteristics are different. Differences in identifiable individual characteristics may suggest they were produced by a different tool.
UAWMAQ	A shaved piece of bright metal was located on the cut edge of the bolt cutters Item 1. This transfer material was collected for analysis by the Forensic Chemical Trace Unit. (Collected but not for analysis). The klipper cut as opposed to centre cut bolt cutters were sampled using the sample wire and marking each cut with the following; 1N & 1W, 2N & 2W, 3N & 3W, 4N & 4W where 1 was closest to the Strap with 4 closest to the tip end of the cutting blade. N represented the close cut side and W the wide side. Test cut 2W was identified to the sample wire Item 3.
UNUNWY	The toolmarks on the piece of wire in item 001-02 was inconclusive as having been made by the bolt cutters in item 001-01 based on the insufficient agreement or disagreement of individual characteristics.
V3B3BH	The questioned toolmarks on Item 2 were found to be in significant disagreement of individual characteristics with those made using the suspect's bolt cutter. The questioned toolmarks on Item 3 were found to be in agreement of appearance of the cut, and in sufficient agreement of individual characteristics with those made using the suspect's bolt cutter.
WCVW37	Current policy does not allow examiner to eliminate based on differences in individual characteristics; therefore, Item 2 is reported as inconclusive instead of an elimination.
WJXU3V	Item 2, the cut wire, had individual characteristics of comparison value. All discernible class characteristics possessed by Item 2 agree with the submitted tool, Item 1. However, there was insufficient individual characteristics to either identify or eliminate Item 1 from having cut Item 2.
WK726N	The side of the jaws of item 1 that was laser etched with the name 'PRO-GRADE' was the side of the jaws that cut item 3.
XVL6ZZ	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. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison.

TABLE 3

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	First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. 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 toolmarksto 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. The basis for a source exclusion conclusion is an Examiner's decision that two toolmarks can be differentiated by their class characteristics. A source exclusion based on general differences does not require a verification. However, a source exclusion based on a minor difference in a measured class characteristic requires a verification. 2) Source Identification: Source Identification is an Examiner's conclusion that two toolmarks originated from the same source. Conditions for a source identification include the degree of similarity being greater than the Examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and the degree of similarity being equivalent to that normally observed in toolmarks known to have been created by the same tool. The basis for a source identification conclusion is an Examiner's decision that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources. Before being reported, a source identification requires a verification to be completed. 3) Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and 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. The basis for an inconclusive conclusion is an Examiner's decision 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. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.
YAF9GW	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. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. 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 toolmarksto 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. The basis for a source exclusion conclusion is an Examiner's decision that two toolmarks can be differentiated by their class characteristics. A source exclusion based on general differences does not require a verification. However, a source exclusion based on a minor difference in a measured class characteristic requires a verification. 2) Source Identification: Source Identification is an Examiner's conclusion that two toolmarks originated from the same source. Conditions for a source identification include the degree of similarity being greater than the Examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and the degree of similarity being equivalent to that normally observed in toolmarks known to have been created by the same tool. The basis for a source identification conclusion is an Examiner's decision that the observed

TABLE 3

WebCode	Additional Comments
	class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources. Before being reported, a source identification requires a verification to be completed. 3) Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and 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. The basis for an inconclusive conclusion is an Examiner's decision 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. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.
YVG83A	Current policy allows for elimination on differences in class characteristics only. Class characteristics observed on Item 2 were reproduced by Item 1 on test cuts of the supplied wire.
ZWAFMY	The shape of the cut end of Item 2 is somewhat different than Item 3 and a slow, controlled test cut with Item 1. However, I was able to reproduce the Item 2 shape by twisting Item 1 while cutting a wire, therefore I can't exclude on this feature. Some non-parallel marks are present on Item 2 that could be use/abuse type imperfections from the edge of the pinching/shearing surface that cut the wire. Since Item 1 does not have any prominent use/abuse marks, the only plausible scenario that includes Item 1 as the source of the marks on Item 2 is if the working surfaces of Item 1 were "cleaned up," or ground, after Item 1 cut Item 2. Item 1 does not show any signs of this process, although if it was done carefully and expertly, perhaps it would not be noticeable. Despite all of the above, in which the preponderance of evidence supports the proposition that Item 2 was marked by a different tool, the operative SOP only permits exclusions when a demonstrable class difference exists. I did not find any class differences as defined in the SOP (intentional design decisions of the manufacturer and minor variations in tool dimensions that are within manufacturer specifications). I also found no similarities in the patterns of individual toolmarks; therefore, Inconclusive was the only available option under the SOP.

-End of Report-
(Appendix may follow)

Collaborative Testing Services ~ Forensic Testing Program

Test No. 19-529: Toolmarks Examination

DATA MUST BE SUBMITTED BY **Nov. 12, 2019, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A WebCode: VEAJWF

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 salvage yard in which multiple vehicle parts were stolen. Investigators believe the perpetrator cut the fence to gain access. A suspect was apprehended later that day and police seized a pair of bolt cutters from his possession. Investigators are requesting that you examine the toolmarks on the submitted wire and determine if either could have been cut using the bolt cutters recovered from the suspect.

Please note the following:
-The painted end of each wire is not to be used in the examination. The color used on each wire is listed in its corresponding item description.
-Additional pieces of wire have been included in the sample pack for testing purposes.

Items Submitted (Sample Pack T2):
Item 1: Bolt cutters recovered from the suspect.
Item 2: First cut piece of wire. (painted blue)
Item 3: Second cut piece of wire. (painted red)

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

	Yes	No	Inconclusive*
Item 2:	○	○	○
Item 3:	○	○	○

*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)