Draft Report:
Feasibility Study on Wood Billets to be used in fabrication of Bats

Performed by the Center for Quantitative X-ray Imaging
For
Universal Systems and the Old Hickory Bat Company

Phil Halleck
June, 2009

Summary:

We tested fourteen of fifteen billets received, in two groups of 7 billets each. We digitally extracted “handles” from each billet and compared the grain orientation in the virtual handles at both ends of each billet. In sum, five of the fourteen billets, about 1/3, would be likely to fail the MLB specification. However 4 of these could be made to pass by choosing the correct end for the handle from X-ray CT data. Two of them will certainly fail if the handle is placed at the wrong end of the billet. These are Billets 7 and 12. In addition, Billets 1 and 4 would be substantially better with the handle at the end specified, although they might pass with the handle at either end. Billet number 10 is marginal in either orientation.

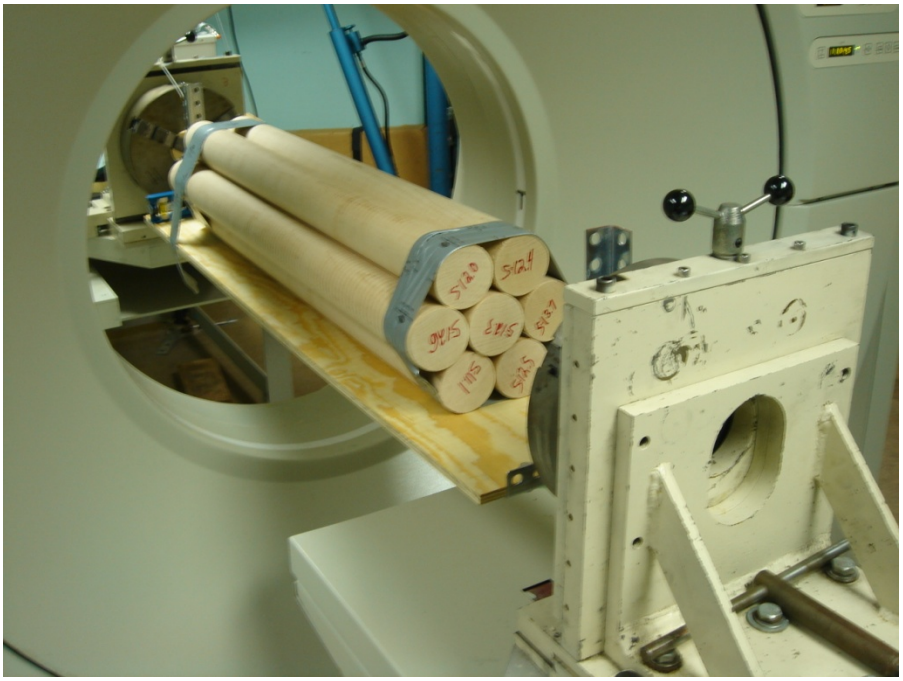
For more information, please contact David Zavagno, 440-349-3210 or zavagno@universal-systems.com.

Background We received 15 billets from Old Hickory Bat Co. with various markings on one end. Fourteen of these were bound together in groups of seven and scanned in our HD350 scanner under the following conditions:

- Excitation Voltage: 130 kV
- Current: 100 mA
- Slice thickness: 2 mm
- Image spacing: 2 mm
- Field of Reconstruction: 300 mm
- Resulting pixel dimensions: 0.59 x 0.59 mm

Each billet was numbered, 1 through 14 as shown below

The bundles were placed on a specially constructed wooden platform mounted between the moving tables of the scanner, and scanned as described above.



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From the resulting image sets, a cylinder 1-inch in diameter was extracted from each billet to represent the handle portion of the resulting bat. The attached movie illustrates how one of these handle cylinders was extracted. Each of these cylinders was then marked at a position 9 inches from the end of the billet. Since the billets are generally longer than the resulting bat, this position represents a position approximately 7.5 inches up from the knob. This was done from both ends of the billet, marked as the “label end” and the “non-label end”.

In each of the following illustrations, the data are presented with the knob end down and the barrel end up. The horizontal line is the marked position 7.5 inches from the knob. There are separate images for the label end and the non-label end. The images have been rotated so that the viewer is looking directly along the planes of the grain. You are looking down at the trademark under the new rules.

The next step was to open each of the resulting images in a CAD program. A line (green) was placed parallel to the handle cylinder and a second line (red) placed along the center-most low density grain. This is the line the ink dot will follow. The CAD program was used to precisely measure the angle between the handle and the grain. These data are illustrated for each billet in the following pages. The results are summarized below:

It should be possible to fabricate bats that will pass the ink spot test from all but one of the fourteen billets tested. However two of them will probably fail if the handle is placed at the wrong end of the billet. These are Billets 7 and 12. In addition, Billets 1 and 4 would be substantially better with the handle at the end specified, although they might pass with the handle at either end. Billet number 10 is marginal in either orientation but should pass.

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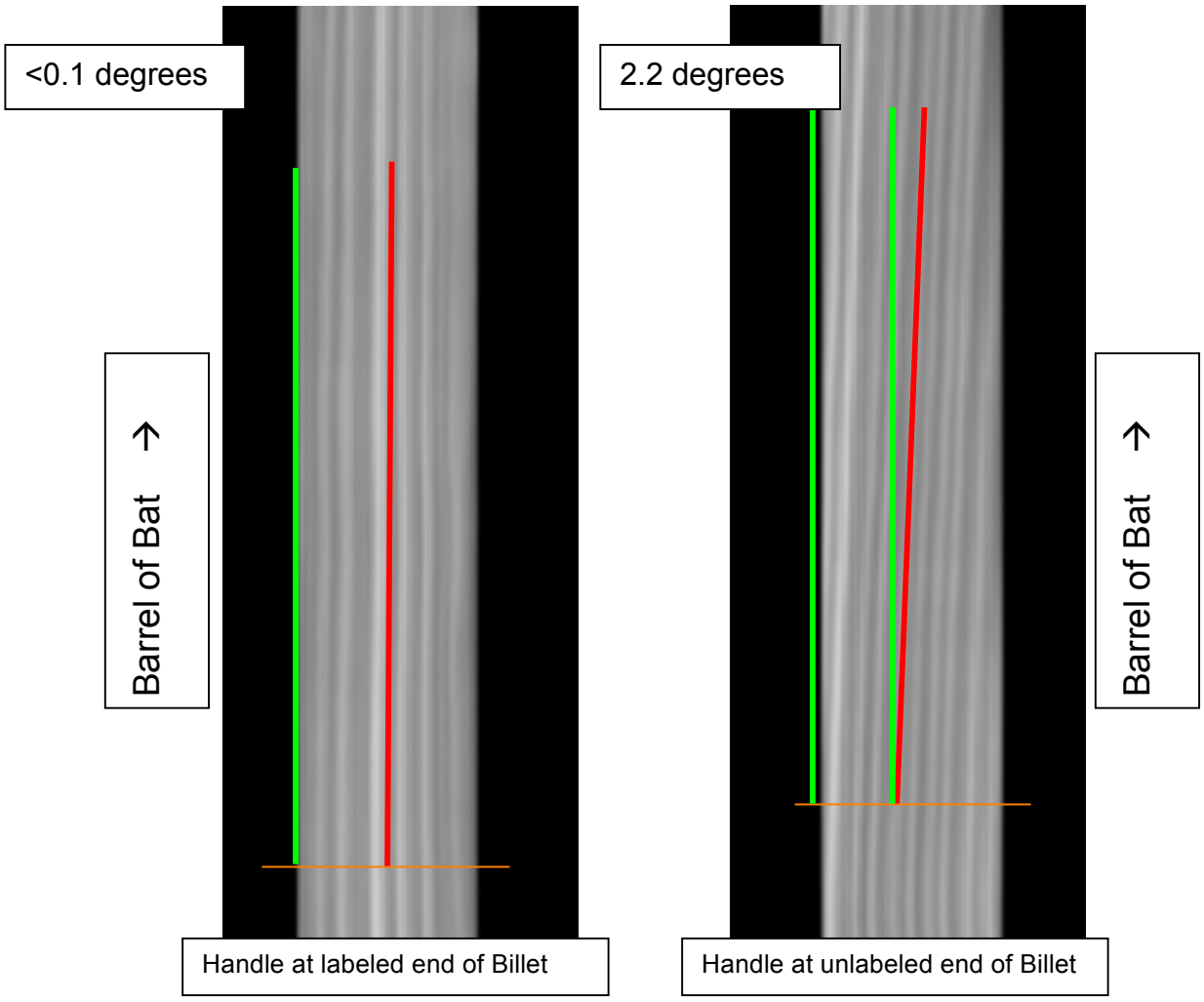
Billet Number 1



The resulting bat should pass with the handle at either end, but would be much better with the handle at the labeled end. It will pass only marginally with the handle at the unlabeled end.

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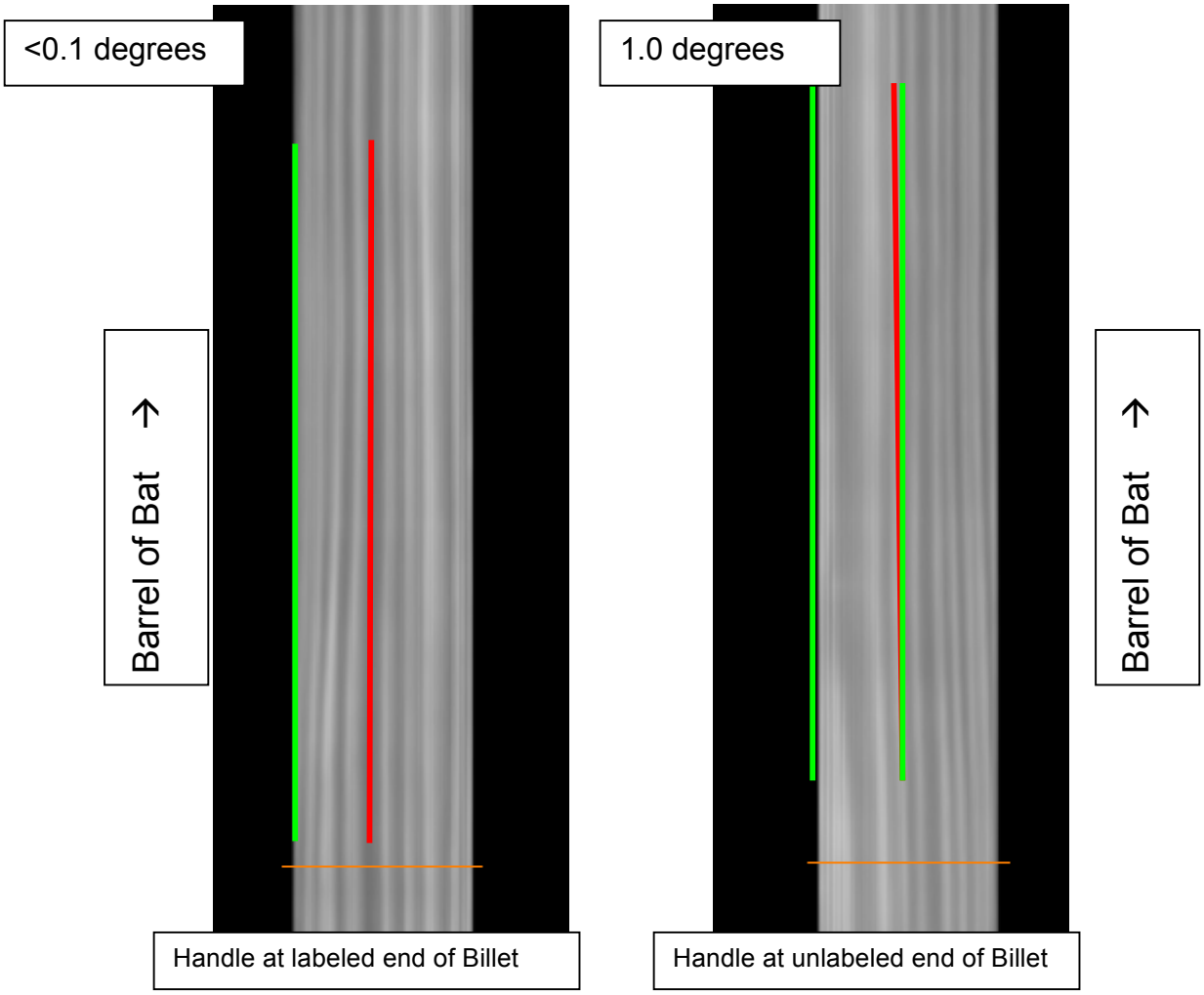
Billet Number 2



The resulting bat should pass with the handle at either end but would be somewhat better with the handle at the labeled end.

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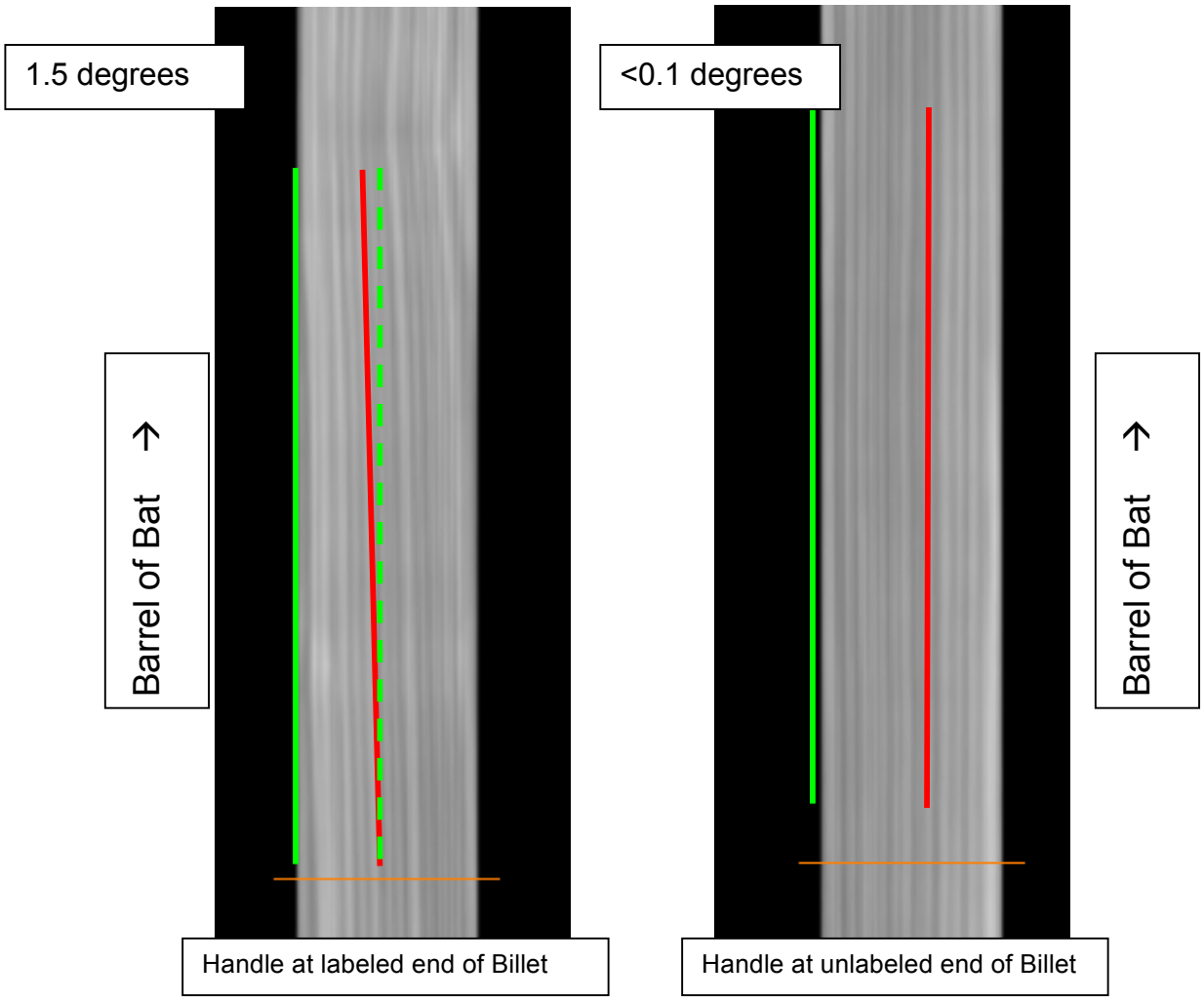
Billet Number 3



The resulting bat should pass with the handle at either end but would be somewhat better with the handle at the unlabeled end.

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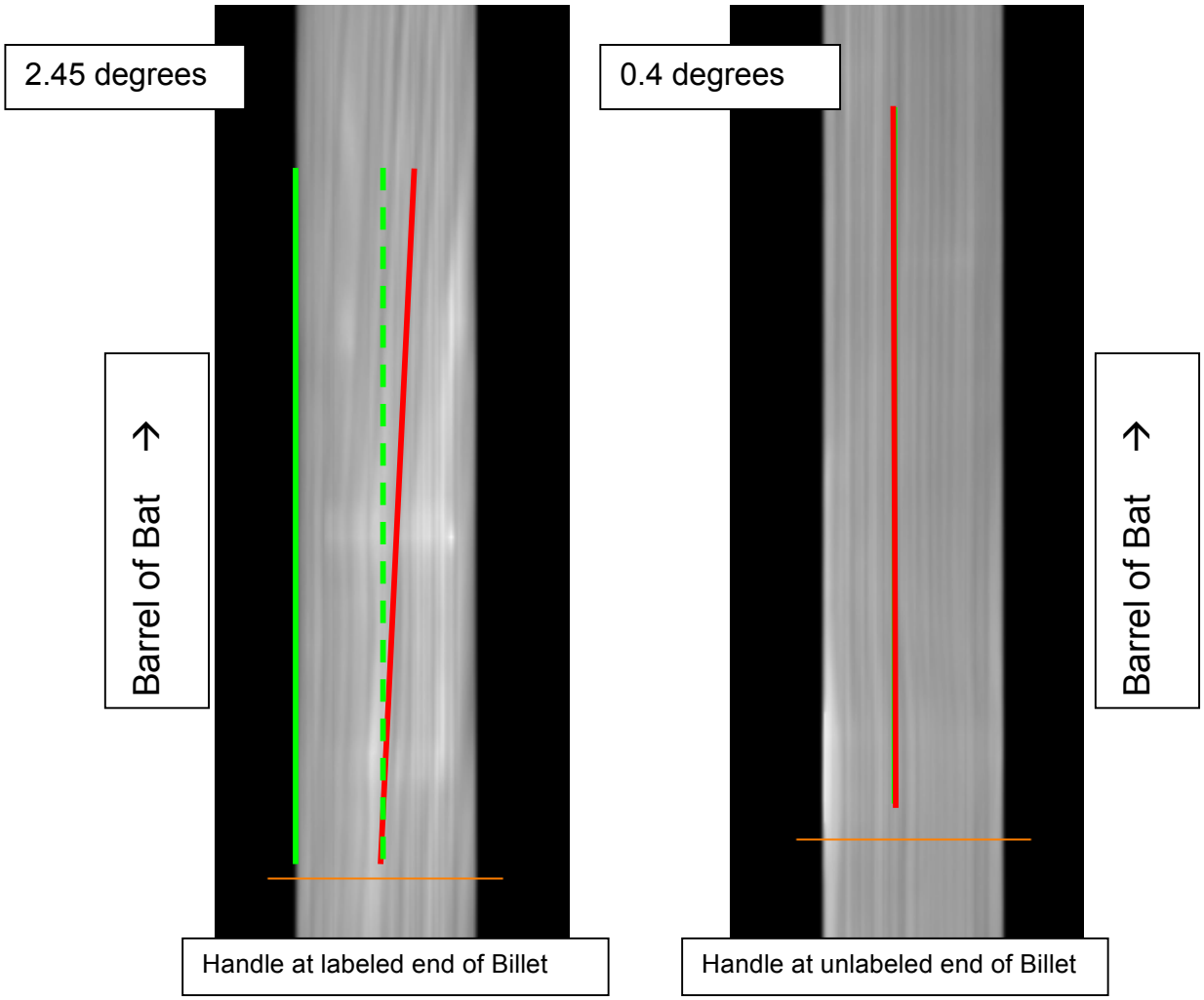
Billet Number 4



The resulting bat might pass with the handle at either end, but would be much better with the handle at the unlabeled end.

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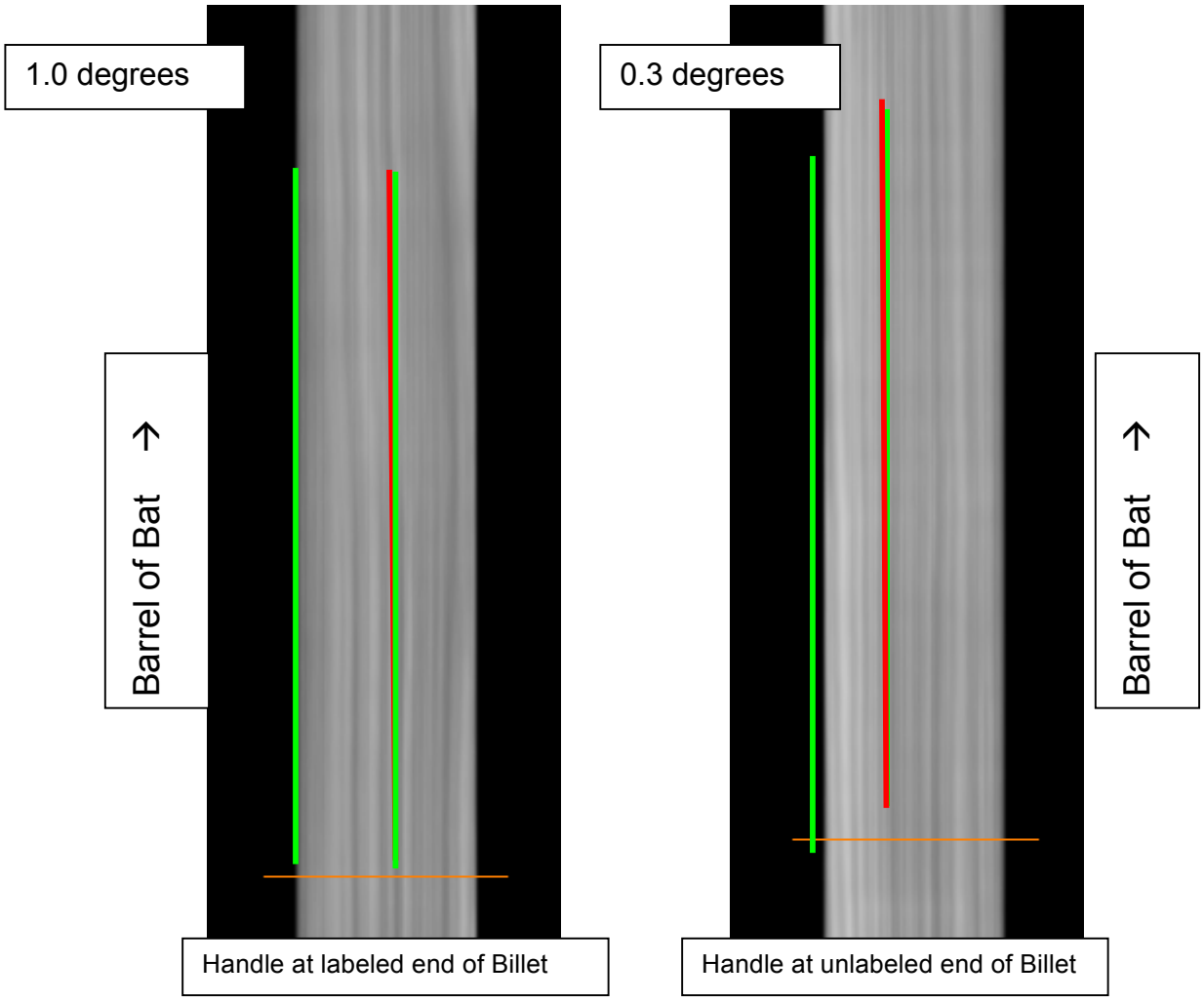
Billet Number 5



The resulting bat should pass easily with the handle at either end.

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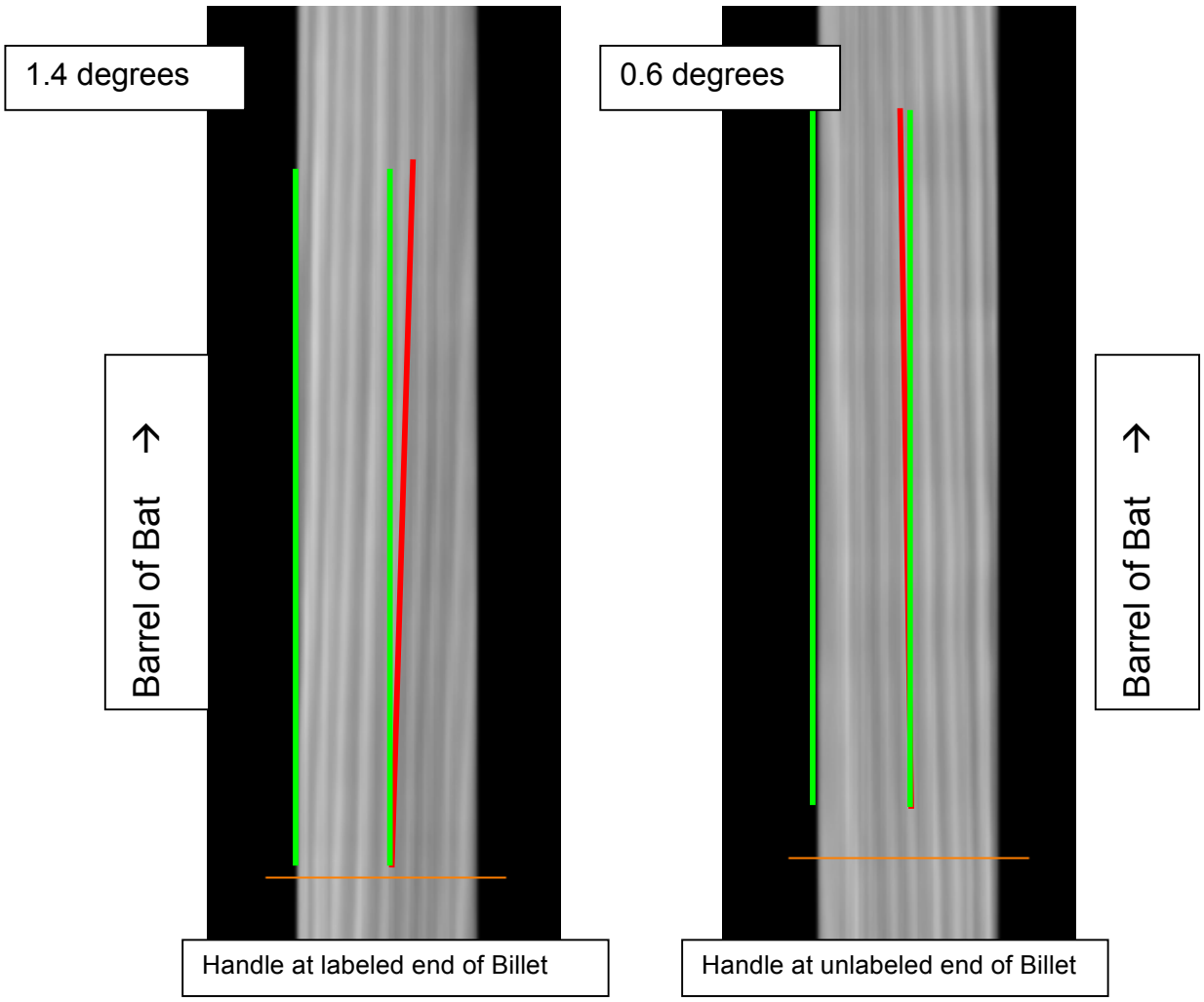
Billet Number 6



The resulting bat should pass with the handle at either end, but would be better with the handle at the unlabeled end.

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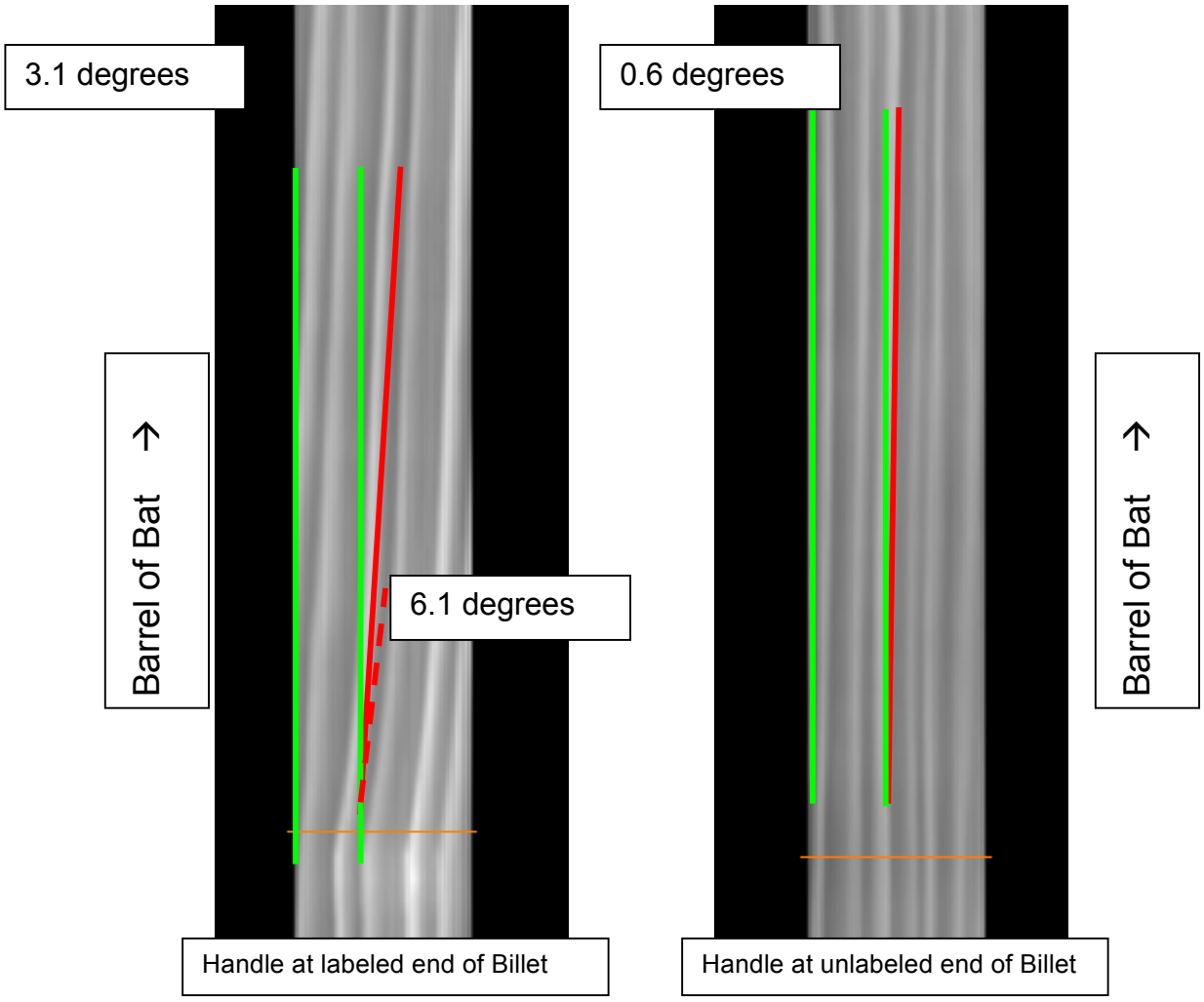
Billet Number 7



This bat must be made with the handle at the unlabeled end. It will fail the ink spot test if made with the handle at the labeled end. Further, a sharp bend in the grain at that end may act as a stress concentrator, making the bat more likely to fracture.

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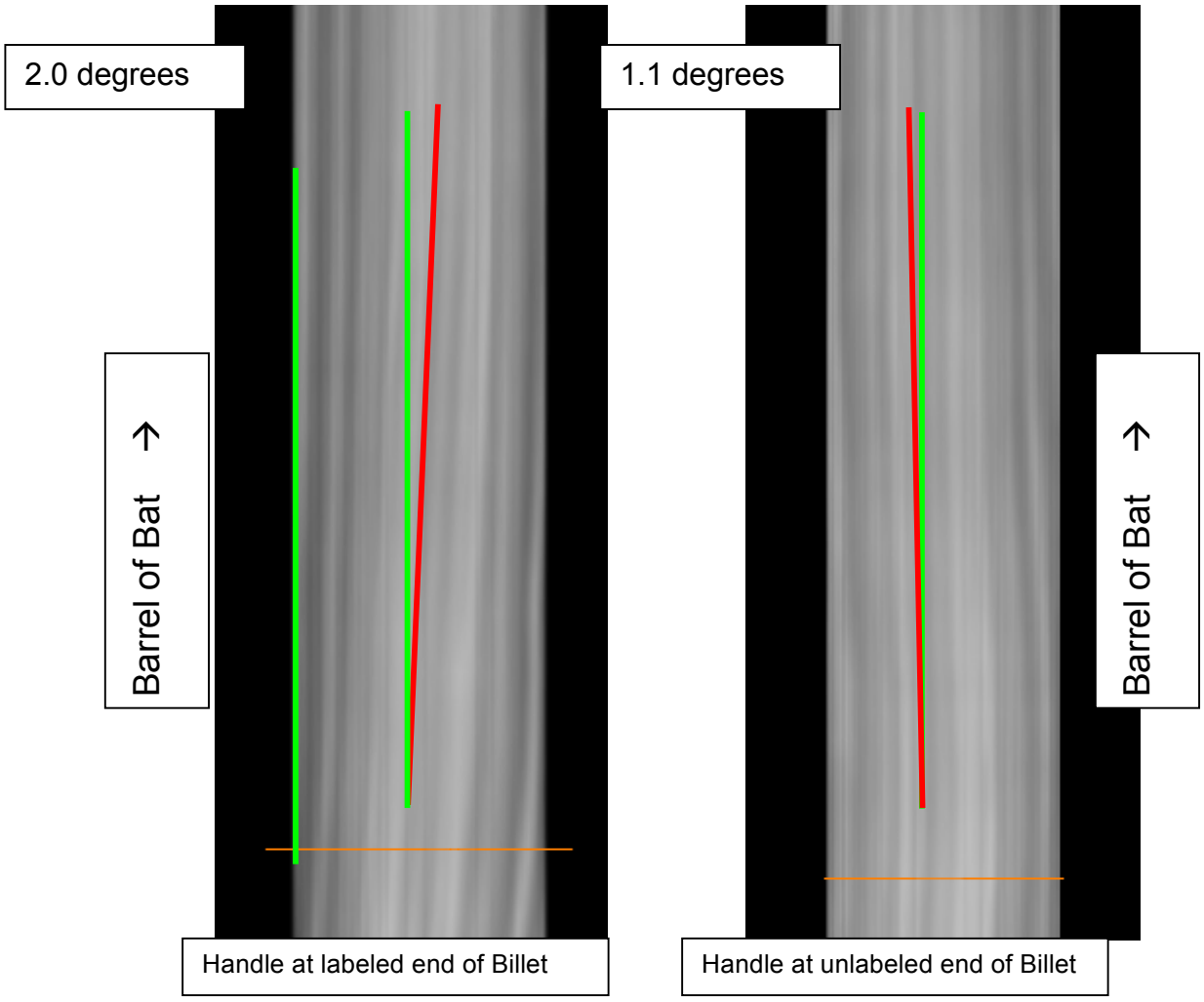
Billet Number 8



The resulting bat should pass the ink spot test with the handle at either end, but would be somewhat better with the handle at the unlabeled end.

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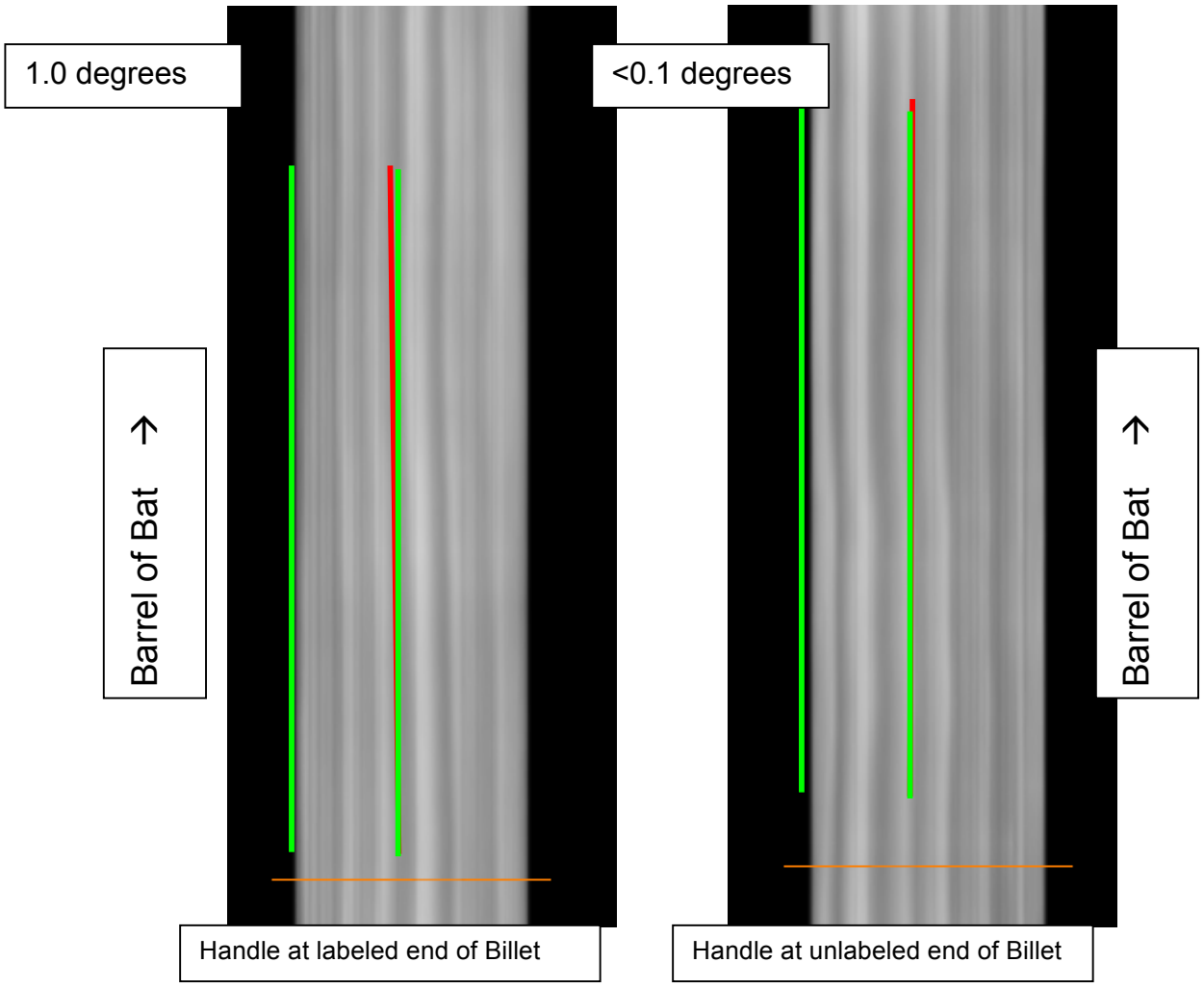
Billet Number 9



The resulting bat should pass the ink spot test easily with the handle at either end.

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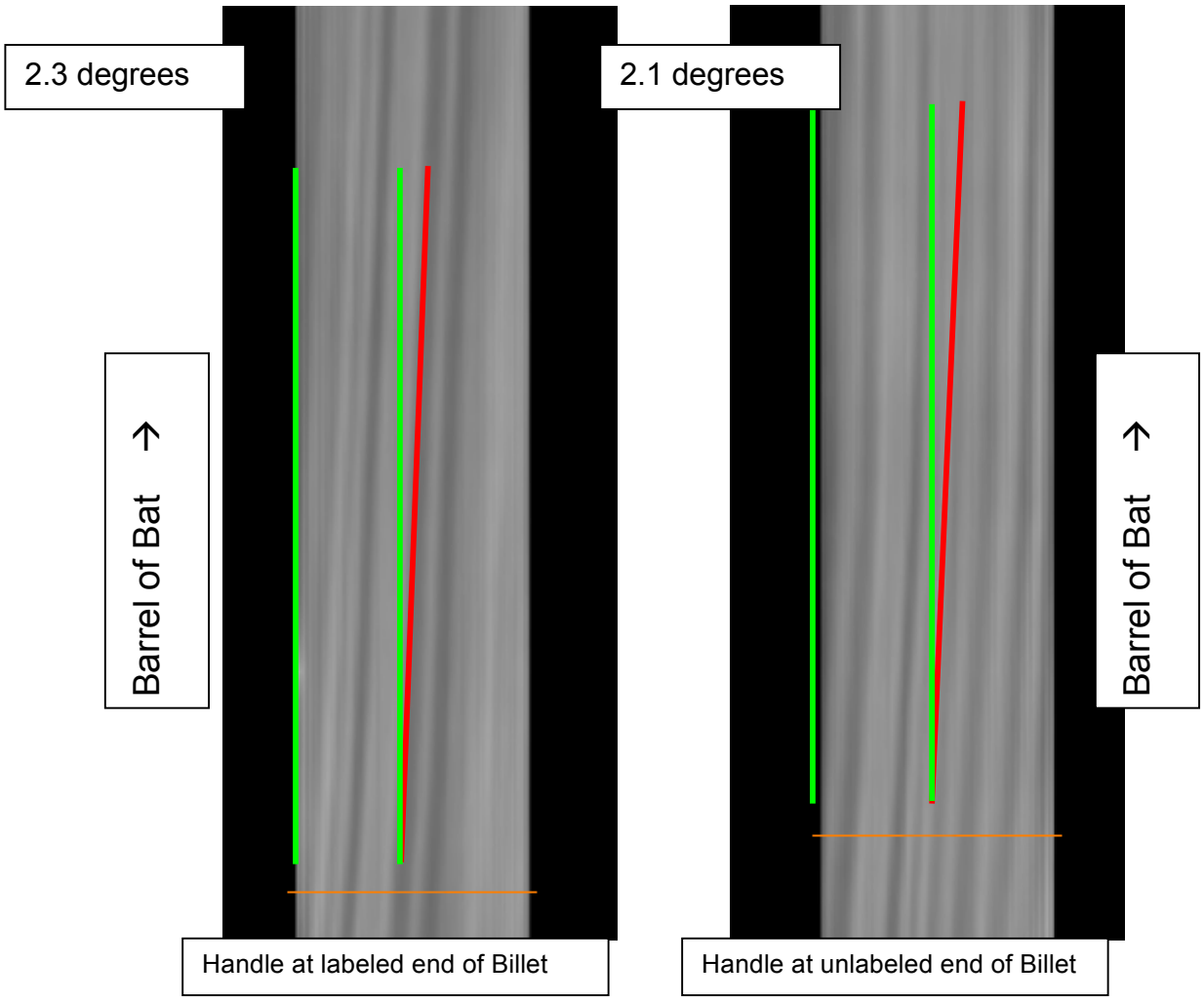
Billet Number 10



The resulting bat should marginally pass the ink spot test with the handle at either end. Neither option is very good and a small error in billet alignment may cause it to fail.

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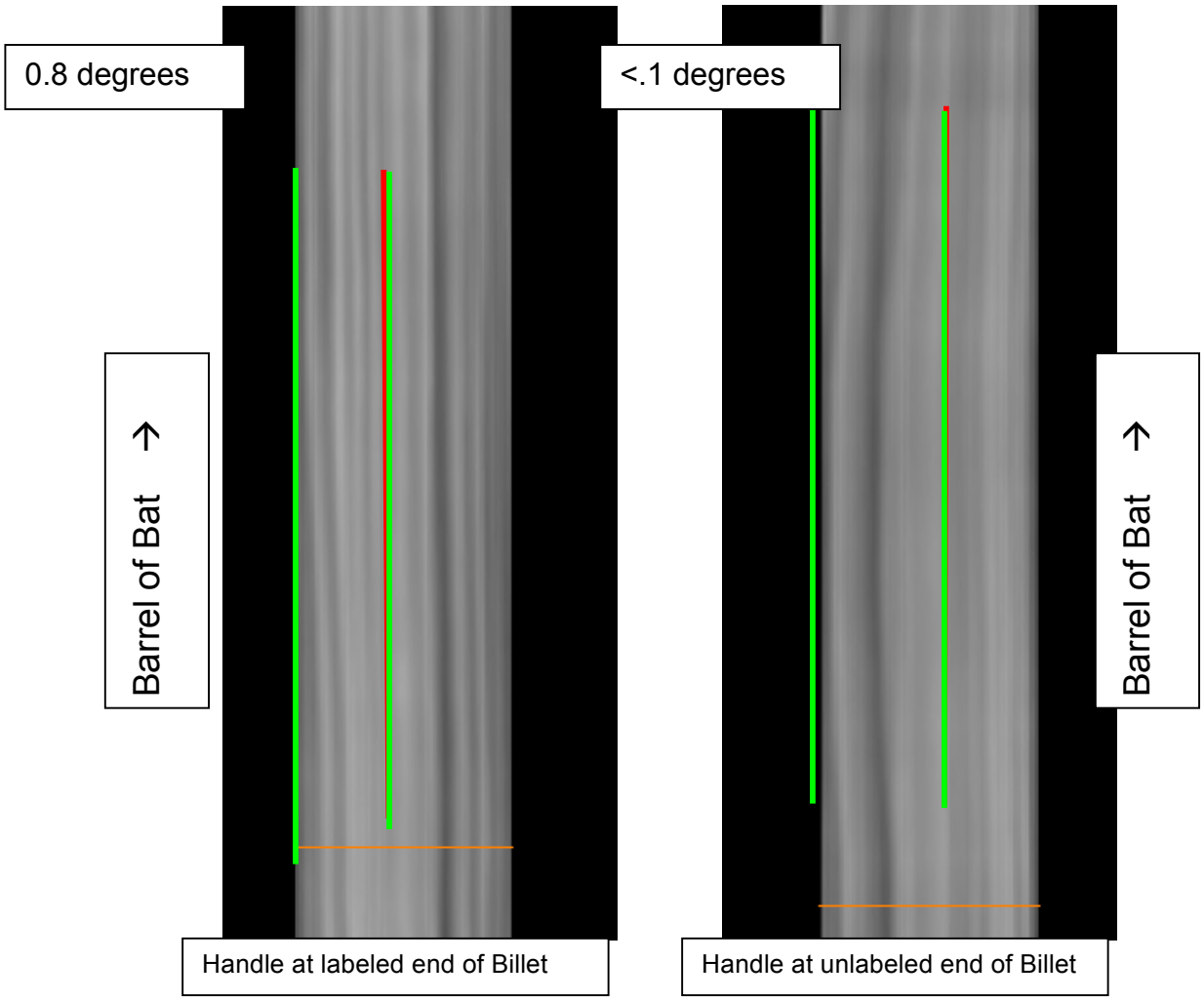
Billet Number 11



The resulting bat should easily pass the ink spot test with the handle at either end.

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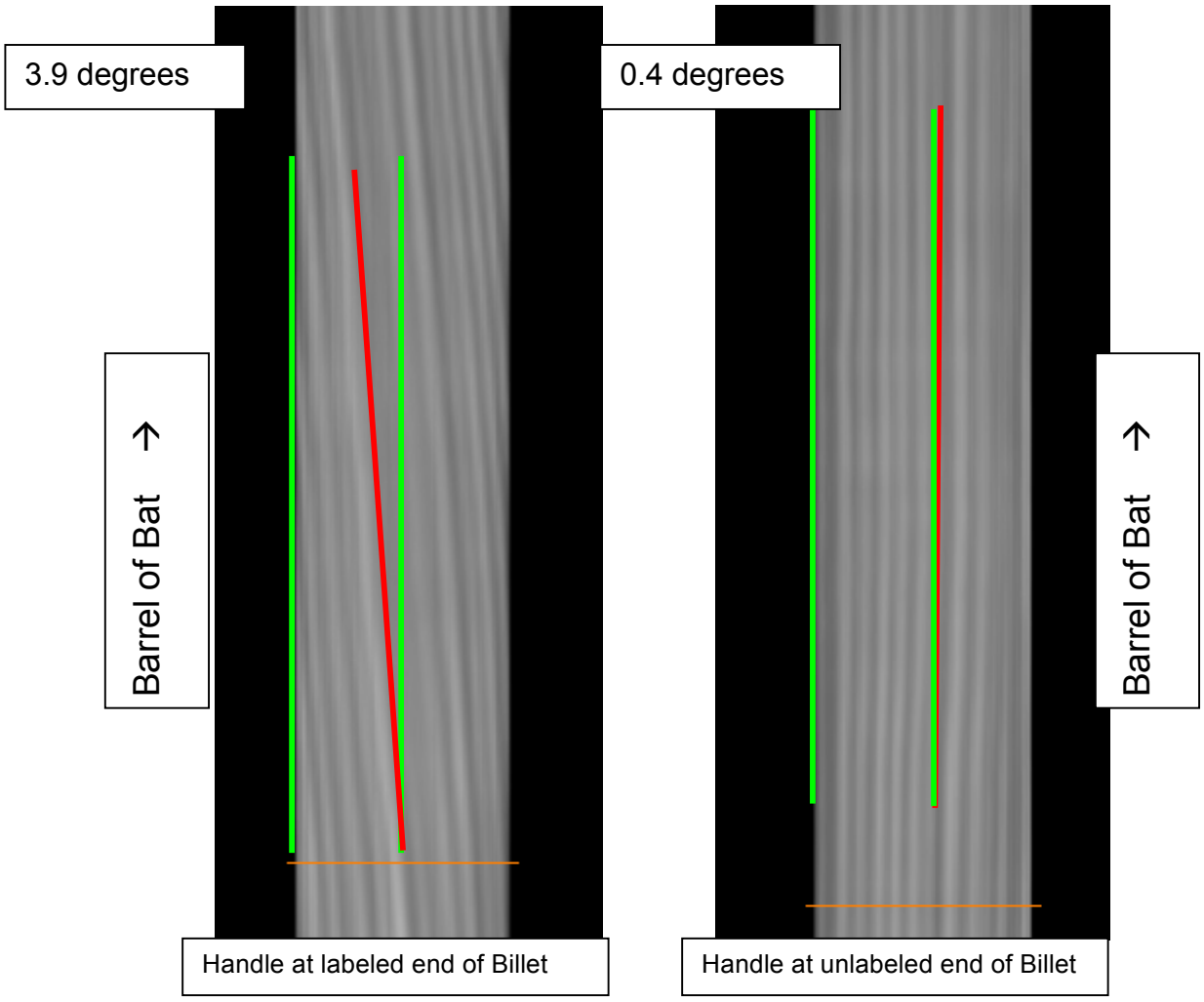
Billet Number 12



This bat must be made with the handle at the unlabeled end. It will fail outright if the handle is at the unlabeled end.

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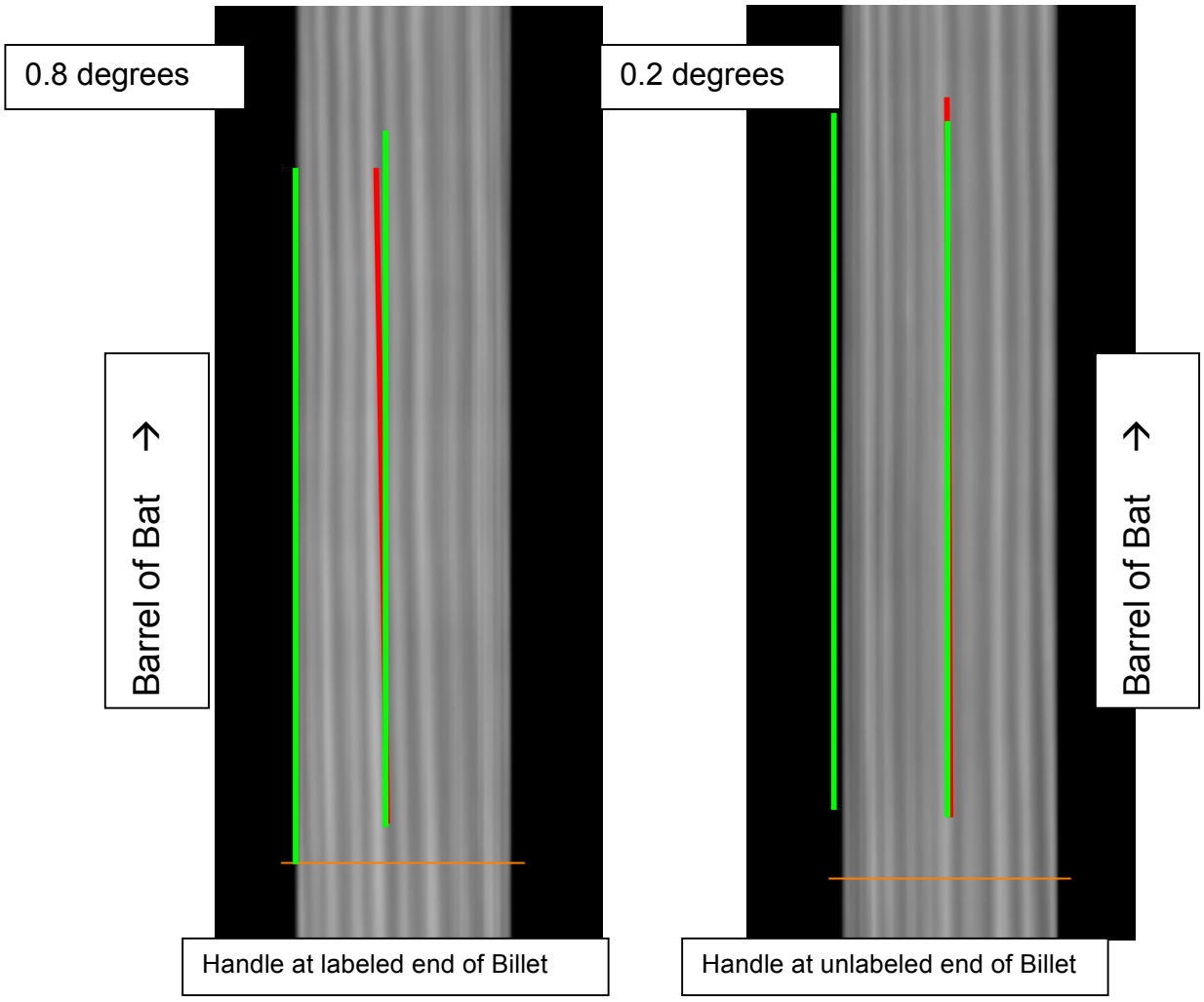
Billet Number 13



The resulting bat should pass the ink spot test easily with the handle at either end.

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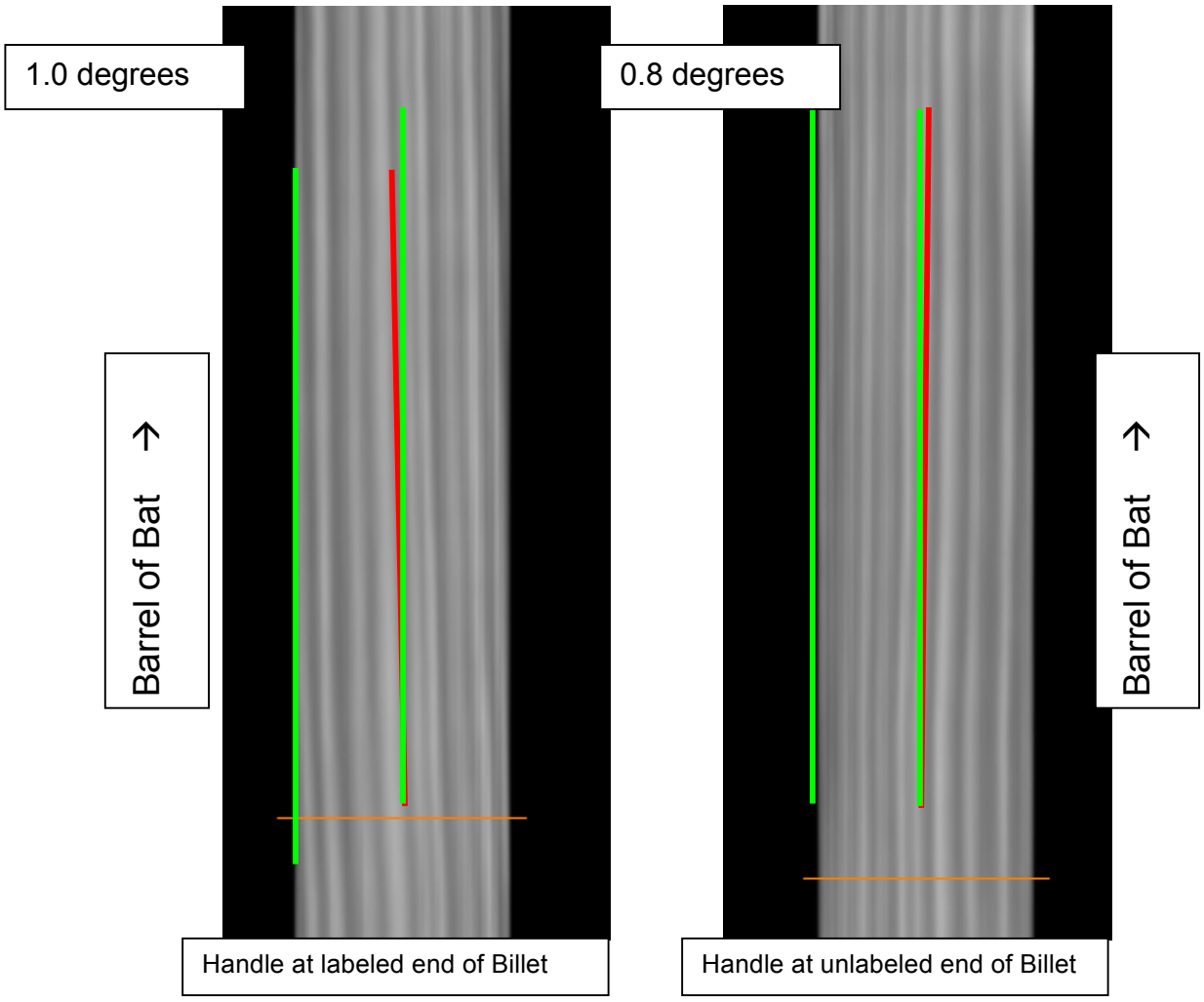
Billet Number 14



The resulting bat should pass with the handle at either end.

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