Please be informed that discussions were held on 14 April 1992 in the Netherlands between a technical mission, led by MTIB and comprising members from the Forest Research Institute Malaysia (FRIM), Timber Exporters Association of Malaysia (TEAM) and the Timber Kilning Association of Selangor (TKAS), and the Stichting Keuringsbureau Hout (SKH) (the Foundation which is responsible for certification and inspection of timber, timber products and timber constructions; in this context, to ensure that window frames manufactured from timbers such as Dark Red Meranti comply with specified standards, including those related to moisture content), the Stichting Hout Research (SHR) (the timber testing laboratory which provides the technical support to the SKH), the Netherlands Timber Trade Association (NHB) and the Netherlands Association of Joinery Manufacturers (NBTF) regarding the above matter.

Following these discussions, it has been agreed that the moisture content (m.c.) requirements for the usual window frame specifications for Dark Red Meranti (DRM) (Meranti bukit and Meranti seraya) 3" x 5" and 3" x 4 1/2" kiln dried timber are as follows:

Specified average moisture content (m.c.): 16 ± 2% (i.e. 14% to 18%)

The average moisture content mentioned above refers to the moisture content of a single piece of timber, and does not refer to the average among the pieces in any parcel.

(a) Average Moisture Content

In order to determine average moisture content of a piece of timber, the correct and final method shall be the result of an oven-test on a whole cross-section of the sample. The use of the core segment alone does not give the true average moisture content.

When using electrical resistance-type moisture meters, readings shall be taken at 1/3 thickness (e.g. 3" x 5" timber at 1" depth), as practised by international scientific organizations.

Moisture meter readings of individual test pieces at 10 mm depth from the surface and at half thickness (i.e. the core) shall not differ more than 4 to 5%, to reduce excessive stresses. Example: a piece of Meranti bukit 3" x 5" scantling measures 17% m.c. at 1" depth (1/3 thickness), 15% at 10 mm depth and 19% at 1 1/2" depth (core) is acceptable because:
(a) the average m.c. reading = 17 % (less than 18 %)
(b) the moisture difference (gradient) = 19 % - 15 % = 4 %
(within the acceptable range)

(The SKH has agreed to use this method in practice, for which they will seek prompt authorisation from their Committee of Experts.)

Tolerance Range for Moisture Content

There should be room for the acceptance of a certain number or percentage of 'deviations' (i.e. pieces with m.c. outside the specified m.c. range).

To allow for such 'deviations', SKH has proposed the adoption of the sampling method as per International Standard Organisation standard ISO 2859 (known in the Netherlands as NEN 5461 or KVK 1980, para 6.3), quality level 2, in taking random samples for testing the m.c. The relevant extract from KVK 1980 is attached as Appendix I.

Using ISO 2859/NEN 5461/KVK 1980, if a parcel of 3" x 5" Meranti bukit contains 312 pieces, at quality level 2, 20 pieces are taken at random from the parcel, which will be accepted if not more than 2 pieces fail to meet the specified m.c. range.

Accuracy of Electrical Resistance-Type Moisture Meters

In April 1992, the SHR and Mr. M. J. Noordhoek (a tropical hardwood expert and arbitrator based in the Netherlands) were commissioned by the TKAS and TEAM to compare readings recorded by three different brands of electrical resistance-type moisture meters which are most widely used, i.e. Delmhorst (which is commonly used in Malaysia), Brookhuis (commonly used in the Netherlands and the brand used by SKII’s inspectors) and Gann, against oven dry results.

Based on SHR’s report No. R92.025e dated 9 April 1992 in conjunction with Mr. Noordhoek’s report, it was found that all these meters do not give consistently accurate readings for Meranti bukit, Meranti seraya and Merbau. Appendix II is an extract from the SHR report. The reports, whilst providing a strong indication, were based on a limited number of tests due to time constraint. It was agreed that further research will be done, jointly by FRIM and SHR, probably to be carried out in FRIM.

The further research will be carried out as follows:

(i) Further interim research to be carried out over the next 6 to 8 weeks, similar to the SHR/Noordhoek tests, using unconditioned samples but larger in number and wider in m.c. range, especially in the 18 % to 25 % m.c. range. Based on the results, an interim adjustment to the meter
readings will be implemented. In the case of the Brookhuis meter, a new calibration can be made within 7 to 10 days.

(ii) Further research, using conditioned samples, will be carried over the next 6 to 12 months to determine the final adjustments needed for the different brands of meters.

In view of these developments, the practices as agreed above shall be followed with respect to kiln-dried Dark Red Meranti (Meranti bukit and Meranti seraya) 3" x 5" and 3" x 4 1/2" timber exported to the Netherlands market for the manufacture of window frames, with effect from the date of this Bulletin.

In cases of disputes regarding the m.c. of any parcel of timber, and if no amicable settlement can be reached on the basis of electrical resistance-type moisture meter readings, the oven-test as described in Malaysian Standard MS 837: "Method for the determination of moisture content of timber" shall be the final recourse. A brief explanation of this test is outlined in Appendix III.

However, with regard to paragraph (b), the more practical method of sampling randomly 70 pieces or 10% of the total number of pieces in a parcel, whichever is the lower, shall be carried out. Of the pieces inspected or sampled, not more than 10% of the total number of pieces shall exceed the maximum allowable moisture content.

All registered timber exporters and kiln-drying plants are advised to inform their buyers/importers in the Netherlands as soon as possible regarding the contents of this Bulletin.

[Signature]

DATO' BAHARUDDIN HJ. GHAZALI
Director-General
Malaysian Timber Industry Board
TRANSLATION FROM THE KVH 1980

6.3 **Inspection-criteria**

A parcel is consider to comply to the requirements of each of the combinations of properties per species norms if the amount of rejected elements are not higher than the "approval-criterium" for the quality range which has to be applied.

**Sample size and approval-criteria**

<table>
<thead>
<tr>
<th>Batch Size from</th>
<th>to</th>
<th>Sample size n</th>
<th>Approval-criteria for quality range 1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>90</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>91</td>
<td>150</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>151</td>
<td>280</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>281</td>
<td>500</td>
<td>20</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>501</td>
<td>1200</td>
<td>32</td>
<td>2</td>
<td>3</td>
<td>5</td>
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<tr>
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<td>125</td>
<td>7</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>350001</td>
<td>-</td>
<td>200</td>
<td>10</td>
<td>14</td>
<td>21</td>
</tr>
</tbody>
</table>

**Explanation:** For the quality range 1, 2 and 3 it means that at least resp. 96%, 93 1/2% and 90% of the parcel size can be considered to comply with the requirements.

**Example:** A parcel of 3 x 5" will consist of about 312 pieces

1) Batch size is from 281 to 500 pieces

2) 20 samples have to be chosen AT RANDOM from the parcel for checking of the MC

3) Quality range 2 applies, and so 2 out of the 20 pieces may be rejected and the parcel is still approved

**Examples**

M.C. specified is between 14 and 18%, but 2 pieces are found to be 22 & 27%. In that case the parcel is still approved

M.C. found are between 14 and 18% but 4 are 22, 23, 25, 27%. In that case the parcel cannot be approved.
### Appendix II

The determination of the moisture content of Meranti and Merbau.

Report code: R92.025c

Date: 9 April 1992

Page nr: 7

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Deviation of the true moisture content (%)</th>
<th>Tendency</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERAYA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brookhuis</td>
<td>+1 to 3 (+6)*</td>
<td>about 2% too high</td>
</tr>
<tr>
<td>Gann</td>
<td>-0.5 to +2 (+4.5)*</td>
<td>about 1 - 2% too high</td>
</tr>
<tr>
<td>Delhorst</td>
<td>-4 to +1 (+3.5)*</td>
<td>about 2 - 3% too low</td>
</tr>
</tbody>
</table>

* highest deviation

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Deviation of the true moisture content (%)</th>
<th>Tendency</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERBAU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brookhuis</td>
<td>+2 to 5</td>
<td>more than 2% too high</td>
</tr>
<tr>
<td>Gann</td>
<td>+1 to 4</td>
<td>1 to 2% too high</td>
</tr>
<tr>
<td>Delhorst</td>
<td>-2 to +2.5</td>
<td>+/- 2% variation</td>
</tr>
</tbody>
</table>

Only 4 samples available
Moisture content between 14 and 16%

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Deviation of the true moisture content (%)</th>
<th>Tendency</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUKIT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brookhuis</td>
<td>0 to +3 (+5)*</td>
<td>about 2% too high</td>
</tr>
<tr>
<td>Gann</td>
<td>-1.5 to +1.5 (+2.5)*</td>
<td>varying about 1½% around the true MC</td>
</tr>
<tr>
<td>Delhorst</td>
<td>-4 to 0 (+1.5)*</td>
<td>about 3% too low</td>
</tr>
</tbody>
</table>

* highest deviations

### CONCLUSION

With the chosen timberspecies (Bukit, Seraya, Merbau) the Brookhuis meter readings have the tendency to indicate too high results.

For Seraya and Bukit the indicated values of the Delhorst seem to be on the lower side.

The Gann meter in this experiment gave the smallest deviations. The amount of samples is however too small for a definite and reliable conclusion.

Once more it has to be said with emphasis that the above conclusions are based on a small amount of samples and that a final conclusion without any limitation, can only be made after an experiment which much more material.

---

Timber Technology, Wood Preservation, Product Development, Wood Laboratories for Research and Testing

SHR is established by and co-operates with SKH N.V.

SKH is the Foundation for the Certification and Inspection of Timber, Timber products and Timber constructions.
DETERMINATION OF MOISTURE CONTENT - OVEN DRYING TEST

Selection of test sections. Complete cross-sections shall be cut from the board or scantling. These shall be 20 mm to 25 mm long on the direction of the grain and free from all defects and imperfections and shall be cut from the test material as follows:

a) If a weighing can be made immediately, the test piece shall be cut from a point at least 600 mm from the end of the board or scantling

b) If weighing cannot be made immediately, a sample of at least 300 mm long shall be cut from a point at least 600 mm from the end of the board or scantling and kept in an airtight cellophane or plastic bag which must be stored in the shade at normal atmospheric temperature. Within 24 hours, the test piece shall be cut from the centre of the 300 mm sample.

Method of test. The test pieces obtained and cut in accordance with (a) and (b), above, shall be weighed immediately after cutting, on a balance, the sensitivity of which shall not be less than 1 in 500 and capable of weighing within 0.1 g. The sections shall then be dried in an oven at a temperature of 100°C to 105°C until the weight is constant and shall be reweighed immediately after removal from the oven.

Calculation. The percentage moisture content shall be calculated from the formula:

\[
M.C. = \frac{(W_i - W_o) \times 100}{W_o}
\]

Where:
- M.C. is the percentage moisture content
- \(W_i\) is the initial weight of test specimen
- \(W_o\) is the oven dry weight of test specimen

(Extracted from Malaysian Standard, MS 837: 1985, "Method For The Determination of Moisture Content of Timber")