The evolution of accuracy and consistency of measurements for hardwood floors by using the lower mortise as the reference point during the milling stage.

By Pierre Trudel, CTO, January 31, 2010

René St-Cyr Inc, a second-generation family business that has always worked on improving the quality of the interlocking with the tongue and groove for hardwood flooring in order to produce the best quality production.

During the period which preceded the launch and development of the TEMAVI system. We met with many of Quebec's hardwood flooring manufacturers and discovered that the measurement taking is still a source of intense discussion, debate and controversy.

We have identified two methods of measurement taking:

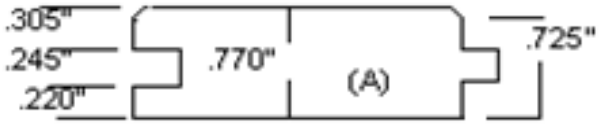
1. Using a caliper to measure the upper mortise
2. Using a caliper to measure the lower mortise

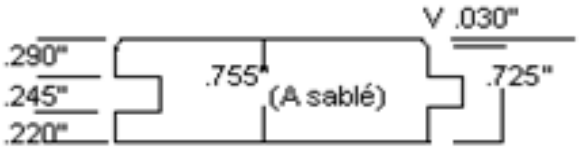
In the following pages of this article, we will try to demonstrate that both methods of measurement will cause the final end product to have discrepancies. These discrepancies in dimensions will vary from one method to the other and are known as the "staircase" or "piano key" effect which are often seen in hardwood flooring.

In our research, we observed that the upper mortise is the one that is most often used as the reference point. Thanks to further research, it led us to patent the TEMAVI ® system. We can now say unequivocally that measuring with a depth gauge, using the lower mortise as the reference point provides better results. This method produces a higher quality product which considerably reduces hassle further down the line. Especially for the end users (we've seen a significant reduction in the number of complaints). Reports from other manufacturing companies currently using the TEMAVI®
system confirm our findings.

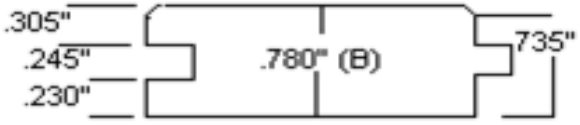
Examples illustrating how using different methods can result in variations in dimensions.

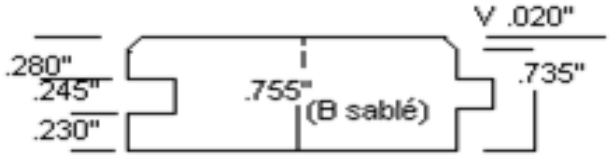
Lets use the dimensions from Fig. A below as our basis for comparison. If the boards' thickness after the milling stage was always .770", regardless of the reference point used either the upper mortise at .305" or the lower mortise at .220". Then we were to sand the board down to .755", we would always have a V-joint of .030" in depth.



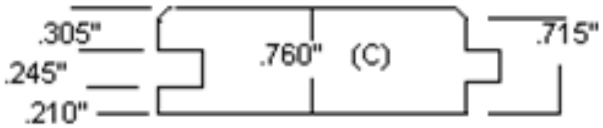


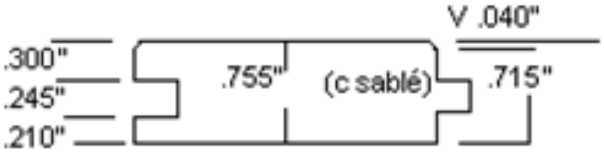
But if we look at Fig. B, we see that using the upper mortise as our reference point which is .305", with a total thickness of .780", sanding it down to the same thickness as Fig. A (.755"), we'll get a V-joint that is only .020" in depth. This will cause definitely difficulties in inserting the lower mortise, being .230" like in Fig. B with the tongue in Fig. A that has an opening reduced to .220", we are missing .010".





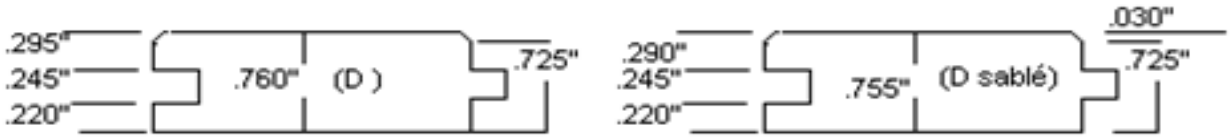
In Fig. C, the upper mortise is still at .305" before sanding but this time the board's total thickness is reduced to .760". The Result: the lower mortise of .210" will insert right under the tongue which is .230" Fig. B and now, we'll get a V-joint that is .040" in depth and with all of these parameters it gives us an unbalanced floor.



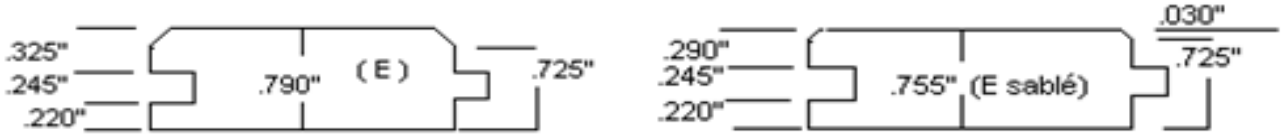


We have found that the first three examples above illustrate boards that have been sanded down to an even thickness of .755". This has an inconsistency in the dimensions from their upper and lower mortises resulting with a floor having unequal V-joints.

Now, lets use the lower mortise as the manufacturing reference point. We have found that sanding the boards' thickness down to .755" like in Fig. D. We have kept the lower mortise and the V-joint as the same as in Fig. A.



Now for an extreme example, let's look at Fig. E. The total thickness here is .790" but after sanding it down to .755 we still have a lower mortise of .220" and a V-joint depth of .030" just like in Fig. A and Fig. D.



Conclusion: Using the lower mortise as the reference point in taking the measurements, it allows some variations in the boards' total thickness without compromising the quality of the final product. This way, the measurements of the upper mortise may differ in production but it will always be corrected during the final sanding process.

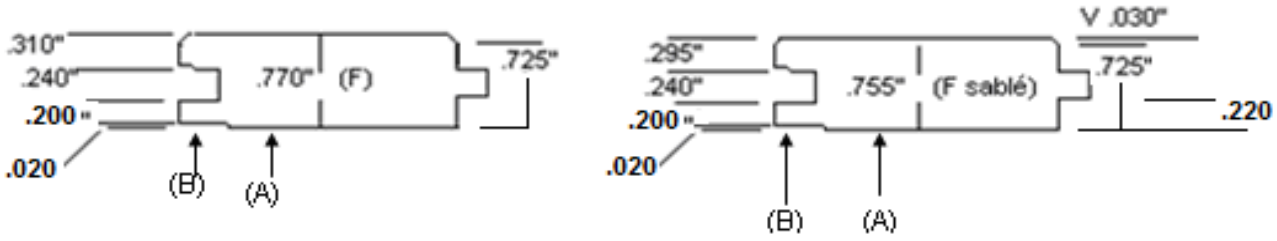
TEMAVI® Measurements

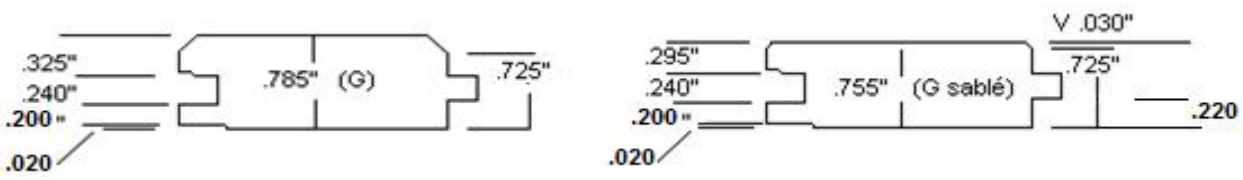
To develop this new technology, we had to find a new way to measure boards after the milling stage so we came up with an idea that surpasses our expectations. It achieves a higher precision in board measurements than the usual methods.

The traditional way was to use a caliper to measure the upper or lower mortise as a reference point ensuring the consistency from one production batch to the next. Unfortunately, this way wasn't always the most precise method and results would vary depending on who was taking the measurements.

With our TEMAVI® system, the lower mortise is milled along both horizontal surfaces at an even measurement of .200" leaving .020" for the milled lower notch in the lower mortise. It is this measurement that takes the importance and we use a depth gauge to collect this measurement. This tool, depth gauge, is more accurate than the caliper since the base is pushed against the bottom of the board (see Fig. F, letter A) and its spring plunger (letter B) is pressed up against the bottom of the milled notch. Now, you will get the exact same measurement every time no matter who takes it.

If we compare the board in Fig. F (.770") and the board in Fig. G (.785"), respecting the dimensions of the milled lower notch in the lower mortise to be (.020") with the opening of the groove to be (.240") and the clamping to be adequate. In both cases, once they're sanded down to .755" the boards will be identical and we find that the V-joint will be .030" in depth.



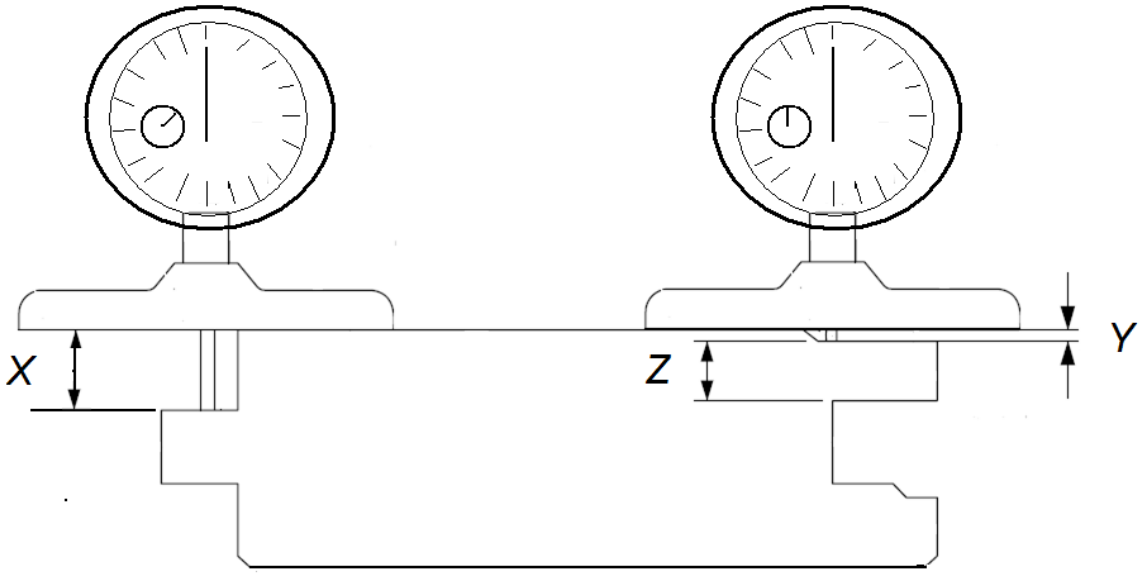


In this example, the difference between the dimensions has been exaggerated but it demonstrates how it can be fixed by sanding. At the milling stage, we have different variances of temperature that the worktables have at the molder. They expand with the heat that is produced from friction that the boards make and retract depending on the length of inactivity. With this in mind, it is easier to maintain the equality or consistencies in dimensions of the lower mortise just by adjusting the molder's last cylinder's upper knife which is on top of the molder.

Now, lets take it a step further. The TEMAVI® system allows us to use the bottom of the lower mortise or the bottom of the tongue as our reference point from the bottom of the board. Since both references are made with the shaper that mills the tongue and groove at the milling stage.

Traditionally, the bottom of the lower mortise is milled with the cylinder knife that mills the bottom of the boards. Now, with the new TEMAVI® system (see the table on the next page), by adjusting the thickness of the lower mortise to .200" (measurement Z) it can be measured accurately with a depth gauge to the thickness of .020 (measurement Y) which is what lacks to match the dimension of .220" (measurement X). This separates the lower part of the tongue and the bottom of the board. This new way in measuring manufactured hardwood floor boards ensures us to obtain an almost perfect equality from one board to another. With the measurement Z, which represents the thickness of the lower mortise (it being always constant), we can change the X and Y measurements provided we comply with the following formula: X = Y + Z.

Table illustrating TEMAVI® system measurements taken with a depth gauge



On the next page, you will find a table illustrating the various analysis methods of measurement currently used in the industry and the impact that the TEMAV®I system has on the quality of a hardwood floor using this process. You will notice that the variation of a board is minimal to almost nonexistent.

René St-Cyr (1996) Inc.
Analysis of measuring methods using different reference points on boards for manufacturing hardwood floors.

	Figures	Variation (too thin)	Variation (too thick	Total variation	
Measuring the upper mortise with a caliper	A, B, C	-.010"	+.010"	020"	. The discrepancy is partly due to the way it is measured, mostly to the fact that the reference point is the upper mortise which needs to be sanded again.
Measuring the lower mortise with a caliper	D, E	-.003"	+.003"	.006"	The discrepancy is due in the way the measurement is taken with the caliper, which is inaccurate if the measurements are taken by different individuals .
Measuring the lower mortise with a depth gauge according to the patented **TEMAVI**TM system	F, G	-.001"	+.001"	.002"	The reduction in variation is due to the use of the depth gauge in measuring the lower mortise according to the TEMAVI®system..

N.B.	The result in having regularity with the dimension of the V-joint is associated with the frequency and speed at which the employees involved in verifying the quality of the production line also having an ease in adjusting the molder

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