

RockBats
 Technical Note
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September, 2006

Method for Visually Measuring Slope-of-Grain on Baseball Bat Billets.

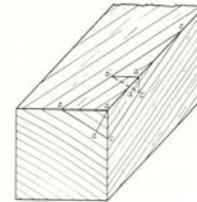
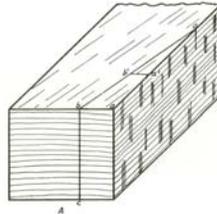
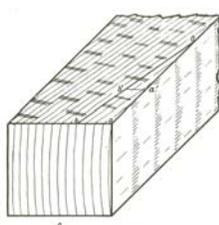
Wood baseball bat billets usually come in round or square form. It is important to understand that there are two planes involved when measuring slope of grain: **radial** plane and **tangential** plane. In round members, both the radial and tangential planes are visible in the billet...



Round billet on left shows annual ring lines visible on the radial plane (easy).

Round billet on right shows slope of grain on tangential plane (more difficult to assess)

When dealing with square billets, radial and tangential planes are both visible only when the annual rings are parallel and perpendicular to the square cross section, as shown in the first 2 examples below. Most square billets are not often cut this way, and usually have annual rings at some angle to the square cross section, as shown in the 3rd example.



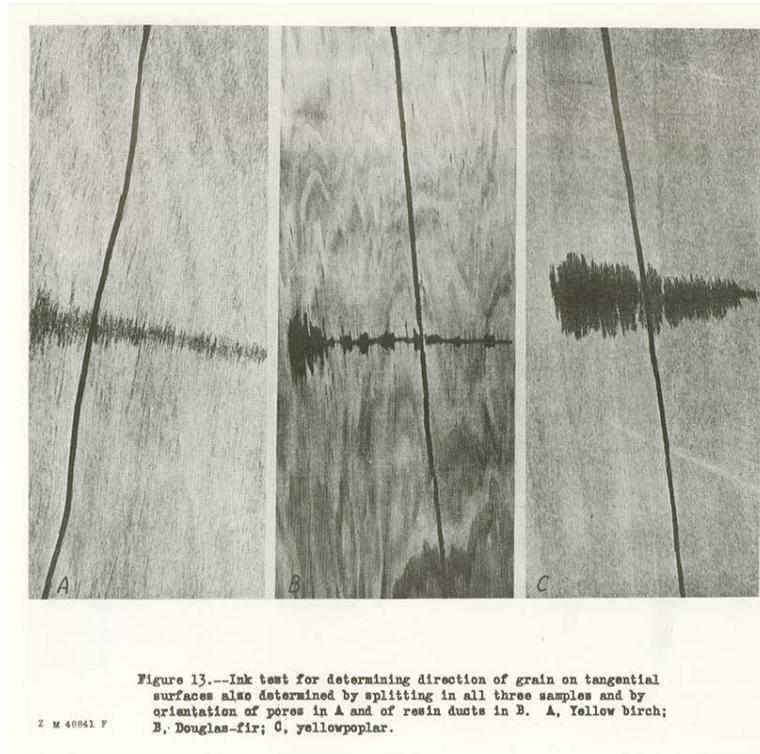
In the 3rd example for square billets, the true SOG must be calculated by the formula (see Tech Note 2A):

$$SOG = \sqrt{(SOG_R)^2 + (SOG_T)^2}$$

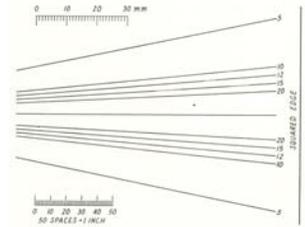
It is well understood that measuring the slope of grain on the tangential face (SOGT) of Sugar Maple is difficult to conduct visually, because the rays of the wood are very small. There are several test methods for measuring slope of grain, which include:

- a scratch test (leaves a scratch on the surface),
- pick test (must gouge the wood to see the grain lift off)
- electrical capacitance (need a flat surface; not effective for round billets)
- magnifying glass (to view small rays in Sugar Maple)

A possible method that could be used is an ink test. By placing a small line of low viscosity ink on the wood surface, the wicking of ink along the grain can be viewed, as shown in the Figure below. A grader can then use a gauge to estimate the slope of grain. This could be used on round billets, or potentially on unfinished bats.



Sample SOG gauge; could potentially be used for round billets, or round baseball bat handle.



If true SOG in baseball bat billets is to be limited to 1:20, this translates to approximately a 1:28 SOG limitation on each of the radial and tangential planes (see table below).

Table 4.— Combined slope of spiral and diagonal grain¹

How to Determine Combined Slope of Spiral and Diagonal Grain

First, determine slopes of spiral and of diagonal grain separately. To determine the combined, or resultant, slope find the column headed by the greater of the two slopes and in this column locate the figure in line with the lesser of the two slopes as given in the left-hand column. This figure represents the length in inches (or other units) in which the grain deviates 1 inch (or other unit) with respect to the central axis of the piece.

Examples: If the slope of spiral grain is 1 in 20 and the slope of diagonal grain is 1 in 25, the combined slope is 1 in 15.6, or if the slope of diagonal grain is 1 in 18 and the slope of spiral grain is 1 in 22, the combined slope is 1 in 13.9.

Slope of spiral or diagonal grain, whichever is lesser	1-10	1-11	1-12	1-13	1-14	1-15	1-16	1-17	1-18	1-19	1-20	1-21	1-22	1-23	1-24	1-25	1-26	1-27	1-28	1-29
1-10	7.1																			
1-11	7.4	7.8																		
1-12	7.7	8.1	8.5																	
1-13	7.9	8.4	8.8	9.2																
1-14	8.1	8.7	9.1	9.5	9.9															
1-15	8.3	8.9	9.4	9.8	10.2	10.6														
1-16	8.5	9.1	9.6	10.1	10.5	10.9	11.3													
1-17	8.6	9.2	9.8	10.3	10.8	11.2	11.7	12.0												
1-18	8.7	9.4	10.0	10.5	11.1	11.5	12.0	12.4	12.7											
1-19	8.8	9.5	10.1	10.7	11.3	11.8	12.2	12.7	13.1	13.4										
1-20	8.9	9.6	10.3	10.9	11.5	12.0	12.5	13.0	13.4	13.8	14.1									
1-21	9.0	9.7	10.4	11.1	11.6	12.2	12.7	13.2	13.7	14.1	14.5	14.9								
1-22	9.1	9.8	10.5	11.2	11.8	12.4	12.9	13.5	13.9	14.4	14.8	15.2	15.6							
1-23	9.2	9.9	10.6	11.3	12.0	12.6	13.1	13.7	14.2	14.6	15.1	15.5	15.9	16.3						
1-24	9.2	10.0	10.7	11.4	12.1	12.7	13.3	13.9	14.4	14.9	15.4	15.8	16.2	16.6	17.0					
1-25	9.3	10.1	10.8	11.5	12.2	12.9	13.5	14.1	14.6	15.1	15.6	16.1	16.5	16.9	17.3	17.7				
1-26	9.3	10.1	10.9	11.6	12.3	13.0	13.6	14.2	14.8	15.3	15.9	16.3	16.8	17.2	17.6	18.0	18.4			
1-27	9.4	10.2	11.0	11.7	12.4	13.1	13.8	14.4	15.0	15.5	16.1	16.6	17.1	17.5	17.9	18.3	18.7	19.1		
1-28	9.4	10.2	11.0	11.8	12.5	13.2	13.9	14.5	15.1	15.7	16.3	16.8	17.3	17.8	18.2	18.6	19.1	19.4	19.8	
1-29	9.5	10.3	11.1	11.9	12.6	13.3	14.0	14.7	15.3	15.9	16.5	17.0	17.5	18.0	18.5	18.9	19.4	19.8	20.1	20.5

¹Based on formula: Combined slope of grain = $\sqrt{(\text{slope of spiral grain})^2 + (\text{slope of diagonal grain})^2}$