

CASE REPORT

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Examination of Random Weld Bead Flow Patterns on Welding Slag and Comparison of These Patterns to the Flow Patterns Present on Welded Surfaces

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ABSTRACT: During the process of welding metal together, a scale or slag develops over the surface of the weld. This slag is a by-product of the welding process. It is composed of metallic oxides and residue of the fluxing agents present in the welding rods. This scale is normally removed when the weld is completed. If the scale remains on the weld, it will chip off when the weld is struck with a hard object or the weld breaks.

When the inside surface of these pieces of slag are examined, random flow patterns are observed that can be compared to the random weld bead flow patterns on the surface of the weld. These patterns are produced by the pooling of molten metal during the fluxing of work surface metal and the welding rod material. These patterns are produced at random and are unique to each and every welded surface.

The author of this paper is not aware of any literature discussing the examination and comparison of random weld bead flow patterns on welded material. In this case discussed herein, such a comparison was made. Specifically, the author was able to compare these flow patterns on the slag removed from a victim's upper torso with the flow patterns on welded surfaces on a wall decoration.

The results of the comparison concluded positively that the slag was once attached to a welded surface on the wall decoration.

KEYWORDS: forensic science, welded surfaces, patterns

Background

The victim of a homicide was found in the rear room of his house. He had been beaten and shot seven times. Initially it was unknown what type of object was used to beat him. However, a spanish design wall decoration was found broken and bent, laying on the floor of a front room of the house. Stains were located on the metal decoration that were positive for blood.

Closer examination of the victim's body revealed numerous small chips of brittle dark material. This material was located on the chest and head area.

It was requested by the homicide investigators to compare the composition of this

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material to the wall decoration. While examining these small fragments, it was observed that flow patterns existed on one side of each fragment. These surfaces were examined for any unusual characteristics. One fragment was selected, because of the unusual appearance of the flow pattern.

Investigation

The wall decoration (Fig. 1) was made from chain that each link was welded together and fashioned into the outline of a shield. Also welded to the shield were two pieces of flat metal resembling swords crisscrossed over the welded chain.

During examination of the wall decoration several welds were observed to be broken and the slag that covered the weld was absent. The flow patterns on the surface of these broken welded surfaces were compared to the flow patterns on the fragments that were removed from the victim's body.

After exhaustive examination, one welded surface (Fig. 2) was found to possess a similar flow pattern when compared to the pattern on one of the small fragments (Fig. 3).

A cast was made of this flow pattern on the welded surface using "mikrosil" silicon casting material. The cast of the weld and a small fragment of slag were examined at a magnification of twenty power using a Reichert comparison microscope with a 35 mm camera attachment. The flow pattern on the cast and the flow pattern on a selected fragment of dark material (slag) were compared and found to represent the continuation of a unique random pattern beginning on the welded surface and continuing inversely to the slag fragment removed from the victim's body. A photo of this comparison was taken with the 35 mm camera (Fig. 4).

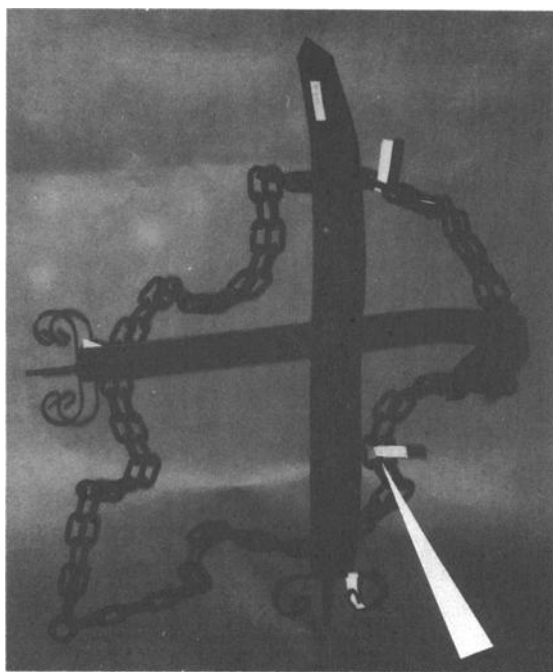


FIG. 1—Welded area compared to fragment (arrow).

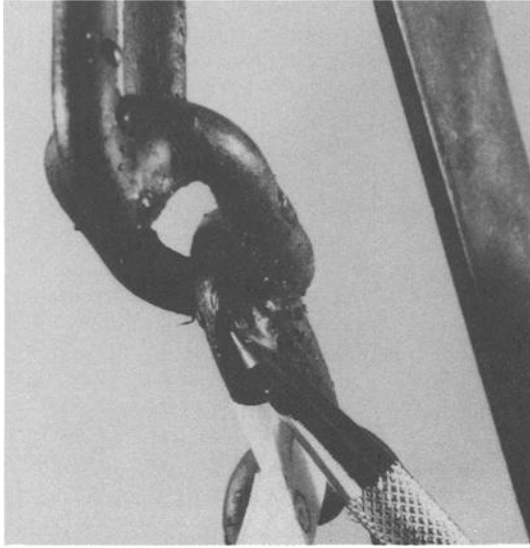


FIG. 2—*Welded surface.*

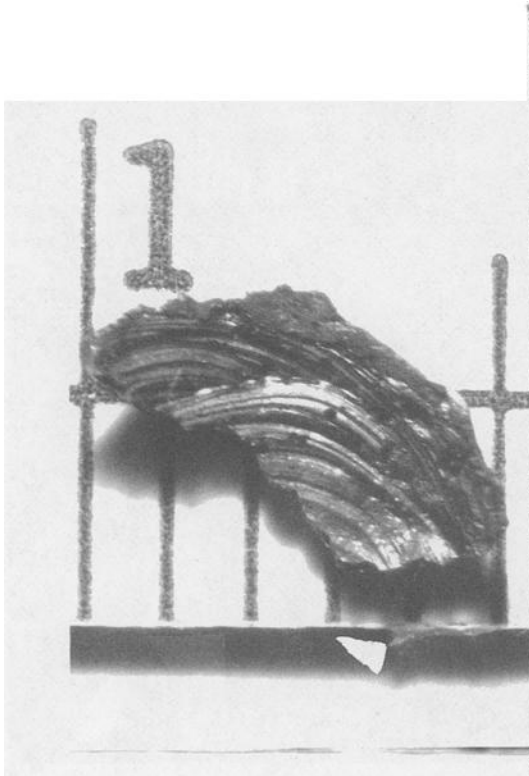


FIG. 3—*Fragment removed from victim's chest (each division 1 mm).*

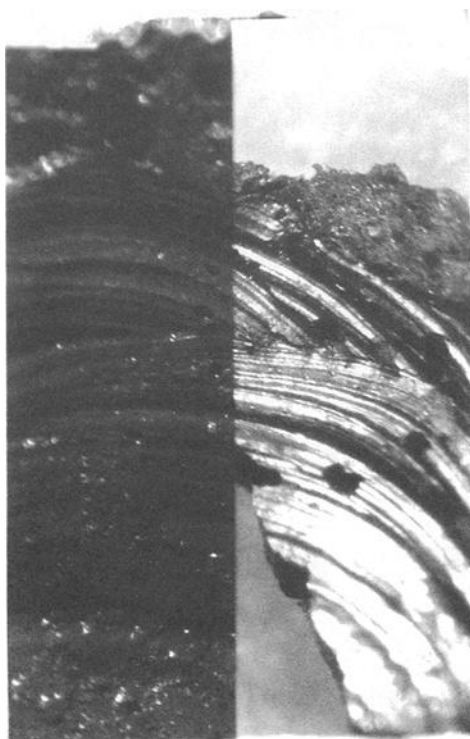


FIG. 4—*Mikrosil silicon cast of welded surface (left) and fragment removed from victim's chest (right).*

Conclusions

This is conclusive proof that the fragments removed from the victim's body came from this wall decoration. The composition of these fragments could have been determined as the detectives requested, but this would not have been as conclusive as the observations made.

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