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**ASSESSMENT OF 'VIVA 20'
CAPACITANCE-TYPE MOISTURE METER**

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May 1989

W.U.R.C. Technical Report

Limited Distribution

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SUMMARY

There is considerable need for a non-destructive moisture meter which is accurate but does not require probes driven into the timber. The Vanicek 'Viva 20' capacitance-type meter and the Bollman resistance-type meter in common use in Western Australian sawmills were compared with the standard oven-dry method. Tests were done on 25 mm and 50 mm thick specimens of jarrah (*Eucalyptus marginata* Donn ex Sm.) at three different nominal moisture levels (equilibrium moisture content, fibre saturation point, and green), giving a total of six treatments.

The results indicated that at f.s.p. and above both meters were inaccurate and gave a guide only to the true moisture content. At e.m.c. there was a considerable error range with the Viva 20 but substantially less with the Bollman meter. The 25 mm specimens give better results than the 50 mm specimens. These tests indicated that thickness and wood density contributed to the variation in moisture content readings with the Viva 20. Significant correlations between wood density and meter error suggested that with sufficient data, regression analysis could be used to establish correction factors when density was taken into account.

INTRODUCTION

Accurate measurement of moisture content in timber is done using the standard oven-dried method, as described in Australian Standard AS1080 Part 1- 1972 (Standards Association of Australia 1972). This method is destructive, and drying usually takes at least 24 hours at about 103°C.

Immediate estimates of moisture contents are generally done with a resistance-type meter such as the Bollman meter which is commonly used in Western Australian sawmills. This requires probes driven into the piece of timber, which causes minor damage to the timber. For purposes such as assessing moisture content in furniture wood, it is obvious that this meter is not acceptable.

This trial assessed a Vanicek 'Viva 20' capacitance-type moisture meter, which does not need probes, and is completely non-destructive. The meter has settings for either wood ('H') or other building materials, with a sensitivity scale 0 to 10 for each setting.

Examples of the required sensitivity scale for different European species were supplied with the meter.

Moisture content readings from this meter and Bollman meter readings were compared with the oven-dry method as the control. The samples used for the assessment were regrowth jarrah (*Eucalyptus marginata* Donn ex Sm.), with two thicknesses and three moisture content ranges being assessed.

MATERIALS AND METHODS

The samples tested were regrowth jarrah in six different treatments:

(a) two thickness classes - 25 mm and 50 mm.

(b) three M.C. ranges - green, fibre saturation point (f.s.p.) and equilibrium moisture content (e.m.c.)

One specimen was cut from each of 10 randomly selected boards in each treatment to 100 x 65 x 25 or 50 mm.

The moisture content of each specimen was then assessed for each combination of thickness and MC range, using the Viva 20 meter, the Bollman meter and finally the oven-dry method.

The method used for assessing the Viva 20 meter was designed to avoid bias caused by variations in resistance. The specimen was placed on a piece of glass raised 50 mm above a wooden table, and the prongs rested on the specimen. The weight of the meter only was used to make the contact, ensuring that all three prongs were actually touching the specimen. If not, the meter was moved until the prongs did touch. The material type was set for wood (the 'H' setting on the meter) and one measurement taken for each sensitivity setting (0 - 10).

The Bollman meter was then used for readings on each specimen, and case and core measurements taken.

Finally, the oven-dry method was used to provide the control data. Specimens were weighed, placed in the oven with air circulated at $80^{o}C$ for four days to dry to constant weight, then re-weighed and initial moisture contents calculated.

The differences between Viva 20 and oven-dry, and between the Bollman and oven-dry moisture contents were then calculated.

RESULTS AND DISCUSSION

The results of the study are given in Table 1. The Viva 20 readings are for the '10' setting on the meter, which were shown to give the closest readings to the correct moisture content. The Bollman readings are the mean of case and core measurements.

Table 1. Comparison of Viva 20 and Bollman meters using the oven-dry method as a control.

	Viva 20		Bollman		Oven-dry
Treatment	**Mean* MC %**	**Error Range %**	**Mean * MC %**	**Error Range %**	**Mean MC %**
EMC 25 mm	14.3	-3.2 to 3.3	13.6	-1.9 to 0.8	14.4
EMC 50 mm	15.4	-1.0 to 4.3	14.9	0.0 to 2.1	13.7
FSP 25 mm	27.0	-19 to -2	23.8	-20 to -6	35.7
FSP 50 mm	25.4	-32 to -11	24.7	-25 to -8	43.5
Green 25 mm	66.2	-48 to -15	50.9	-67 to -23	91.7
Green 50 mm	65.2	-45 to -16	45.4	-63 to -22	92.7

*Using '10' setting

The mean moisture content values (and the error range) showed that the accuracy of the Viva 20 and Bollman meter decreased as moisture content of the wood increased, as indicated by the comparison with the data from the standard oven-dry method. These results indicated that at f.s.p. and above, moisture meter readings should be used as a guide only. In 25 mm thick boards, the Viva 20 read an average 8.7 per cent lower at f.s.p. and 25.5 per cent lower than the oven-dry values for green timber, and 18.1 per cent and 27.5 per cent lower in 50 mm thick specimens. The corresponding errors for the Bollman meter were 11.9 per cent lower (f.s.p.) and 40.8 per cent lower (green) in 25 mm boards, and 18.8 per cent and 47.3 per cent lower in 50 mm specimens.

At e.m.c. the results were reasonably accurate, with the Bollman meter showing a considerably smaller error range than the Viva 20 (Table 1). The error range in the Viva 20 results (6.5 per cent in 25 mm and 5.3 per cent in 50 mm specimens), suggested that the meter could not be recommended.

However, the data did indicate that thickness of the timber was one major cause of variation in the Viva 20 results, and it was considered that wood density could also be a factor. Consequently estimates of wood density were made of the same sets of e.m.c. specimens. The density estimates were then related to the error in moisture content in that specimen, giving a correlation coefficient of 0.52 (N.S.) in 25 mm specimens but 0.72 (p.01) in 50 mm specimens.

There is a considerable need for a non-destructive meter (i.e. no probes to insert) like the Viva 20. The correlation between meter error and wood density suggested that regression analysis methods could be used to establish correction factors for moisture contents estimated using the meter. Considerably more data would be required to increase the accuracy of prediction. The major difficulty would be estimating density of wood, within a specified range of moisture content, to predict the actual error in the meter.

REFERENCE

STANDARDS ASSOCIATION OF AUSTRALIA (1972). Methods of testing timber. AS1080 Part 1 -1972. Moisture content.