



Toolmarks Examination Test No. 24-5281 Summary Report

Each sample set contained one folding knife and two pieces of blue tubing containing questioned toolmarks. Participants were asked to examine these items using their existing protocols. Data were returned from 121 participants and are compiled into the following tables:

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

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

Manufacturer's Information

Each sample set contained one Sheffield® drop point blade folding knife (Item 1) and two pieces of blue tubing containing questioned toolmarks (Items 2 and 3). Participants were asked to determine if any of the questioned toolmarks were made by the submitted tool (Item 1).

SAMPLE PREPARATION: The blue tubing was cut into 2" questioned pieces and paint was applied to one end of each piece. Item 2 received a white paint mark and Item 3 received a red paint mark.

ITEMS 1, 2, & 3 (IDENTIFICATION MARKS): The Item 1 folding knife was used to puncture both pieces of tubing, Items 2 and 3. After which, the pre-labeled folding knife was packaged in bubble wrap. The questioned pieces of tubing, Items 2 and 3 were placed into their respective pre-labeled envelopes and sealed.

SAMPLE SET ASSEMBLY: The corresponding Item 1 folding knife and the pieces of questioned tubing, Items 2 and 3, were packaged into a pre-labeled sample set box along with four additional 5" pieces of tubing for testing purposes.

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

Summary Comments

This test was designed to allow participants to assess their proficiency at a toolmark examination involving impression, stab/puncture marks. Participants were supplied with one folding knife (Item 1) and two pieces of blue tubing containing questioned toolmarks (Items 2 and 3). The Items 2 and 3 blue tubing were punctured by the Item 1 tool. Refer to the Manufacturer's Information for preparation details.

Of the 121 responding participants, 101 (83%) identified both Items 2 and 3 as having been punctured by the Item 1 folding knife. Sixteen either eliminated or were inconclusive for both of the questioned items as having been punctured by the Item 1 folding knife, and the remaining four participants identified Item 2 and eliminated Item 3 as having been punctured by the Item 1 folding knife.

Examination Results

Did the suspect's folding knife (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of tubing (Items 2 or 3)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
28HA6C	Yes	Yes	7K69X9	Yes	Yes
29XFT2	Yes	Yes	7LLBWU	Yes	Yes
2ANR48	Yes	Yes	7LV839	Yes	Yes
2HXWGX	Yes	Yes	86DG3Z	Yes	Yes
2HZHCD	Yes	Yes	8DB9BU	Yes	Yes
2QDNU3	Yes	Yes	8QDMP7	Yes	Yes
2R4249	Yes	Yes	8Y68K7	Inc	No
2W2GZB	Yes	Yes	8YBANW	Yes	Yes
34H863	Inc	Inc	9F9ZR6	Yes	Yes
36U4B8	Yes	Yes	9J7G6Y	Yes	Yes
3D67W8	Yes	Yes	9VEKU4	No	No
3G23UD	No	No	9Z6V63	Yes	Yes
3G2Z69	Yes	Yes	A3HQH6	Yes	Yes
3K2EPD	No	No	AJM44T	Yes	Yes
47Y6L4	Yes	Yes	ARZAQY	No	No
4FK72D	Yes	Yes	AVLPP7	No	No
4LD2AD	Yes	Yes	B3EGA6	Yes	Yes
4UCMHZ	Yes	Yes	B7DT76	Yes	Yes
4X6W2D	Yes	Yes	BBC69W	Yes	Yes
4ZDZXA	Yes	Yes	BF8VGU	Yes	Yes
62HWX6	Yes	Yes	BRBBCW	No	No
6PBXEX	Yes	Yes	BXR6R4	Yes	Yes
6T8VC4	Yes	Yes	C9ULC6	Yes	Yes
76GVL3	Yes	Yes	CAVCQZ	Yes	Yes
7JJ4PB	Yes	Yes	DK9WM2	Yes	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
DPH8LM	Yes	Yes	LRXA3T	Yes	Yes
DTGDB2	Yes	Yes	M8PPLJ	Yes	Yes
DUQFN2	Yes	Yes	MAFNZH	Yes	Yes
E324BX	Yes	Yes	MJVPWR	Yes	Yes
E8GLE2	Yes	Yes	MKX8JE	Yes	Yes
EFBPNP	Yes	Yes	MNXKYQ	Yes	Yes
FEPPUY	Yes	Yes	MVFPCK	Inc	Inc
FX6YUY	Yes	Yes	MYCMCC	Yes	Yes
G6H8V2	Yes	Yes	NFGDRL	Yes	Yes
GCKG3T	Yes	No	NTQY6D	Yes	Yes
GTEC4X	Yes	Yes	PAK9CM	Yes	Yes
HBY43W	Yes	Yes	PEZGYL	Yes	Yes
HCVJNR	No	No	PFRQTN	Yes	Yes
HKEURK	Yes	Yes	PK8XGM	Yes	Yes
HVCV6P	Yes	Yes	PMEB6G	Yes	Yes
HYR4TN	Yes	Yes	PR6YBL	Yes	Yes
JCWL4N	Yes	Yes	PTKW3L	Yes	No
JKAU6Q	Yes	Yes	PXWX9P	Yes	Yes
JPZCEV	Yes	Yes	QU84QF	Yes	Yes
JXETFH	Yes	Yes	QVKHEP	Yes	Yes
K34UPV	Yes	Yes	RVH6CE	Inc	Inc
K8K3DU	Yes	Yes	T4MQML	Yes	No
KA7YLK	Yes	Yes	T4RUPD	No	No
L2LABP	Yes	Yes	T8R6LC	Yes	Yes
L2RDDG	Yes	Yes	TDTJ2M	Yes	Yes
L6QQXL	Yes	Yes	U2FLVH	Yes	Yes
LAWCVQ	Yes	Yes	U84B8F	Yes	Yes
LMLBMT	Yes	Yes	UB9P78	Yes	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
UTJV6G	Yes	Yes			
UZW6WJ	Yes	Yes			
V6WE2H	No	No			
V82ZR4	No	No			
WEXD9H	Yes	Yes			
WZ7TBF	No	No			
WZF8DH	Yes	Yes			
XKJJC9	Yes	Yes			
YBQJJC	Yes	No			
YF3CN9	Yes	Yes			
YLAXME	Yes	Yes			
YTTAQ8	Yes	Yes			
YYDHMH	Inc	Inc			
ZAN93Y	Yes	Yes			
ZEKY9B	Yes	Yes			

Response Summary		Total Participants: 121	
<i>Did the suspect's folding knife (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of tubing (Items 2 or 3)?</i>			
	<u>ITEM 2</u>	<u>ITEM 3</u>	
Yes	105 (86.8%)	101 (83.5%)	
No	11 (9.1%)	16 (13.2%)	
Inc	5 (4.1%)	4 (3.3%)	

Conclusions

TABLE 2

WebCode	Conclusions
28HA6C	Examined the two specimens marked #2 and #3. They are portions of blue tubing. Each specimen exhibits a cut defect. Examined the specimen marked #1. It is a Sheffield folding knife. The two portions of cut tubing (#2 and #3) were compared microscopically against test cuts and identified as having been made by the submitted knife (#1).
29XFT2	The questioned marks have been compared to the references created using the knife. The class characteristics didn't show clear discrepancy. Therefore, each mark has been compared at macroscopical level. The comparison between the Item 2 and the references created by using the suspect's knife highlighted a high level of correspondance. The same observation has been done between Item 3 and the traces left by the suspect's knife. These observations strongly support the hypothesis of a common source between the observed marks on the questioned Items and the reference samples.
2ANR48	The cut sections of tubing in items #2 and #3 were visually examined and a linear, puncture defect was located in each section. Toolmarks present in the defects were microscopically compared to test punctures made using the knife submitted as item #1. The following conclusion was reached: The punctures in items #2 and #3 were microscopically identified as having been made by the knife of item #1.
2HXWGX	Upon the examination, it is possible to conclude that the suspect's folding knife (Item 1) did produce the questioned toolmarks on the submitted cut pieces of tubing (Items 2 and Item 3).
2HZHCD	The toolmarks observed on the Items A1-2 and A1-3 pieces of flexible hose are consistent in class characteristics with the Item A1-1 folding knife. Item A1-1 was compared to items A1-2 and A1-3. The Items A1-2 and A1-3 toolmarks were examined, compared microscopically, and identified as having been produced by the Item A1-1 folding knife. An Identification conclusion is based on an examiner's determination that all discernible class and individual characteristics agree such that the extent of agreement exceeds that which has been demonstrated by toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been made by the same tool.
2QDNU3	Tool Mark Analysis: Methodology: Physical (Visual Examination). Microscopy (Comparison Microscope). Test marks were made with Item 1, the Sheffield lock-blade knife, using submitted testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool marks on Items 2 and 3, the blue vinyl tubes, were made with Item 1, the Sheffield lock-blade knife, based upon corresponding class and individual microscopic characteristics.
2R4249	The toolmarks found on Item 2 and Item 3 were made by Item 1.
2W2GZB	Examinations showed that the tool marks on Item 2 were produced by the Item 1 folding knife. Examinations showed that the tool marks on Item 3 were produced by the Item 1 folding knife.
34H863	My examination indicates class characteristics of the toolmarks (cut pieces of tubing) relate to the tool (folding knife) provided. Both Items of tubing indicate they have been pierced with the point of a knife creating a 'V' shape visible under magnification using the VisionX Projectina comparison microscope. The measurements of the tool provided and the discernible test marks were agreed to be compatible. However, the striated marks of the toolmark were unable to be reproduced despite numerous attempts. Therefore the results are more probable the folding knife (tool) did not produce the questioned toolmark on either of the cut pieces of tubing.
36U4B8	Item 1.1 is one Sheffield brand folding knife. Test cuts were made using Item 1.1 and tubing submitted with it. Items 1.2 and 1.3 are two pieces of blue colored tubing each having a defect consistent with being caused by a single bladed tool. The defects in Items 1.2 and 1.3 were microscopically compared to the test cuts made using Item 1.1. Based on agreement of all discernible class characteristics and corresponding individual detail, Item 1.1 was identified as having caused the defects in Items 1.2 and 1.3.
3D67W8	The item 1.1 knife was examined and test standards were made for future reference and comparison purposes. Upon exam completion, the test standards were returned to container 1. Agreements of

TABLE 2

WebCode	Conclusions
	class and sufficient agreement of individual characteristics confirmed the item 1.2 and 1.3 pieces of plastic tubing were cut by the item 1.1 knife.
3G23UD	1. Examinations showed Item 2 and Item 3 were not cut by Item 1 due to differences in individual marks. 2. Examinations showed Item 2 and Item 3. were cut by the same unknown cutting tool.
3G2Z69	The punctures present in the two pieces of tubing (Items 2 and 3) were identified as having been produced by the Sheffield brand folding knife (Item 1). Agreement of the characteristics is sufficient to determine that the knife is the source of the toolmarks.
3K2EPD	The pipes delivered, Items 2 and 3, were not cut by the folding knife Item 1.
47Y6L4	A comparison of the tool marks on the two pieces of tubing in items 2 and 3 with test marks made using the suspected folding knife, item 1 was undertaken. A high degree of correspondence was noted between the marks on both items 2 and 3 and the test marks made using the knife, item 1. I have considered the proposition that the tool marks on the pieces of tubing in items 2 and 3 were made using the suspected folding knife, item 1; the results of this examination provide conclusive support for this proposition.
4FK72D	Results of Examinations: Item 1 is a Sheffield brand folding knife that uses a slicing action. Item 2 and Item 3 are pieces of blue tubing that contain toolmarks consistent with a slicing action. Toolmarks present on the Item 2 and Item 3 tubing were identified as having been produced by the Item 1 knife.
4LD2AD	Both of the Items 01-02 and 01-03 pieces of blue tubing were identified as having been punctured by the Item 01-01 knife. One piece of the Item 01-04 pieces of blue tubing was used in the generation of test punctures.
4UCMHZ	Tool Mark Analysis: Methodology: Physical (Visual Examination). Microscopy (Comparison Microscope). Test marks were made with Item 1, the Sheffield knife, using submitted standard testing media. Item 1A, the test marks/casts, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Items 2 and 3, the tubes, were made with Item 1, the Sheffield knife, based upon corresponding class and individual microscopic characteristics.
4X6W2D	The two (2) pieces of blue vinyl, item 2 and item 3, were both identified as having tool marks (stab marks) that were created by the Sheffield folding knife, item 1.
4ZDZXA	Items 2 and 3 were microscopically compared with test specimens produced by the Item 1 knife, revealing correspondence of class characteristics and individual distinguishing characteristics. It was concluded that the stab marks in Items 2 and 3 were made by the Item 1 knife blade.
62HWX6	(1) This knife was used to make test marks. (2 and 3) The puncture/toolmarks in Items 2 and 3 have been examined and compared microscopically with each other and tests made using the submitted knife, Item 1. Based on the observed agreement of their class characteristics and sufficient agreement of their individual characteristics, the toolmarks in Item 2 and 3 were made by Item 1.
6PBXEX	1. Examination of Exhibit 1 revealed one Sheffield brand folding knife designed to be used as a single edge slicing tool. Exhibit 1 was used to create the Exhibit 1.1 test standards. 2. Examination of Exhibits 2 and 3 revealed each consists of one cut piece of blue tubing displaying damage consistent with that caused by a single edge slicing tool. A. The toolmarks on Exhibits 2 and 3 are suitable for microscopic comparison. B. The toolmark on Exhibit 2 measures 14.04 mm long. C. The toolmark on Exhibit 3 measures 14.00 mm long. 3. Microscopic comparison revealed the damage on Exhibits 2 and 3 were caused by the Exhibit 1 tool due to sufficient agreement of individual characteristics.
6T8VC4	The Item 1 knife was examined and determined to be a Sheffield brand stainless steel folding knife. The knife was in working condition with no visible damage. The Items 2 and 3 blue tubing were examined and each contained a toolmark with the appearance of a stab mark. The toolmark area of each item was excised to aid with microscopic comparison. The toolmarks present on Items 2 and 3 were microscopically compared to tests made using the Item 1 knife and the supplied blue tubing. The Item 1 knife was identified as having made the questioned toolmarks in both Items 2 and 3 due to sufficient agreement of individual characteristics. The significance of these identifications is made to the practical, not absolute, exclusion of all other tools.
76GVL3	Our examination with a comparison light microscope leads us to the following conclusion: Item 2

TABLE 2

WebCode	Conclusions
	(white) The toolmarks on the piece of tubing (Item 2) and the comparison marks made by the folding knife (Item 1) show numerous well matching marks with general and individual characteristics. The toolmarks (Item 2) were caused by the folding knife (Item 1). Item 3 (red) The toolmarks on the piece of tubing (Item 3) and the comparison marks made by the folding knife (Item 1) show numerous well matching marks with general and individual characteristics. The toolmarks (Item 3) were caused by the folding knife (Item 1).
7JJ4PB	Item 1 is a "SHEFFIELD®" brand single-edged folding knife. Item 2 and Item 3 each consist of a blue-colored piece of rubber tubing with a punctured/sliced region in the approximate center. The interior walls of each punctured/sliced region bear toolmarks of value. Toolmarks present on the Item 2 and Item 3 pieces of rubber tubing were identified as having been produced by the Item 1 folding knife.
7K69X9	Results of Examinations: Item 1 is a folding single bladed knife manufactured by Sheffield. Item 2 and Item 3 are two segments of tubing, each bearing a toolmark from a puncture/slicing action. Toolmarks present on the Item 2 and Item 3 tubing were identified as having been produced by the Item 1 knife.
7LLBWU	An excellent correspondence of matching striae was found between the cuts in both lengths of tubing (items 2 and 3) and test cuts made using the folding knife (item 1). In subjectively interpreting the toolmark evidence, I have considered the likelihood of observing this correspondence if the folding knife made the cuts in the two lengths of tubing, as opposed to finding the correspondence if the cuts in the two lengths of tubing were made by another knife. Given the vast range of knives available and the expected differences in the striae they produce, in my opinion the finding of corresponding striae provides extremely strong support for the suggestion that the folding knife made the cuts in both lengths of tubing, as opposed to another knife. I have chosen the term 'extremely strong support' from the following scale: neutral, slight support, moderate support, strong support, very strong support, and extremely strong support. This scale can be used to indicate the level of support for either proposition.
7LV839	I examined the cut pipes mentioned and compared the individual and class characteristics markings transferred to them by the knife and found that the cut pipes marked 65572/24 A2+A3 were cut by the knife marked 65572/24 A1.
86DG3Z	The toolmarks present on the Item 2 and Item 3 tubing were microscopically identified as having been made by the Item 1 knife.
8DB9BU	On the 23rd of February 2024, I received a box sealed with evidence tape and labelled, CTS test # 24-5281. The test contained three envelopes that were labelled items 1-3 and four 20mm blue pressure hoses approximately 120mm long, that were packed loosely with the three envelopes. These four pieces were not labelled or listed in the scenario notes, but it is practical that they are to be used as a test comparison. Item 1 – A yellow sealed envelope containing a metallic grey folding knife being a Sheffield brand with a single edge blade 17mm wide at its widest point. Item 2 – A yellow sealed envelope containing a blue 20mm plastic pressure hose approximately 60mm long with manufacturer unknown. The hose was marked with white paint. Item 3 - A yellow sealed envelope containing a blue 20mm plastic pressure hose approximately 60mm long with manufacturer unknown. The hose was marked with red paint. I downloaded a scenario and instructions that corresponded with the test. The instruction stated that both ends of the sections of plastic pressure hoses (Item 2 & 3) had been cut by a hose cutter and not to examine the ends, the cut that was to be examined was near the centre of the hose. Upon inspection, item's 2 & 3 contained a penetrating cut near the centre of the hose. The penetrating cut was approximately 16mm long and had a 'Y' section at one end which is indicative of a single edge blade knife being pressed into the tube with the 'Y' being created by the spine of the knife. Item 1, Sheffield knife appeared to be of good condition with a sharp blade. At the time of receiving, the knife was folded as per its design. Four test cuts were performed using item 1 Sheffield knife with the four loose pieces of the 20mm blue pressure pipe. When item 1 was pushed into the test tubing, it exhibited a 'Y' mark at the end where the spine makes contact. These were labelled A, B, C, D before being cut open so they could be compared with a corresponding test hose. I conducted a visual and comparative microscopic examination of the corresponding segments of test hose A and C, using the comparison microscope. The comparison microscope is a highly specialised optical instrument that allows two objects to be simultaneously examined under the same magnification, as a

TABLE 2

WebCode	Conclusions
	<p>composite image. Along the cut sections of both pieces of hose, were randomly positioned striation marks. These marks were compared resulting in an overwhelming amount of corresponding striation marks identified. This test was repeated with test hose B and D, resulting in an overwhelming amount of corresponding striation marks identified. The cut extremities on items 2 and 3 were identified and marked before being cut open and labelled accordingly to expose the area damaged by the offender. I conducted a visual and comparative microscopic examination of the segments of item 2 and compared it with test hose B. Along the cut sections of both pieces of hose, were randomly positioned striation marks. When compared to both the test hose B and item 2, there were an overwhelming amount of corresponding striation marks identified. Given the pronounced and random arrangement of the numerous microscopic features I observed on the test hose B, and the overwhelming degree of the matching striations I observed when comparing it to item 2, In my opinion, the probability that some other similar knife randomly chosen, could create by chance, the overwhelming degree of matching striations I observed in item 2 and the test hose B, is so remote as to be a practical impossibility. I conducted a visual and comparative microscopic examination of the segments of item 3 and the test hose B. Along the cut sections of both pieces of hose, were randomly positioned striation marks. When compared to both test hose B and item 3, there were an overwhelming number of random striation marks that corresponded. Given the pronounced and random arrangement of the numerous microscopic features I observed on test hose B and the overwhelming degree of the matching striations I observed when comparing it with item 3, In my opinion, the probability that some other similar knife randomly chosen, could create by chance, the overwhelming degree of matching striations I observed in item 3 and the test hose B, is so remote as to be a practical impossibility. I base this on the following; 1. Both the test subject and items 2 & 3 were examined at the same point of the cut. 2. Both items 2 & 3 when compared to the test B hose showed overwhelming corresponding striation marks. 3. A further test, (2a) was performed using another Sheffield knife that had the same class characteristics and sub class characteristics as item 1. This test was designed to establish if another randomly chosen knife could make the same positional striation marks as item 1. The test provided the following conclusion. a. I performed a visual and comparative microscopic examination of the segments of item 2 and the test hose 2a. Along the cut sections of both pieces of hose, were randomly positioned striation marks. b. When compared to both test 2a and item 2, there was an insufficient number of random striation marks that corresponded. In my opinion for a randomly selected knife to make corresponding marks at item 1, is so remote as to be a practical impossibility.</p>
8QDMP7	Examinations showed the tool marks on Item 2 and Item 3 were made by Item 1.
8Y68K7	After the examination on the item 2 and 3 (tubes) with respect to item 1 (knife) by class characteristic . It was found that that item 1 (knife) was not used on the item 3 (red mark tube), whereas for the item 2 (white tube) we found out it to be inconclusive.
8YBANW	Tool Mark Analysis: Methodology: Physical (Visual Examination). Microscopy (Comparison Microscope). Test marks were made with Item 1, the Sheffield folding knife, using submitted testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool marks on Items 2 and 3, the blue rubber tubes, were made with Item 1, the Sheffield folding knife, based upon corresponding class and individual microscopic characteristics.
9F9ZR6	In my opinion Item 1 was used to cut Items 2 and 3 - CONCLUSIVE ASSOCIATION
9J7G6Y	Based on microscopic comparisons, in the opinion of the laboratory: The toolmarks on items 1-2-1 and 1-3-1 tubing were identified as having been created by item 1-1-1 knife.
9VEKU4	Item 2 and item 3 were cut with the same tool. But item 1 was not used to cut item 2 and 3.
9Z6V63	Item 2: First cut piece of tubing (marked with white paint) and Item 3: Second cut piece of tubing (marked with red paint) were produced by the tool marked Item 1 (folding knife recovered from the suspect).
A3HQH6	1. The tool marks present on the piece of plastic tubing, described in item 2, were produced by the folding knife described in item 1 (identification). 2. The tool marks present on the piece of plastic tubing, described in item 3, were produced by the folding knife described in item 1 (identification).
AJM44T	Toolmark Analysis: Methodology – Physical (Visual Examination). Microscopy (Comparison

TABLE 2

WebCode	Conclusions
	Microscopy). Test marks were made with Item 1, the Sheffield knife, using the submitted testing material. Item 1A, the test marks and casts, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool marks on Items 2 and 3, the cut pieces of tubing, were made with Item 1, the Sheffield knife, based upon corresponding class and individual microscopic characteristics.
ARZAQY	Visual and microscopic analyses of the evidence items containing the questioned toolmarks Q1 (Item 2) and Q2 (Item 3) and the reference standards created from the folding knife K1 (Item 1) were performed and the results of the examinations and comparisons are as follows: The toolmarks present on Q1 (Item 2) and Q2 (Item 3) were identified as having been produced by the same tool based on agreement of all discernible class characteristics and sufficient agreement of individual characteristics. The toolmarks present on Q1 (Item 2) and Q2 (Item 3) were excluded as having been produced by the folding knife K1 (Item 1) based on sufficient disagreement of individual characteristics.
AVLPP7	Lab Items #1 (Sheffield folding knife), #2 (cut piece of blue tubing, cut edge marked with white paint), and #3 (cut piece of blue tubing, cut edge marked with red paint) were examined and microscopically compared on 2/13/2024. Based on agreement of all discernible class characteristics and sufficient disagreement of individual characteristics, the toolmarks on Lab Items #2 (cut piece of blue tubing) and #3 (cut piece of blue tubing) were eliminated as having been created using Lab Item #1 (Sheffield folding knife). Based on agreement of all discernible class characteristics and sufficient agreement of individual characteristics, the toolmarks on Lab Items #2 (cut piece of blue tubing) and #3 (cut piece of blue tubing) were positively identified as having been created using the same tool.
B3EGA6	Toolmarks present on Items 2 and 3 were microscopically examined and identified as having been cut by the Item 1 knife, based on corresponding class and individual characteristics. Two tests produced using Item 1 and laboratory stock material are being returned as Item 1T in Container 1 and should be maintained for possible future examinations.
B7DT76	The pocketknife (1-01) was functional. The two pieces of cut tubing (1-02 and 1-03) were identified as having been cut by the pocketknife (1-01) due to consistent and repeatable pattern areas of marks. The four piece of tubing (1-04) were submitted as test material and were used to make comparison samples.
BBC69W	The toolmarks found on exhibits 2 and 3 were identified as having been made by exhibit 1, the submitted folding knife.
BF8VGU	As a result of my examination, I formed the opinion that the folding knife listed as item 1 had cut both pieces of tubing listed as items 2 and 3.
BRBBCW	The visual and microscopic analyses of the toolmarks present on evidence cut plastic tubing pieces Items 2 and 3 and toolmarks created utilizing test tubing by K1 Item 1 suspect folding knife were initiated on 3/25/2024 and the results of the comparisons and evaluations are as follow: Based on agreement of class characteristics and agreement of individual characteristics, the toolmarks present on Items 2 and 3 plastic tubing are identified as having been created with the same unknown tool. A conclusion of identification is based on an analyst's determination that all discernible class and individual characteristics agree such that the extent of agreement exceeds that which has been demonstrated by toolmarks known to have been made by different tools (Known Non Matches) and is consistent with the agreement demonstrated by toolmarks known to have been made by the same tool (Known Matches). Based on disagreement of individual characteristics, the toolmarks on Items 2 and 3 were excluded from having been created with K1 Item 1 folding knife. A conclusion of exclusion is based on an analyst's determination that the observed characteristics of the items in question were marked with different tools.
BXR6R4	3. On 2024-02-29 during the performance of my official duties I received an intact sealed evidence bag with number PA4003884520 marked inter alia CTS 24-5281F from Case Administration of the Ballistics Section. I opened the bag and found the following exhibits: 3.1: One (1) "Sheffield" stainless steel folding knife marked by me "63818/24 1". 3.2: Two (2) cut pieces of blue rubber tubing marked by me "63818/24" each and "2" and "3" respectively. 4. The intention and scope of this forensic examination comprise of the following Ballistics techniques: 4.1: The examination of tools and toolmark related materials. 4.2: Microscopic individualization of toolmarks. 5. I examined the folding

TABLE 2

WebCode	Conclusions
	knife mentioned in paragraph 3.1 and made replications for test purposes marked as "63818/24 1A" and "63818/24 1B" respectively. 6. I compared the individual and class characteristic markings on the two (2) cut pieces of tubing and the test replications mentioned in paragraphs 3.2 and 5 respectively, using a comparison microscope and found: 6.1: The marks on the two (2) cut pieces of tubing mentioned in paragraph 3.2 were produced by the folding knife mentioned in paragraph 3.1.
C9ULC6	Item 1 is a folding knife sold under the Sheffield trade name, which uses a slicing type action. Items 2 and 3 are both blue pieces of tubing bearing toolmarks of value from a single bladed tool that punctured the walls of the tubing. Toolmarks present on the Item 2 and Item 3 pieces of tubing were identified as having been produced by the Item 1 knife.
CAVCQZ	Examinations showed the toolmarks on Item 2 were created by Item 1. Examinations showed the toolmarks on Item 3 were created by Item 1.
DK9WM2	The Item 1 knife was examined and two (2) test marks were produced using submitted tubing material. The tests produced are being maintained for possible future examinations. Item 2, Item 3, and the test marks produced using Item 1 were microscopically examined. Toolmarks present on Items 2 and 3 were identified as having been produced by the Item 1 tool based on corresponding class and individual characteristics.
DPH8LM	A comparison microscopic examination of the suspect toolmarks (stabmarks) (items 2 and 3) and tests made by the suspect knife (item 1) revealed they had been made by the same knife.
DTGDB2	[No Conclusions Reported.]
DUQFN2	3. On 2024-02-26 during the performance of my official duties I received an intact sealed evidence bag with numbers PA4003884519 marked inter alia CTS 24-5281E from Case Administration of the Ballistics Section. I opened the bag and found the following exhibits: 3.1: One (1) unknown manufacturer Sheffield folding knife marked by me "63721/24 1". 3.2: Two (2) blue pieces of hose tubing marked by me "63721/24" each and "2" and "3" respectively. 3.3: Four (4) blue pieces of hose tubing not marked by me. 4: The intention and scope of this forensic examination comprise of the following Ballistics techniques: 4.1: Microscopic individualization of toolmarks. 4.2: Examination of tools and toolmark related materials. 5. I examined the folding knife mentioned in paragraph 3.1 and made replicas for test purposes. as follows: 5.1: Tests were cut using the folding knife mentioned in paragraph 3.1 from the hose tubing mentioned in paragraph 3.3. 5.2: Five (5) tests were cut as mentioned in paragraph 5.1 marked by me T1A, T1B, T2A, T2B, T3A, T3B, T4A, T4B, T5A and T5B respectively. 6. I compared the individual and class characteristic markings on the exhibits mentioned in paragraph 3.2 with the tests mentioned in paragraph 5.2 marked T1A, T1B, T2A, T2B, T3A, T3B, T4A, T4B, T5A and T3B using a comparison microscope and found: 6.1: The marks on the exhibits mentioned in paragraph 3.2 were produced by the folding knife mentioned in paragraph 3.1.
E324BX	Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the polymer hose segments, Laboratory Items 2 and 3, were identified as having been created by the use of the knife, Laboratory Item 1.
E8GLE2	Examinations showed the tool marks present on Item 2 (D-1) and Item 3 (D-2) were created by Item 1.
EFBPNP	Test cuts (Item 1.TC) were made using the Item 1 knife and retained in the laboratory. The slit/cuts in the Item 2 and 3 tubing were identified as having been made by the Item 1 knife. Identification is the strongest level of positive association.
FEPPUY	I concluded that the questioned toolmarks on both of the submitted pieces of tubing, Item 2 and Item 3, were produced by the same tool, that is, the suspect's folding knife, Item 1.
FX6YUY	Corresponding fine detail was observed between the cast of a test mark made using Item 1, and the casts taken from the cut/damaged area of both Item 2 and 3. I consider the likelihood of observing this level of correspondence, had the submitted knife (Item 1) not been used to puncture the submitted sections of tubing (Items 2 and 3), to be so remote, it can be excluded as a practical possibility. Therefore, in my opinion the findings show conclusively that the submitted knife (Item 1) was used to puncture the two sections of tubing (items 2 and 3).

TABLE 2

WebCode	Conclusions
G6H8V2	Results of Examinations: Item 1 is a Sheffield brand stainless steel single blade folding knife which uses a slicing/puncturing action. Items 2 and 3 are blue vinyl hoses which each exhibit a puncture consistent with having been created by a single blade cutting tool. The toolmarks present on the Item 2 and Item 3 hoses were identified as having been produced by the Item 1 knife.
GCKG3T	I compared the toolmark of the item 2 and 3 with the toolmark by item 1 folding knife using comparison microscope. Toolmark of Item 2 is exactly matched to the toolmark producing by item 1.
GTEC4X	I examined the cut pipes marked with lab nr 65572/24 item 2 and 3 and compared individual and class characteristics markings transferred to them by folding knife marked with lab nr 65572/24 item 1 and found that both items were cut by the knife marked item 1.
HBY43W	Item 2: First cut piece of tubing (marked with white paint) and Item 3: Second cut piece of tubing (marked with red paint) were produced by the tool marked Item 1 (folding knife recovered from the suspect).
HCVJNR	The item 2 and 3 sections of hose are eliminated as having been cut by the item 1 knife. The item 2 and 3 sections of hose are identified as having been cut by the same unknown tool.
HKEURK	The recovered toolmark in the first cut piece of tubing marked with white paint in item 2 was made by the folding knife recovered from the suspect in item 1. The recovered toolmark in the second cut piece of tubing marked with red paint in item 3 was made by the folding knife recovered from the suspect in item 1.
HVCV6P	The toolmarks found on exhibits 2 and 3 were identified as having been made by exhibit 1, the submitted folding knife. Comparison microscope examinations were conducted between the suspect toolmarks and standards made with the submitted folding knife.
HYR4TN	Items 2 and 3, the cut pieces of tubing, were cut by the folding knife recovered from the suspect, Item 1. There was sufficient agreement of surface contours and / or microscopic toolmarks on the tubing for identification.
JCWL4N	The submitted sections of cut plastic tubing, items 2 and 3, exhibit knife "puncture/stab" type toolmark characteristics that were identified as having been produced by the Sheffield folding knife, item 1.
JKAU6Q	IDENTIFICATION: The following items were compared and were found to show the presence of matching features. The opinion of Identification is based upon the agreement of a combination of individual characteristics and all discernible class characteristics consistent with having been created by the same tool. Item 1 (test cut mark from folding knife) Item 2 (cut mark) Item 3 (cut mark)
JPZCEV	The findings give extremely more support to the proposition that the toolmarks on item2 and item3 are produced with the folding knife (item1) than with another random knife.
JXETFH	I made an examination of the cast marks using a comparison microscope. This type of examination allows two objects to be viewed simultaneously so that microscopic marks left behind on the stabbed surfaces can be compared and assessed. I undertook a microscopic comparison of the casts 'White 1' and 'Red 2', and found that they were damaged by the same bladed instrument. I then undertook a microscopic comparison of the casts 'White 1' and 'Test 1' and found that they were damaged by the same bladed instrument, being Item 1. In conclusion, Item 1 were used to damage both Item 2 and Item 3.
K34UPV	Examinations showed that the tool marks within Items 2 and 3 were created by Item 1.
K8K3DU	Items – Description/Visual Examination. Item 1: One (1) Sheffield brand folding knife with silver handle. Item 2: One (1) piece of tubing with a cut that contains striated toolmarks (marked with white paint). Item 3: One (1) piece of tubing with a cut that contains striated toolmarks (marked with red paint). Examination Results: Test cuts were created using Item 1 for microscopic comparison purposes. Microscopic Comparison Conclusions: Identification: Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made Lab Item # Evidence Type Conclusion 2 & 3 Cuts in tubing with striated toolmarks Created by Item 1 (folding knife). [Participant submitted data in a format that could not be reproduced in this report.]
KA7YLK	Test cuts were produced using the Exhibit 1.1 folding knife. Comparison microscope examinations were conducted on the evidence listed above. The findings of this examiner are the following: 1.

TABLE 2

WebCode	Conclusions
	Exhibits 1.2 (Item 2) and 1.3 (Item 3) were cut with the Exhibit 1.1 (Item 1) folding knife based on sufficient agreement of class and individual characteristics observed. No further analysis was conducted on the submitted evidence at this time.
L2LABP	Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the pieces of cut tubing, Laboratory Items 2 and 3, were identified as having been created by the use of the knife, Laboratory Item 1.
L2RDDG	1) Exhibit 1 contains one Sheffield brand folding knife with overall length of 132mm with the blade unfolded. The blade is 53mm long, 16mm wide, and 2.6mm thick. The blade, grip, and clip of Exhibit 1 are all ferromagnetic and the blade is marked "Stainless Steel". a. Slicing type tool action. Subclass potential is unlikely due to the edge of the blade being polished with an abrasive action type tool. b. Exhibit 1 was used to create test marks on the polymer tubing provided by the submitter. These test marks were sub-exhibited as Ex. 1.1 and marked as "A" or "B" to correspond to the "A" and "B" markings added to each side of the blade of Ex. 1. c. As received, the container for Exhibit 1 was unsealed (protruding from bottom of envelope, see photos). 2) Exhibits 2 and 3 each contain one section of blue flexible polymer tubing 24-26mm in diameter, 3-3.8mm thick, and 60-64mm in length. As received, Exhibit 2 is marked with white paint and Exhibit 3 is marked with red paint. a. Exhibits 2 and 3 each contain one slice toolmark in the center of one side and is suitable for microscopic comparison. This type of toolmark is consistent with damage caused by a slicing type action tool, such as Exhibit 1. 3) Microscopic comparison of Exhibits 1.1, 2, and 3 revealed: a. Exhibit 2 and 3 toolmarks were created by Exhibit 1 due to an agreement of class characteristics and sufficient agreement of individual characteristics. i. Same area of striated marks identified across Exhibits 1.1, 2, and 3. Side "A" of Exhibits 2 and 3, side "B" of Exhibit 1. Area of agreement phase marked with silver marker. All measurements are approximate.
L6QQXL	The toolmarks near the center of items 2 and 3 were identified as having been produced by item 1 based on the significant agreement of class and individual characteristics.
LAWCVQ	[No Conclusions Reported.]
LMLBMT	Toolmarks present on items 2 and 3 were compared microscopically, with test cuts from item 1. There is agreement of all discernible class characteristics and sufficient agreement of individual characteristics. The toolmarks present on item 2 and 3 were identified as having been produced by the recovered folding knife, item 1.
LRXA3T	Items – Description/Visual Examination. Item 1: One (1) Sheffield brand folding knife with silver handle. Item 2: One (1) cut piece of tubing with white paint, striated toolmarks observed. Item 3: One (1) cut piece of tubing with red paint, striated toolmarks observed. Examination Results: Test cuts (toolmarks) were created using Item 1 for comparison purposes. Microscopic Comparison: Conclusions: Identification Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Item 2 & 3 striated toolmarks (cut tubing) created by Item 1 (folding knife)
M8PPLJ	The puncture toolmarks present in the Exhibit 2 and 3 pieces of tubing were identified as having been produced by the Exhibit 1 folding knife.
MAFNZH	Having conducted a tool mark comparison between item 1 (Folding knife) and the two scene exhibits Item 2 (cut piece of tubing marked with white paint) and Item 3 (cut piece of tubing marked with red paint) I am of the opinion Item 1 produced the scene cuts in Items 1&2 based on an agreement of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.
MJVPWR	Item 2: First cut piece of tubing (marked with white paint) and Item 3: Second cut piece of tubing (marked with red paint) were produced by the tool marked Item 1 (folding knife recovered from the suspect).
MKX8JE	1. Examination of Exhibit 1 revealed one Sheffield brand folding knife designed to be used as a single

TABLE 2

WebCode	Conclusions
	edge slicing tool. Exhibit 1 was used to create the Exhibit 1.1 test standards. 2. Examination of Exhibits 2 and 3 revealed each contains one piece of blue rubber tubing displaying damage consistent with that caused by a single edge slicing tool such as a knife. a. Exhibit 2 measures 61.52mm long, 25.63mm in diameter, and 3.26mm thick with a toolmark in the approximate center measuring 14.58mm long. b. Exhibit 3 measures 60.94mm long, 25.77mm in diameter, and 3.27mm thick with a toolmark in the approximate center measuring 15.43mm long. c. The toolmarks on Exhibit 2 and Exhibit 3 are suitable for microscopic comparison. 3. Microscopic comparison revealed the damage on Exhibits 2 and 3 was caused by Exhibit 1 due to agreement of class characteristics and sufficient agreement of individual characteristics. Please note all measurements are approximate.
MNXKYQ	The test toolmarks from the folding knife marked item #1 were examined and microscopically compared to the toolmarks left on the blue tubing marked item #2 (marked with white paint) and the blue tubing marked item #3 (marked with red paint) with positive results (identification). The toolmarks left on the blue tubes marked #2 and #3 were made by the folding knife marked item #1.
MVFPCK	Test cuts were made using Item 1 (Folding knife). The test cuts were microscopically compared to the questioned cuts on Items 2 and 3 (blue tubing). After microscopic comparison it was determined that while there was some limited agreement, there was also significant disagreement of striated marks between the test cuts and the questioned cuts. Therefore it is inconclusive whether the knife listed as Item 1 made the cuts to the tubing on Items 2 and 3.
MYCMCC	Microscopic examination and comparison of the questioned toolmarks on Items 2 and 3 were made by the tool, Item 1, based on class and individual characteristics.
NFGDRL	The Item 2 tube segment is identified as having been cut by the Item 1 knife. The Item 3 tube segment is identified as having been cut by the Item 1 knife.
NTQY6D	The blue pieces of tubing, being Item 2 and Item 3 were both cut (stabbed) using the knife Item 1.
PAK9CM	Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the pieces of blue tubing, Laboratory Items 2 and 3, were identified as having been created by the use of the knife, Laboratory Item 1.
PEZGYL	A microscopic comparison revealed the known tool, item 1, produced the questioned tool marks on items 2 and 3.
PFRQTN	Items 1-3 were examined. Item 1 was used to make tests using similar material as Items 2 and 3. Items 2 and 3 were each found to exhibit a single blade puncture. Toolmarks as a result of those punctures were microscopically compared to tests made with Item 1. Items 2 and 3 were punctured by Item 1 based on the sufficient agreement of individual characteristics. The above analysis began on 03/18/2024.
PK8XGM	Examinations showed toolmarks present on Items 2 and 3 were created by Item 1.
PMEB6G	The puncture marks on exhibits 2 and 3 (items 2 and 3) were identified as having been made by exhibit 1 (item 1), the submitted knife.
PR6YBL	The questioned striated toolmarks registered on the Items 2 and 3 rubber tubes were identified as having been made by the cutting edges of the Item 1 pocketknife, as a result of the significant agreement of individual characteristics exhibited by the toolmarks on Item 2, Item 3, and test cuts from Item 1.
PTKW3L	There are striated pattern toolmark of the damaged surface of item 2 and 3. I compared these pattern to the toolmark on the sample hose punctured by item 1. The pattern in the item 2 is same with the toolmark produced by item 1.
PXWX9P	identification
QU84QF	The toolmarks in the tubing items 2 and 3 were created by the folding knife item 1.
QVKHEP	Item 1 folding knife recovered from the suspect produced the questioned toolmarks on both Item 2 and Item 3 pieces of cut tubing. There is an agreement of class and individual characteristics sufficient for an identification.

TABLE 2

WebCode	Conclusions
RVH6CE	The folding knife (Item 1) created toolmarks on the test tubing that display similar class characteristics as those present on the submitted cut tubing (Items 2 and 3) however, the examinations and comparisons resulted in an inconclusive finding. There was insufficient individual detail to identify or eliminate Items 2 and 3 as having been cut by the folding knife (Item 1).
T4MQML	The suspect's folding knife (item 1) left a mark on the cut piece of tubing (item 2)
T4RUPD	The exhibit knife (Item 1) was not used to cut the exhibit hose sections (Items 2 & 3) collected from the crime scene.
T8R6LC	An initial assessment and comparison of the stab marks and the random pattern of striae produced in the tubing (Items 2 and 3), revealed that the same knife had been used to make both marks. There was an overwhelming level of agreement within the pattern of striae on the cuts between Items 2 and 3 that in my opinion, would not be observed if a different knife (or other tool) had been used to create them. I then conducted a comparative microscopic examination between the stab marks in both pieces of tubing (Items 2 and 3), to test stabs I made using the submitted knife (Item 1), in similar tubing. In my opinion, the overwhelming level of agreement observed in the striae pattern, indicated the knife (Item1) had been used to make the stab marks in both piece of tubing (Items 2 and 3).
TDTJ2M	The Item 01-01 knife was identified as having punctured the Item 01-02 and Item 01-03 pieces of tubing.
U2FLVH	The questioned toolmarks on Item 2 were produced by Item 1. The questioned toolmarks on Item 3 were produced by Item 1.
U84B8F	The item 1 knife was functional when creating test cuts. The item 2 and 3 tubes are identified as having been cut by the item 1 knife. The item T1 box was not examined. All test samples will be forwarded to the submitting agency.
UB9P78	1. Examination of Exhibit 1 revealed it to be a Sheffield branded single edge folding pocket knife designed to be used as a single edge slicing tool. Exhibit 1 was used to create the test standard in Exhibit 1.1. 2. Examination of Exhibits 2 and 3 revealed each to be a cut section of blue rubber tubing containing an area of damage consistent with a single edge slicing tool. a. Exhibit 2 measures 57.81mm long, 26.09mm in diameter, and has a wall thickness of 4.11mm. The damaged portion is 14.77mm long and is consistent with a single edge slicing tool. b. Exhibit 3 measures 59.71mm long, 26.15mm in diameter, and has a wall thickness of 3.89mm. The damaged portion is 16.16mm long and is consistent with a single edge slicing tool. 3. Microscopic comparison revealed that the damage on Exhibits 2 and 3 was caused by Exhibit 1 due to an agreement of class characteristics and sufficient agreement of individual characteristics. All measurements are approximate.
UTJV6G	THE CUTS ON THE TEST ITEMS 2 AND 3 WERE BOTH FOUND TO SHOW AGREEMENT IN CLASS, SUB-CLASS AND INDIVIDUAL CHARACTERISTICS WITH THE SUBMITTED KNIFE SUCH THAT, IN MY OPINION, THE SUBMITTED KNIFE IS RESPONSIBLE FOR BOTH CUTS.
UZW6WJ	Item 2: First cut piece of tubing (marked with white paint) and Item 3: Second cut piece of tubing (marked with red paint) were produced by the tool marked Item 1 (folding knife recovered from the suspect).
V6WE2H	elimination
V82ZR4	The examination of the two cut pieces of tubing labeled Item2 and Item3 reveals a puncture on each of them. In each case, the puncture exhibits characteristics suggesting it may have been caused by the blade of a knife similar to Item1. For comparison purposes, we produced samples of perforations using the folding knife labeled Item1 to pierce pieces of tubing with similar characteristics to those of Item2 and Item3. We then examined and compared these samples with the perforations present on Item2 and Item3 using a microscope. It became apparent that the tool mark characteristics present on the puncture samples produced with Item1 do not match those observed on the perforations of Item2 and Item3. Therefore, Item1 could not have caused either the puncture present on Item2 or the one present on Item3.
WEXD9H	There is a puncture observed in both Items #1.2 and #1.3. These punctures were compared microscopically with puncture tests made with the submitted knife, Item #1.1. There is agreement in

TABLE 2

WebCode	Conclusions
	all discernible class characteristics and sufficient agreement in individual characteristics for identification. The punctures in Items #1.2 and #1.3 were made by the submitted knife, Item #1.1.
WZ7TBF	The items 2 and 3 were cut with the same tool but not with item 1.
WZF8DH	Items #2 and #3 are identified as being cut by the submitted folding knife, item #1, due to the significant agreement seen in the class and individual characteristics during comparison.
XKJKC9	The Exhibit 1 folding knife was used to make test toolmarks. The test toolmarks were designated as Exhibit 1.1. The Exhibit 1.1 toolmark was cast. The cast was designated as Exhibit 1.1C1. The Exhibits 2 and 3 tube segment toolmarks were cast. The casts were designated as Exhibits 2.1 and 3.1. The Exhibits 2 and 3 tube segment toolmarks were identified as having been made by the Exhibit 1 knife.
YBQJJC	The striated pattern on the damaged surface of the item 2 is exactly same to the toolmark on the sample hose punctured by item 1 folding knife.
YF3CN9	I compared the cut hoses item 2 and 3 with each other and found sufficient agreement of individual marks for identification. The cuts in items 2 and 3 were both made by the same blade. I compared cut hoses item 2 and Item 3 with test cut (both sides of the blade) made by the knife item 1. I found sufficient agreement of individual stria between item 2, Item 3 and test cuts made by the knife item 1 (left side and right side) for identification. Item 1 cut both the hoses item 2 and 3.
YLAXME	Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the pieces of tubing, Laboratory Items 2 and 3, were identified as having been created by the use of the folding knife, Laboratory Item 1.
YTTAQ8	Comparison microscope examinations were conducted on the submitted evidence. The findings of this examiner are the following: Exhibit 1.2 (Item 2) and Exhibit 1.3 (Item 3) were cut with Exhibit 1.1 (Item 1) based on sufficient agreement of individual characteristics present. No further analysis was conducted on the submitted evidence at this time.
YYDHMH	Results of Examinations: Item 1 is a Sheffield folding pocket knife that uses a slicing action. A pattern examination of toolmarks present on the Item 2 and 3 pieces of tubing and Item 1 knife was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics. Toolmarks present on the Item 2 and 3 pieces of tubing were identified as having been produced by the same tool using a slicing type action.
ZAN93Y	The toolmarks on the plastic tubing submitted in laboratory evidence items 1.2 and 1.3 were microscopically compared to test marks made with the small folding knife contained in laboratory evidence item 1.1 with the following results. The toolmarks on laboratory evidence items 1.2 and 1.3 were identified as having been made with the small folding pocket knife contained in laboratory evidence item 1.1.
ZEKY9B	The result speaks with great certainty that item 2 and item 3 have suffered the damage caused by item 1.

Additional Comments

TABLE 3

WebCode	Additional Comments
34H863	Several attempts were made to replicate the test trying to consider likely angle and force of use by the suspect. Although the stress marks from the compression of a knife into the substrate were visible and agreed to match the provided test marks it was the striations from the edge of the tool that were unable to be individualised
4FK72D	<p>Methods: Pattern Examination Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2) Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3) Inconclusive: Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result it may not be possible for an examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
6PBXEX	<p>Please note 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</p>

TABLE 3

WebCode	Additional Comments
	amount of agreement from a different source is considered extremely remote.
7K69X9	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2) Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3) Inconclusive: Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result it may not be possible for an examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>
7LV839	There is sufficient agreement of class and individual characteristics on both the cut pipes to conclude that they were cut by the knife.
8Y68K7	Although related to usage of item 1 (knife) on item 2 (white mark tube) we agreed it to be close to yes by comparing the class characteristics, but due to insufficient details it was not confirmed, we marked it as inconclusive.
A3HQH6	By means of microscopic examination of tool marks and microscopic comparison performed, the aforementioned result was determined. Identification: Based on agreement of individual characteristics observed by microscopic comparison examination.
ARZAQY	A conclusion of identification is based on an analyst's independent determination that all discernible class and individual characteristics agree such that the extent of agreement exceeds that which has been demonstrated by toolmarks known to have been made by different tools (Known Non Matches) and is consistent with the agreement demonstrated by toolmarks known to have been made by the same tool

TABLE 3

WebCode	Additional Comments
	(Known Matches). A conclusion of Exclusion is based on an analyst's independent determination that the observed characteristics of the items in question were marked by different tools.
G6H8V2	<p>Methods: Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2) Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3) Inconclusive: Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result it may not be possible for an examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes. Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline.</p>
GTEC4X	There is agreement of class characteristics and individual characteristics on both items. Several tests were cut using item 1.
L2RDDG	<p>Exhibits discussed in the forensic discipline reports were examined; all results are accredited and formed using accepted scientific and professional practices. The [Laboratory] Department is accredited under ISO/IEC 17025. See certificate number [Number] issued by [Accrediting Body]. 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</p>

TABLE 3

WebCode	Additional Comments
	firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.
MKX8JE	TECHNICAL NOTES: Class characteristics are defined as measurable features of a tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of 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 tool are not to the absolute exclusion of all other tools because it is not feasible to examine all possible tools. However, observing this amount of agreement from a different source is considered extremely remote.
MNXYQ	It may be beneficial to cut the tubing samples (for testing) to same size of evidence. Not everyone has nose cutters. Thank you.
PEZGYL	The condition of the items included in this test do not represent the conditions observed in our lab's typical routine casework.
RVH6CE	Microscopic comparisons were conducted between the toolmarks that exist on Items 2 and 3. The toolmarks were identified as having been made by the same unknown tool. The identification was based on the agreement of all discernible class characteristics and sufficient agreement of individual markings present in the tool mark.
TDTJ2M	I use internal LIMS item numbers. The numbers are as follows: Agency Item 1 = Item 01-01, Agency Item 2 = Item 01-02, Agency Item 3 = Item 01-03
UB9P78	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.
UTJV6G	THE TUBING SUPPLIED FOR MAKING TEST CUTS WAS DIFFERENT IN DIMENSIONS AND OPACITY TO THE TEST ITEMS WHICH MADE IT A LITTLE MORE DIFFICULT TO COMPLETE THE COMPARISON.
V6WE2H	2 and 3 same source
V82ZR4	The similarities in the toolmark characteristics observed at the location of the perforations on Item2 and Item3 indicate that they were caused by one and the same tool.
YYDHMH	Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics

TABLE 3

WebCode	Additional Comments
	<p>requires a verification. 2) Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3) Inconclusive: Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result it may not be possible for an examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p>

-End of Report-
(Appendix may follow)

Test No. 24-5281: Toolmarks Examination

DATA MUST BE SUBMITTED BY **April 01, 2024, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: A63NY9

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

Scenario:

Police are investigating a case involving vandalism at a business. Investigators have recovered two pieces of tubing with a questioned toolmark from the crime scene. A suspect was apprehended later that same day and a folding knife was recovered from his possession. Investigators are requesting that you examine the toolmarks and determine if any were made using the suspect's folding knife.

Please note the following:

-Each Item is in an envelope, it is suggested that when the items are removed from their labeled envelope, they be marked according to your laboratory procedure.

-The knife is a sharp object, and all precautions should be taken to handle it in a safe manner.

-For the sections of hose, the mark for examination is located in the center, the two ends were cut using a hose cutter and are not for comparison.

Items Submitted (Sample Pack T1):

Item 1: Folding knife recovered from the suspect.

Item 2: First cut piece of tubing (marked with white paint).

Item 3: Second cut piece of tubing (marked with red paint).

1.) Did the suspect's folding knife (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of tubing (Items 2 or 3)?

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

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

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 ANAB and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

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

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

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

ANAB Certificate No.

A2LA Certificate No.

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

Authorized Contact Person and Title

Laboratory Name

Location (City/State)