



Title: Dimensional stability of Accoya™ wood under different moisture conditions

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Entries: Dimensional stability, ASE, adsorption, desorption, shrinking, swelling, moisture conditions, Accoya™ wood, Radiata Pine, KOMO certification, BRL 0605

Summary

Titan Wood B.V. appointed SHR Timber Research to examine the dimensional stability of Accoya™ wood under different moisture conditions. The technology behind Accoya™ wood is based on wood acetylation. In this investigation Accoya™ wood and the untreated original wood species, Radiata Pine, were tested as part of the research scheme for KOMO certification BRL 0605 "Modified Timber".

Equilibrium Moisture Content, density and dimensional stability of Accoya™ wood

In the table below, the characteristics of Accoya™ wood (originating from New Zealand), acetylated in three separate batches, are summarised.

| Aspect | Avg. | Stdev. | Min. | Max. |
|--|------|--------|------|------|
| Equilibrium Moisture Content (at 65% RH, 20°C) [%] | 3.3 | 0.15 | 3.0 | 3.8 |
| Density (at 65% RH, 20°C) [kg/m ³] | 510 | 36 | 438 | 599 |
| Swelling (oven dry – water saturated) | | | | |
| - radial [%] | 0.69 | 0.13 | 0.49 | 0.99 |
| - tangential [%] | 1.47 | 0.24 | 0.91 | 2.34 |

Uniformity and variation

On basis of the results it can be concluded that there is a low variation in results between the different acetylation batches compared to the overall variation. It can be concluded that as regards the Equilibrium Moisture Content and dimensional stability, the acetylation process is uniform (within a batch) and reproducible (between batches).

Comparison between Accoya™ wood originating from New Zealand and Chile

The Accoya™ wood samples originating from Chile showed similar values for the hygroscopicity (equilibrium moisture content) and dimensional stability (swelling and shrinking) as the Accoya™ wood samples originating from New Zealand. The average density, however, is slightly higher for the Accoya™ wood samples originating from Chile, as well as the variation between samples.

Comparison between Accoya™ wood and (untreated) Radiata Pine

The results show a substantial reduction of the hygroscopicity (Equilibrium Moisture Content) for the Accoya™ wood compared to the untreated Radiata Pine under the same moisture conditions (relative humidity). The dimensional stability (swelling and shrinking) of Accoya™ wood is considerably improved (by approximately 80%) compared to the (untreated) Radiata Pine.

| Aspect | Accoya™ wood | Radiata Pine | Improvement |
|---|---------------------|---------------------|--------------------|
| Equilibrium Moisture Content (at 65% RH, 20°C) [%] | 3.3 | 9.8 | 66% |
| Density (at 65% RH, 20°C) [kg/m ³] | 510 | 466 | - |
| Swelling (oven dry – water saturated) | | | |
| - radial [%] | 0.69 | 3.40 | 80% |
| - tangential [%] | 1.47 | 7.89 | 81% |

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1 Assignment

Titan Wood B.V. appointed SHR Timber Research to examine the dimensional stability of Accoya™ wood under different moisture conditions. The technology behind Accoya™ wood is based on wood acetylation, a chemical modification process that improves the dimensional stability, UV-stability and durability of wood. The process modifies the wood without the addition of toxic chemicals. Accoya™ wood's durability and dimensional stability can be determined after the acetylation process has taken place by analysing the wood's acetyl content.

In co-operation with a Dutch certification body, SKH, and research institute, SHR Timber Research, Titan Wood has established a research scheme to independently prove the quality of Accoya™ wood. This scheme consists of:

1. KOMO certificate BRL 0605 "Modified Timber". Here the emphasis is on the uniformity and reproducibility of the production process, as well as on Titan Wood's quality system.
2. Fulfilment of the (material) requirements as listed for in use of certified Dutch joinery (SKH Publication 97-04). Emphasis is on material properties, such as durability, dimensional stability and paintability.

In this research, the Equilibrium Moisture Content (EMC), the adsorption and desorption behaviour and the shrinking and swelling behaviour (dimensional stability) of Accoya™ wood (originating from New Zealand) under different moisture conditions are determined and compared to the untreated (original) wood species, Radiata Pine. These tests are part of the research scheme described above. In addition to the main research programme, samples of Accoya™ wood from Radiata pine grown in Chile were tested to investigate whether the origin of wood had any impact on the results. Although the results are incorporated, this report mainly presents and discusses the results of the Accoya™ wood originating from New Zealand.

2 Execution of the test

2.1 Identification and description of the samples

Sampling was performed according to BRL 0605 “Modified Timber” by Titan Wood. Accoya™ wood samples (originating from New Zealand) were taken from 3 batches produced in Titan Wood’s pilot plant (15 samples per batch), originating from different boards. In addition 10 Accoya™ wood samples from Radiata pine grown in Chile were used for the test. The Accoya™ wood samples and 10 samples of (untreated) Radiata Pine (from New Zealand) were used for the test, each with a dimension of 40 x 40 x 10 mm (radial x tangential x longitudinal). The codes of the samples and the correlating batch numbers can be found in appendix 1.

2.2 Procedure

The dimensional stability of Accoya™ wood was extensively investigated by establishing a so-called hysteresis curve, conforming to Standard Operation Procedures of SHR Timber Research, the Netherlands (WVS-SHR-047, WVS-SHR-048 and WVS-SHR-049). Samples were conditioned at the following climates: oven dry, 25, 35, 50, 65, 80, 95% relative humidity and water saturated (all at a temperature of 20 °C). In this order (adsorption sequence), as well as in the reverse order (desorption sequence). The weight and dimensions (radial and tangential) of the samples were determined for each of the conditions. Based on the weight measurements, the relation between the relative humidity (of the air) and the corresponding Equilibrium Moisture Content (EMC) of the wood was determined for both the adsorption and desorption sequence. The corresponding shrinking and swelling was measured in the radial and tangential orientations of the wood structure.

Calculation of swelling

Using the measurements of the dimensions, the swelling was calculated both for the radial and the tangential directions by:

$$S_{swell, j} = \frac{d_j - d_{od}}{d_{od}}$$

with:

- $S_{swell, j}$: swelling of the wood at equilibrium moisture content (EMC) j. This value is often represented as a percentage and is also called swelling coefficient.
- d_j : dimension of the wood at EMC j (in radial or in tangential direction).
- d_{od} : dimension of the wood after oven drying.

This calculation was executed for each sample separately. Thereafter the mean and the standard deviations for all samples were calculated.

Calculation of shrinking

Using the measurements of the dimensions, the shrinking was calculated both for the radial and the tangential directions by:

$$S_{shrink, j} = \frac{d_{sat} - d_j}{d_{sat}}$$

with:

- $S_{shrink, j}$: shrinking of the wood at equilibrium moisture content (EMC) j. This value is often represented as a percentage and is also called shrinking coefficient.
 d_j : dimension of the wood at EMC j (in radial or in tangential direction).
 d_{sat} : dimension of the wood after water saturation.

This calculation was executed for each sample separately. Thereafter the mean and the standard deviations for all samples were calculated.

Calculation of the linear ASE

The Anti Shrinking (or Swelling) Efficiency (ASE) of the acetylation treatment is calculated by comparing the shrinking and swelling behaviour of the Accoya™ wood to that of the untreated Radiata Pine. With the above mentioned averages of swelling and shrinking, the linear ASE for swelling or shrinking was calculated as follows:

$$ASE_{lin, i-j} = \frac{S_{lin,ref, i-j} - S_{lin,beh, i-j}}{S_{lin,ref, i-j}}$$

With:

- $ASE_{lin, i-j}$: Linear anti swelling or shrinking efficiency, expressed as a percentage in the RH trajectory i% tot j%.
 $S_{lin,ref, i-j}$: Average linear swelling or shrinking coefficient of the reference (untreated) samples in RH trajectory i% to j%.
 $S_{lin,beh, i-j}$: Average linear swelling or shrinking coefficient of the treated samples in RH trajectory i% to j%.

ASE_{rad} or ASE_{tan} shall be used as the symbol instead of ASE_{lin} , depending on the direction for which the assessment was done (resp. radial or tangential).

The density of all samples and the deviation in density were determined.

3 Results and discussion

3.1 Equilibrium Moisture Content (EMC)

The averaged Equilibrium Moisture Content (EMC) of Accoya™ wood and untreated Radiata Pine, under different moisture conditions during the adsorption sequence and desorption sequence, are shown in table 1 and 2. In figure 1, a graphical overview of the averaged results of the Accoya™ wood samples originating from New Zealand is given. All individual values can be found in appendix 2 and 3.

Table 1. The average EMC under different moisture conditions during the adsorption sequence of Accoya™ wood and untreated Radiata Pine.

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|-----------|----------------|----------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | | | adsorption → | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | EMC [%] | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.8 | 118 |
| | | stdev | 0 | 0.07 | 0.09 | 0.11 | 0.16 | 0.19 | 0.32 | 12 |
| | LG122 | EMC [%] | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 119 |
| | | stdev | 0 | 0.05 | 0.08 | 0.09 | 0.12 | 0.14 | 0.32 | 14 |
| | LG123 | EMC [%] | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 127 |
| stdev | | 0 | 0.09 | 0.11 | 0.12 | 0.16 | 0.19 | 0.35 | 15 | |
| average | | EMC [%] | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.1 | 7.5 | 121 |
| | | stdev | 0 | 0.07 | 0.10 | 0.11 | 0.15 | 0.17 | 0.33 | 14 |
| Accoya™ wood (Chile) | LG135 | EMC [%] | 0 | 1.2 | 1.4 | 2.2 | 2.9 | 3.5 | 6.5 | 100 |
| | | stdev | 0 | 0.17 | 0.24 | 0.29 | 0.39 | 0.44 | 0.81 | 15 |
| Radiata Pine (New Zealand) | Ref-LG122 | EMC [%] | 0 | 4.6 | 5.6 | 7.2 | 9.8 | 11.8 | 23.2 | 158 |
| | | stdev | 0 | 0.10 | 0.17 | 0.14 | 0.14 | 0.14 | 0.56 | 14 |

Table 2. The average EMC under different moisture conditions during the desorption sequence of Accoya™ wood and untreated Radiata Pine.

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|-----------|----------------|----------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | | | ← desorption | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | EMC [%] | 0 | 1.8 | 2.5 | 3.7 | 4.6 | 5.4 | 7.5 | 117 |
| | | stdev | 0 | 0.13 | 0.17 | 0.22 | 0.28 | 0.34 | 0.44 | 12 |
| | LG122 | EMC [%] | 0 | 1.8 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 118 |
| | | stdev | 0 | 0.08 | 0.11 | 0.15 | 0.19 | 0.23 | 0.30 | 13 |
| | LG123 | EMC [%] | 0 | 1.9 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 124 |
| stdev | | 0 | 0.12 | 0.15 | 0.19 | 0.23 | 0.27 | 0.40 | 13 | |
| average | | EMC [%] | 0 | 1.8 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 120 |
| | | stdev | 0 | 0.11 | 0.14 | 0.19 | 0.23 | 0.28 | 0.38 | 13 |
| Accoya™ wood (Chile) | LG135 | EMC [%] | 0 | 1.5 | 2.0 | 3.1 | 3.8 | 4.4 | 6.2 | 105 |
| | | stdev | 0 | 0.28 | 0.36 | 0.46 | 0.56 | 0.65 | 1.00 | 16 |
| Radiata Pine (New Zealand) | Ref-LG122 | EMC [%] | 0 | 6.7 | 8.5 | 11.5 | 14.0 | 16.1 | 23.9 | 178 |
| | | stdev | 0 | 0.17 | 0.19 | 0.21 | 0.21 | 0.24 | 0.57 | 14 |

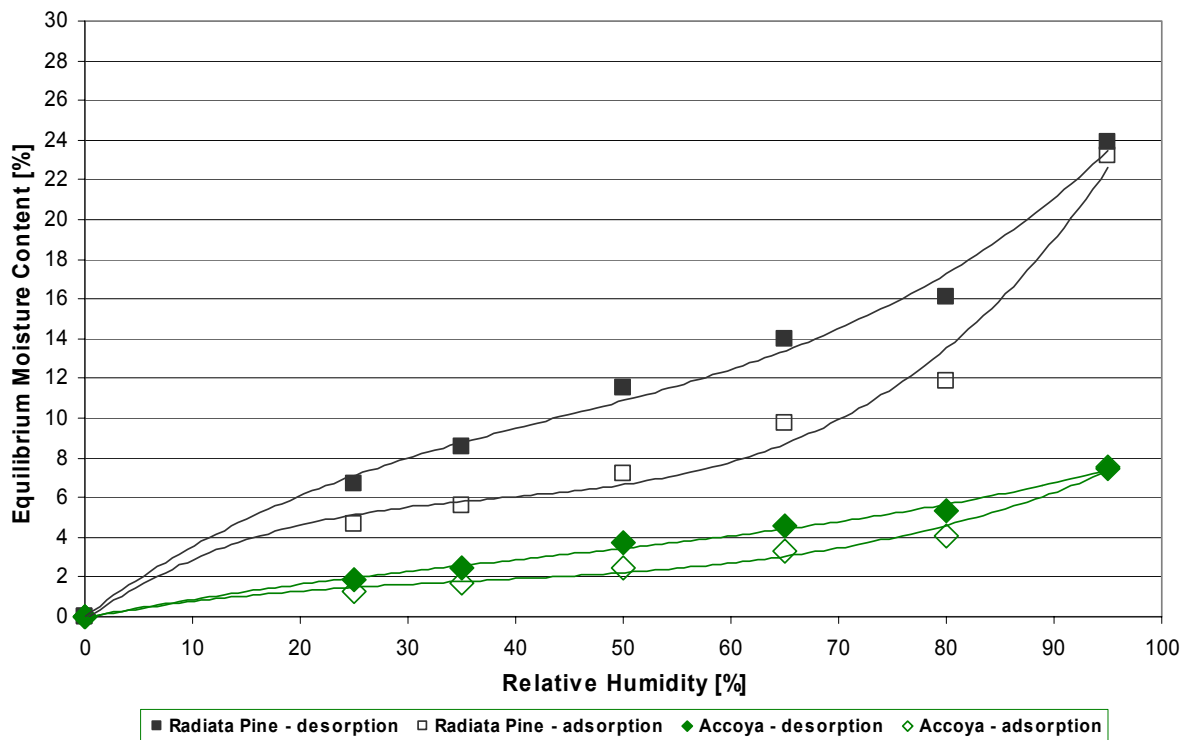


Figure 1. Averaged EMC of Accoya™ wood (originating from New Zealand) and untreated Radiata Pine under different moisture conditions.

Figure 1 demonstrates the substantial reduction of the hygroscopicity of the Accoya™ wood compared to the untreated Radiata Pine. The reduction of EMC (average reduction for all individual conditions) of Accoya™ wood (originating from New Zealand) compared to (untreated) Radiata Pine was 69%. The results per moisture condition are ranked in the same order as the overall average reduction, as can be seen in appendix 4.

Table 1 and 2 show a low variation in EMC between the different batches of Accoya™ wood, in comparison to the overall variation in EMC results. The standard deviation of the measured EMC of the Accoya wood™ was found to be slightly lower than the untreated reference (Radiata Pine).

The Accoya™ wood samples originating from Chile showed similar values to the Accoya™ wood samples from New Zealand.

3.2 Dimensional stability

Table 3 and 4 show the averaged (percentages of) swelling and shrinking in the radial and tangential directions of Accoya™ wood and untreated Radiata Pine, under different moisture conditions. In figure 2 (shrinking) and 3 (swelling) a graphical overview of the averaged results of the Accoya™ wood samples originating from New Zealand is given. All individual values can be found in appendix 5, 6, 7 and 8.

Table 3. The average swelling in the radial (rad.) and tangential (tang.) directions under different moisture conditions of Accoya™ wood and untreated Radiata Pine.

| Species | Batch | | Oven dry | Relative Humidity adsorption → | | | | | | Water saturated |
|-------------------------------|----------------|-----------------|-------------|---|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | rad. swell. [%] | 0 | 0.10 | 0.11 | 0.16 | 0.28 | 0.34 | 0.60 | 0.67 |
| | | <i>stdev</i> | 0 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 | 0.12 | 0.12 |
| | LG122 | rad. swell. [%] | 0 | 0.09 | 0.13 | 0.16 | 0.29 | 0.35 | 0.65 | 0.73 |
| | | <i>stdev</i> | 0 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.11 | 0.13 |
| | LG123 | rad. swell. [%] | 0 | 0.10 | 0.13 | 0.15 | 0.27 | 0.32 | 0.61 | 0.68 |
| | | <i>stdev</i> | 0 | 0.02 | 0.03 | 0.03 | 0.05 | 0.05 | 0.11 | 0.13 |
| | average | rad. swell. [%] | 0 | 0.10 | 0.12 | 0.16 | 0.28 | 0.34 | 0.62 | 0.69 |
| | <i>stdev</i> | 0 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.11 | 0.13 | |
| Accoya™ wood (Chile) | LG135 | rad. swell. [%] | 0 | 0.11 | 0.13 | 0.17 | 0.29 | 0.35 | 0.66 | 0.74 |
| | | <i>stdev</i> | 0 | 0.04 | 0.05 | 0.06 | 0.09 | 0.10 | 0.22 | 0.25 |
| Radiata Pine (New Zealand) | Ref-LG122 | rad. swell. [%] | 0 | 0.55 | 0.67 | 0.86 | 1.23 | 1.50 | 2.95 | 3.40 |
| | | <i>stdev</i> | 0 | 0.09 | 0.11 | 0.14 | 0.19 | 0.23 | 0.54 | 0.63 |

| Species | Batch | | Oven dry | Relative Humidity adsorption → | | | | | | Water saturated |
|-------------------------------|----------------|------------------|-------------|---|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | tang. swell. [%] | 0 | 0.12 | 0.17 | 0.27 | 0.45 | 0.58 | 1.26 | 1.46 |
| | | <i>stdev</i> | 0 | 0.03 | 0.04 | 0.05 | 0.07 | 0.10 | 0.26 | 0.31 |
| | LG122 | tang. swell. [%] | 0 | 0.12 | 0.18 | 0.28 | 0.47 | 0.60 | 1.30 | 1.51 |
| | | <i>stdev</i> | 0 | 0.03 | 0.03 | 0.04 | 0.07 | 0.08 | 0.20 | 0.24 |
| | LG123 | tang. swell. [%] | 0 | 0.12 | 0.17 | 0.26 | 0.44 | 0.56 | 1.23 | 1.43 |
| | | <i>stdev</i> | 0 | 0.03 | 0.04 | 0.04 | 0.06 | 0.07 | 0.15 | 0.17 |
| | average | tang. swell. [%] | 0 | 0.12 | 0.17 | 0.27 | 0.45 | 0.58 | 1.26 | 1.47 |
| | <i>stdev</i> | 0 | 0.03 | 0.04 | 0.04 | 0.06 | 0.08 | 0.20 | 0.24 | |
| Accoya™ wood (Chile) | LG135 | tang. swell. [%] | 0 | 0.14 | 0.16 | 0.25 | 0.42 | 0.52 | 1.12 | 1.30 |
| | | <i>stdev</i> | 0 | 0.06 | 0.08 | 0.11 | 0.17 | 0.21 | 0.45 | 0.56 |
| Radiata Pine (New Zealand) | Ref-LG122 | tang. swell. [%] | 0 | 0.91 | 1.12 | 1.50 | 2.19 | 2.73 | 5.92 | 7.89 |
| | | <i>stdev</i> | 0 | 0.12 | 0.12 | 0.13 | 0.15 | 0.17 | 0.42 | 0.76 |

The results show that the dimensional stability of the Accoya™ wood (originating from New Zealand) was substantially improved compared to that of untreated Radiata Pine. There is a low variation in average shrinking and swelling values of Accoya™ wood (originating from New Zealand) treated in different batches of Accoya™ wood, in comparison to the overall variation. The averaged overall standard deviation of the shrinking and swelling values of Accoya™ wood was lower compared to that of untreated Radiata Pine.

The Accoya™ wood samples originating from Chile showed similar values as the Accoya™ wood samples originating from New Zealand.

The average maximum swelling (from oven dry to water saturated) in the radial direction for Accoya™ wood was 0.7% (for both wood sources; New Zealand as well as Chile), whereas the corresponding average maximum swelling for the untreated Radiata Pine was 3.4%. The largest (individual) maximum swelling (and shrinking) in the radial direction for Accoya™ wood was 1.2% (see appendix 5 and 7).

The average maximum swelling (from oven dry to water saturated) in the tangential direction for Accoya™ wood was 1.5% (New Zealand) and 1.3% (Chile), whereas the corresponding average maximum swelling for the untreated Radiata Pine was 7.9%. The largest (individual) maximum swelling (and shrinking) in the tangential direction for Accoya™ was 2.7% (see appendix 6 and 8).

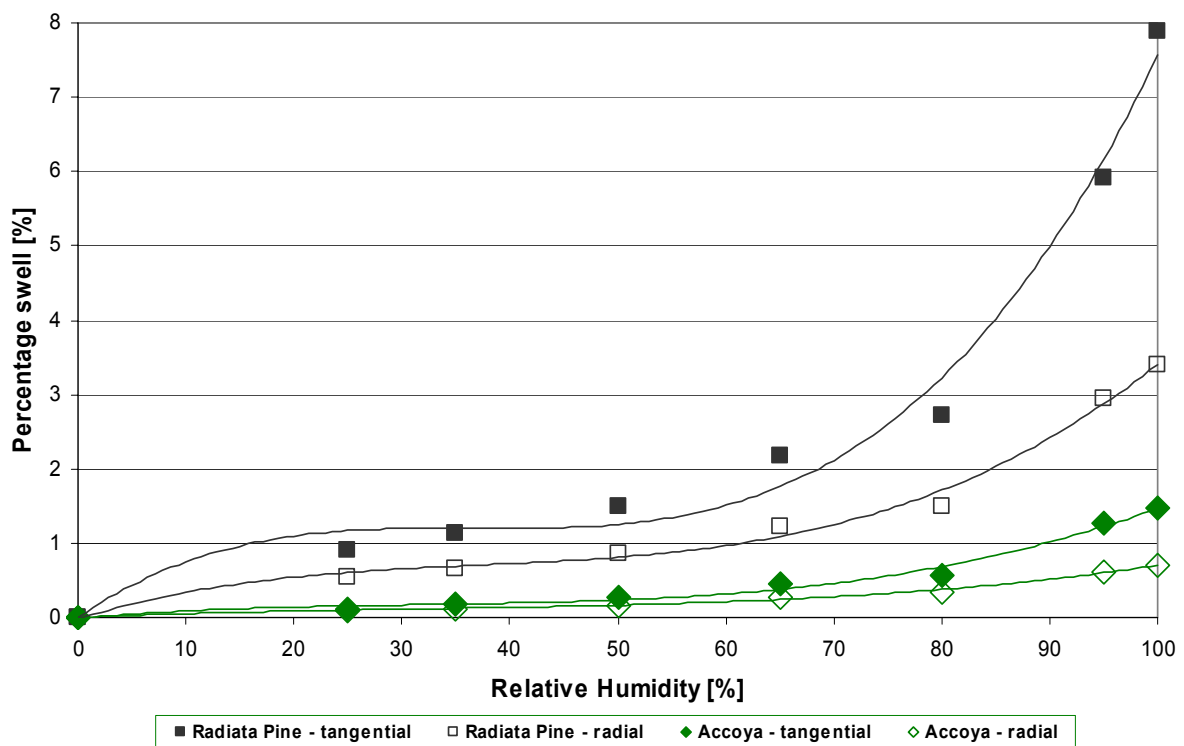


Figure 2. Swelling in the radial and tangential directions as a function of the relative humidity of the (conditioned) air of Accoya™ wood (originating from New Zealand) and Radiata Pine.

Table 4. The average shrinking in the radial (rad.) and tangential (tang.) directions under different moisture conditions of Accoya™ wood and untreated Radiata Pine.

| Species | Batch | | Oven dry | ← desorption | | | | | Water saturated | |
|-------------------------------|-----------|------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-----------------|----------|
| | | | | Relative Humidity | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | rad. shrink. [%] | 0.64 | 0.57 | 0.50 | 0.39 | 0.36 | 0.24 | 0.09 | 0 |
| | | stdev | 0.12 | 0.10 | 0.09 | 0.07 | 0.06 | 0.05 | 0.03 | 0 |
| | LG122 | rad. shrink. [%] | 0.73 | 0.65 | 0.56 | 0.47 | 0.42 | 0.30 | 0.12 | 0 |
| | | stdev | 0.18 | 0.13 | 0.15 | 0.10 | 0.10 | 0.08 | 0.06 | 0 |
| | LG123 | rad. shrink. [%] | 0.67 | 0.59 | 0.53 | 0.41 | 0.37 | 0.27 | 0.11 | 0 |
| | | stdev | 0.13 | 0.11 | 0.10 | 0.10 | 0.08 | 0.07 | 0.05 | 0 |
| average | | rad. shrink. [%] | 0.68 | 0.60 | 0.53 | 0.42 | 0.38 | 0.27 | 0.11 | 0 |
| | | stdev | 0.14 | 0.12 | 0.11 | 0.09 | 0.08 | 0.07 | 0.05 | 0 |
| Accoya™ wood (Chile) | LG135 | rad. shrink. [%] | 0.73 | 0.62 | 0.55 | 0.43 | 0.39 | 0.28 | 0.09 | 0 |
| | | stdev | 0.26 | 0.22 | 0.20 | 0.16 | 0.13 | 0.10 | 0.05 | 0 |
| Radiata Pine (New Zealand) | Ref-LG122 | rad. shrink. [%] | 3.33 | 2.48 | 2.22 | 1.80 | 1.50 | 1.20 | 0.36 | 0 |
| | | stdev | 0.66 | 0.54 | 0.50 | 0.43 | 0.39 | 0.31 | 0.11 | 0 |

| Species | Batch | | Oven dry | ← desorption | | | | | Water saturated | |
|-------------------------------|-----------|-------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-----------------|----------|
| | | | | Relative Humidity | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | tang. shrink. [%] | 1.49 | 1.27 | 1.15 | 0.93 | 0.78 | 0.58 | 0.19 | 0 |
| | | stdev | 0.34 | 0.28 | 0.25 | 0.22 | 0.18 | 0.15 | 0.07 | 0 |
| | LG122 | tang. shrink. [%] | 1.53 | 1.31 | 1.19 | 0.97 | 0.81 | 0.61 | 0.20 | 0 |
| | | stdev | 0.25 | 0.21 | 0.19 | 0.16 | 0.15 | 0.10 | 0.04 | 0 |
| | LG123 | tang. shrink. [%] | 1.45 | 1.24 | 1.12 | 0.91 | 0.77 | 0.57 | 0.18 | 0 |
| | | stdev | 0.18 | 0.15 | 0.14 | 0.12 | 0.10 | 0.08 | 0.04 | 0 |
| average | | tang. shrink. [%] | 1.49 | 1.27 | 1.15 | 0.94 | 0.79 | 0.58 | 0.19 | 0 |
| | | stdev | 0.26 | 0.22 | 0.20 | 0.16 | 0.14 | 0.11 | 0.05 | 0 |
| Accoya™ wood (Chile) | LG135 | tang. shrink. [%] | 1.32 | 1.13 | 1.03 | 0.83 | 0.69 | 0.53 | 0.18 | 0 |
| | | stdev | 0.55 | 0.47 | 0.43 | 0.35 | 0.29 | 0.23 | 0.09 | 0 |
| Radiata Pine (New Zealand) | Ref-LG122 | tang. shrink. [%] | 7.17 | 5.75 | 5.30 | 4.56 | 3.96 | 3.38 | 1.46 | 0 |
| | | stdev | 0.76 | 0.71 | 0.71 | 0.68 | 0.65 | 0.62 | 0.36 | 0 |

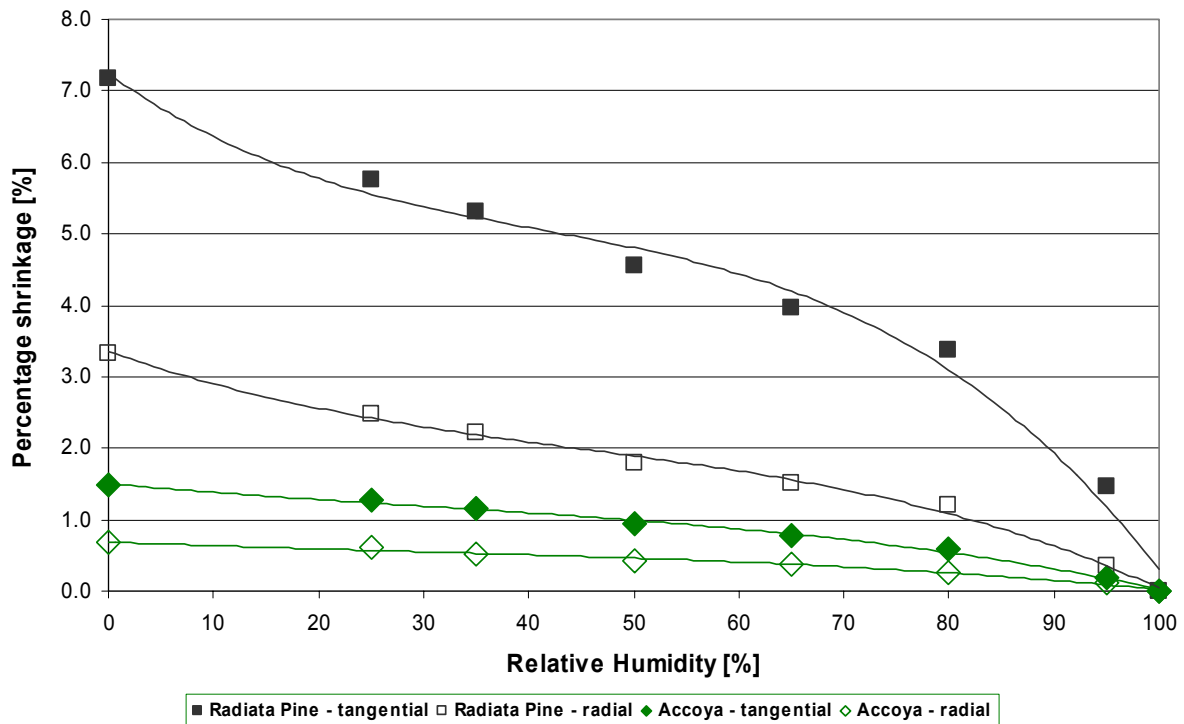


Figure 3. Shrinking in the radial and tangential directions as a function of the relative humidity of the (conditioned) air of Accoya™ wood (originating from New Zealand) and Radiata Pine.

In the figure below, the hygroscopic behaviour (water vapour desorption and adsorption) of Accoya™ wood is shown in changing relative humidities (of the surrounding air). The corresponding (percentage of) swelling or shrinking due to moisture uptake or loss is shown in the right part of the graphic.

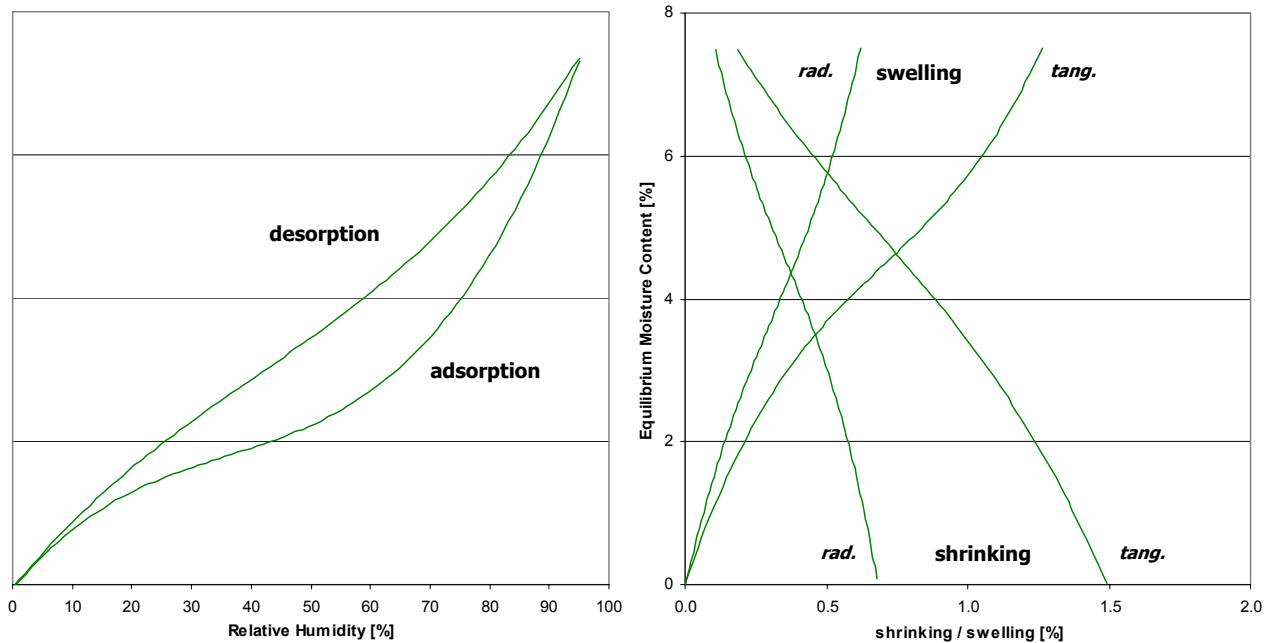


Figure 4. Hygroscopic behaviour (left) of Accoya™ wood under different moisture conditions and the corresponding swelling and shrinking behaviour.

3.3 Anti-Swelling (Shrinking)-Efficiency (ASE)

The impact of the treatment on the reduction of swelling and shrinking compared to the untreated wood can be expressed in the so-called Anti-Swelling-Efficiency or Anti-Shrinking-Efficiency; both referred to as ASE. The average overall ASE in the radial direction was 78% and in the tangential direction 81%. The values for ASE are comparable for the whole range of air humidity tested, as can be seen in appendix 9.

In the figure below the hygroscopic behaviour (water vapour desorption and adsorption) of Accoya™ wood and (untreated) Radiata pine is shown in changing relative humidities (of the surrounding air). The corresponding (percentage of) swelling or shrinking due to moisture uptake or loss is shown in the right part of the graphic.

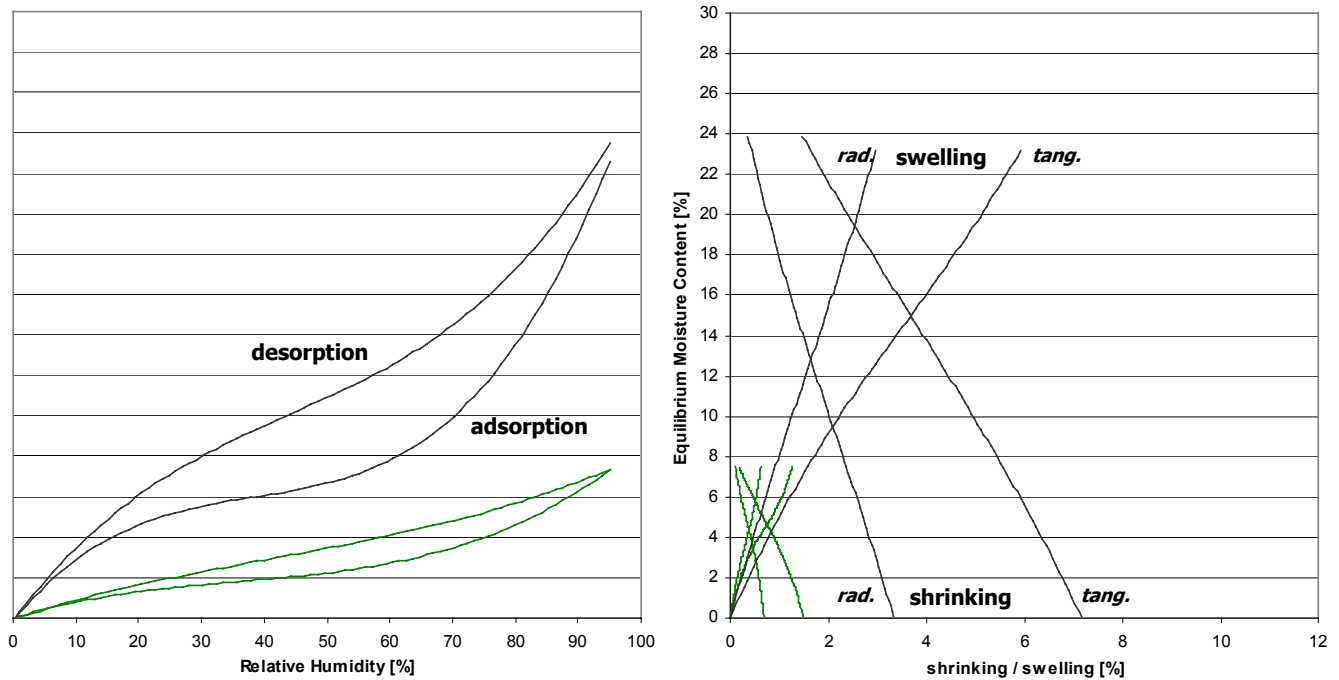


Figure 5. Hygroscopic behaviour (left) of Accoya™ wood (green line) and (untreated) Radiata Pine (grey line) under different moisture conditions and the corresponding swelling and shrinking behaviour.

3.4 Density

In table 5 an overview of the variation in density of Accoya™ wood and Radiata Pine is shown for three specific climates / conditions. (The complete data for density under different moisture conditions of Accoya™ wood and untreated Radiata Pine can be found in appendix 10). At the standard climate condition, 20 °C and 65% relative humidity, the average density of Accoya™ wood (New Zealand) was 510 kg/m³, whereas the average density of the untreated Radiata Pine was 466 kg/m³ under the same condition. The average increase of the density of Accoya™ wood compared to the untreated wood was 14% based on (oven) dry material. The Accoya™ wood samples originating from Chile had in general a higher average density and a larger variation compared to the Accoya™ wood samples originating from New Zealand.

Table 5. Density and EMC under different moisture conditions of Accoya™ wood and untreated Radiata Pine.

| Species | Condition | EMC [%] avg. | Density [kg/m ³] | | | |
|-------------------------------|---------------|-----------------|------------------------------|-------|------|------|
| | | | avg. | stdev | min. | max. |
| Accoya™ wood (New Zealand) | oven dry | 0 | 497 | 35 | 427 | 585 |
| | 65% RH, 20 °C | 3.3 | 510 | 36 | 438 | 599 |
| | 95% RH, 20 °C | 7.5 | 525 | 36 | 451 | 613 |
| Accoya™ wood (Chile) | oven dry | 0 | 543 | 57 | 429 | 649 |
| | 65% RH, 20 °C | 2.9 | 555 | 58 | 439 | 663 |
| | 95% RH, 20 °C | 6.5 | 568 | 59 | 453 | 677 |
| Radiata Pine (New Zealand) | oven dry | 0 | 440 | 29 | 402 | 497 |
| | 65% RH, 20 °C | 9.8 | 466 | 30 | 427 | 526 |
| | 95% RH, 20 °C | 23.2 | 496 | 31 | 454 | 558 |

4 Conclusions

4.1 Equilibrium Moisture Content, density and dimensional stability of Accoya™ wood

The table below summarises the characteristics of Accoya™ wood (originating from New Zealand) that was acetylated in three separate batches. On the basis of the results, it can be concluded that there is a low variation between the different acetylation batches compared to the overall variation. It can be concluded that in respect to the Equilibrium Moisture Content and dimensional stability the acetylation process is uniform (within a batch) and reproducible (between batches).

Table 6. Density, Equilibrium Moisture Content, and radial and tangential swelling of Accoya™ wood (adsorption sequence).

| Aspect | Avg. | Stdev. | Min. | Max. |
|--|------|--------|------|------|
| Equilibrium Moisture Content (at 65% RH, 20°C) [%] | 3.3 | 0.15 | 3.0 | 3.8 |
| Density (at 65% RH, 20°C) [kg/m ³] | 510 | 36 | 438 | 599 |
| Swelling (oven dry – water saturated) | | | | |
| - radial [%] | 0.69 | 0.13 | 0.49 | 0.99 |
| - tangential [%] | 1.47 | 0.24 | 0.91 | 2.34 |

4.2 Comparison between Accoya™ wood originating from New Zealand and Chile

The Accoya™ wood samples originating from Chile showed similar values for the hygroscopicity (equilibrium moisture content) and dimensional stability (swelling and shrinking) as the Accoya™ wood samples from New Zealand. The average density, however, was higher for the Accoya™ wood samples originating from Chile, as well as the variation between samples.

Table 7. Average density, Equilibrium Moisture Content, and radial and tangential swelling (adsorption sequence) of Accoya™ wood originating from New Zealand (NZ) and Chile (CL).

| Aspect | Accoya™ wood (NZ) | Accoya™ wood (CL) |
|--|-------------------|-------------------|
| Equilibrium Moisture Content (at 65% RH, 20°C) [%] | 3.3 | 2.9 |
| Density (at 65% RH, 20°C) [kg/m ³] | 510 | 555 |
| Swelling (oven dry – water saturated) | | |
| - radial [%] | 0.69 | 0.74 |
| - tangential [%] | 1.47 | 1.30 |

4.3 Comparison between Accoya™ wood and (untreated) Radiata Pine

The results show a substantial reduction of the hygroscopicity (Equilibrium Moisture Content) of the Accoya™ wood compared to the untreated Radiata Pine under the same moisture conditions (relative humidity). The dimensional stability (swelling and shrinking) of Accoya™ wood is considerably improved (by approximately 80%) compared to the (untreated) Radiata Pine.

Table 8. Average density, Equilibrium Moisture Content, and radial and tangential swelling of Accoya™ wood and untreated Radiata Pine (adsorption sequence).

| Aspect | Accoya™ wood | Radiata Pine | Improvement |
|---|--------------|--------------|-------------|
| Equilibrium Moisture Content (at 65% RH, 20°C) [%] | 3.3 | 9.8 | 66% |
| Density (at 65% RH, 20°C) [kg/m ³] | 510 | 466 | - |
| Swelling (oven dry – water saturated) | | | |
| - radial [%] | 0.69 | 3.40 | 80% |
| - tangential [%] | 1.47 | 7.89 | 81% |

References

WVS-SHR-047 (2002). Bepaling van het evenwichtsvochtgehalte van massief hout. SHR Hout Research, Wageningen.

WVS-SHR-048 (2002). Bepaling van ASE uit krimp- en zwellgegevens. SHR Hout Research, Wageningen.

WVS-SHR-049 (2002). Bepaling van krimp en zwellings van massief hout. SHR Hout Research, Wageningen.

Appendix 1 Sampling, codes and batch numbers

| Accoya™ wood (New Zealand) | | | Accoya™ wood (Chile) | Reference (Radiata Pine - NZ) |
|-------------------------------|-------------|-------------|-------------------------|----------------------------------|
| Batch LG118 | Batch LG122 | Batch LG123 | Batch LG135 | References |
| LG118 RP2 | LG122 RP1 | LG123 RP2 | LG135 RP1 | REF - LG118 RP2 |
| LG118 RP3 | LG122 RP5 | LG123 RP3 | LG135 RP3 | REF - LG118 RP3 |
| LG118 RP5 | LG122 RP6 | LG123 RP4 | LG135 RP5a | REF - LG118 RP7 |
| LG118 RP7 | LG122 RP8 | LG123 RP5 | LG135 RP5b | REF - LG118 RP9 |
| LG118 RP8 | LG122 RP9 | LG123 RP6 | LG135 RP7 | REF - LG118 RP11 |
| LG118 RP9 | LG122 RP10 | LG123 RP8 | LG135 RP8 | REF - LG118 RP14 |
| LG118 RP11 | LG122 RP11 | LG123 RP9 | LG135 RP9 | REF - LG118 RP15 |
| LG118 RP14 | LG122 RP13 | LG123 RP10 | LG135 RP11 | REF - LG118 RP16 |
| LG118 RP15 | LG122 RP14 | LG123 RP11 | LG135 RP12 | REF - LG118 RP21 |
| LG118 RP16 | LG122 RP15 | LG123 RP12 | LG135 RP100 | REF - LG118 RP23 |
| LG118 RP17 | LG122 RP16 | LG123 RP14 | | |
| LG118 RP21 | LG122 RP17 | LG123 RP15 | | |
| LG118 RP22 | LG122 RP20 | LG123 RP16 | | |
| LG118 RP23 | LG122 RP21 | LG123 RP18 | | |
| LG118 RP24 | LG122 RP22 | LG123 RP19 | | |

Appendix 2 EMC adsorption

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 0 | 1.3 | 1.6 | 2.4 | 3.2 | 4.0 | 7.3 | 122 |
| LG118 RP3 | 0 | 1.3 | 1.6 | 2.4 | 3.2 | 3.9 | 7.5 | 141 |
| LG118 RP5 | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 114 |
| LG118 RP7 | 0 | 1.3 | 1.7 | 2.4 | 3.3 | 4.0 | 7.5 | 112 |
| LG118 RP8 | 0 | 1.5 | 2.0 | 2.8 | 3.8 | 4.7 | 8.6 | 113 |
| LG118 RP9 | 0 | 1.3 | 1.8 | 2.5 | 3.4 | 4.2 | 7.8 | 131 |
| LG118 RP11 | 0 | 1.3 | 1.8 | 2.5 | 3.4 | 4.2 | 7.8 | 112 |
| LG118 RP14 | 0 | 1.2 | 1.6 | 2.4 | 3.2 | 3.9 | 7.5 | 134 |
| LG118 RP15 | 0 | 1.3 | 1.8 | 2.6 | 3.5 | 4.2 | 7.9 | 100 |
| LG118 RP16 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.9 | 105 |
| LG118 RP17 | 0 | 1.3 | 1.8 | 2.5 | 3.4 | 4.2 | 7.9 | 110 |
| LG118 RP21 | 0 | 1.3 | 1.7 | 2.4 | 3.3 | 4.0 | 7.6 | 103 |
| LG118 RP22 | 0 | 1.2 | 1.7 | 2.4 | 3.3 | 4.0 | 7.7 | 124 |
| LG118 RP23 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.2 | 8.1 | 126 |
| LG118 RP24 | 0 | 1.4 | 1.7 | 2.6 | 3.5 | 4.3 | 8.0 | 118 |
| Avg | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.8 | 118 |
| Stdev | 0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 11.8 |

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 0 | 1.2 | 1.6 | 2.3 | 3.1 | 3.8 | 6.9 | 130 |
| LG122 RP5 | 0 | 1.3 | 1.8 | 2.5 | 3.5 | 4.2 | 7.6 | 126 |
| LG122 RP6 | 0 | 1.2 | 1.7 | 2.4 | 3.2 | 3.9 | 7.1 | 94 |
| LG122 RP8 | 0 | 1.3 | 1.7 | 2.4 | 3.3 | 4.0 | 7.4 | 128 |
| LG122 RP9 | 0 | 1.3 | 1.8 | 2.5 | 3.4 | 4.1 | 7.4 | 122 |
| LG122 RP10 | 0 | 1.3 | 1.8 | 2.5 | 3.4 | 4.1 | 7.4 | 104 |
| LG122 RP11 | 0 | 1.3 | 1.7 | 2.4 | 3.3 | 4.0 | 7.4 | 139 |
| LG122 RP13 | 0 | 1.3 | 1.7 | 2.4 | 3.3 | 4.0 | 7.5 | 129 |
| LG122 RP14 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.4 | 107 |
| LG122 RP15 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.6 | 112 |
| LG122 RP16 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.5 | 108 |
| LG122 RP17 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.2 | 7.9 | 120 |
| LG122 RP20 | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.1 | 7.8 | 134 |
| LG122 RP21 | 0 | 1.1 | 1.5 | 2.2 | 3.0 | 3.7 | 6.6 | 98 |
| LG122 RP22 | 0 | 1.3 | 1.6 | 2.5 | 3.3 | 4.1 | 7.6 | 136 |
| Avg | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 119 |
| Stdev | 0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.3 | 14.4 |



| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 0 | 1.1 | 1.5 | 2.3 | 3.1 | 3.8 | 7.0 | 159 |
| LG123 RP3 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.7 | 125 |
| LG123 RP4 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.0 | 7.3 | 143 |
| LG123 RP5 | 0 | 1.2 | 1.7 | 2.4 | 3.3 | 4.0 | 7.1 | 136 |
| LG123 RP6 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.0 | 7.2 | 111 |
| LG123 RP8 | 0 | 1.2 | 1.6 | 2.4 | 3.2 | 3.8 | 6.8 | 105 |
| LG123 RP9 | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.3 | 123 |
| LG123 RP10 | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 126 |
| LG123 RP11 | 0 | 1.3 | 1.6 | 2.4 | 3.3 | 3.9 | 7.2 | 127 |
| LG123 RP12 | 0 | 1.3 | 1.6 | 2.4 | 3.2 | 3.9 | 7.2 | 149 |
| LG123 RP14 | 0 | 1.4 | 1.8 | 2.6 | 3.6 | 4.3 | 7.9 | 115 |
| LG123 RP15 | 0 | 1.5 | 1.9 | 2.8 | 3.7 | 4.5 | 8.2 | 114 |
| LG123 RP16 | 0 | 1.3 | 1.7 | 2.5 | 3.4 | 4.1 | 7.6 | 113 |
| LG123 RP18 | 0 | 1.2 | 1.6 | 2.4 | 3.2 | 3.9 | 7.2 | 141 |
| LG123 RP19 | 0 | 1.2 | 1.5 | 2.3 | 3.2 | 3.9 | 7.2 | 121 |
| Avg | 0 | 1.3 | 1.7 | 2.5 | 3.3 | 4.0 | 7.4 | 127 |
| Stdev | 0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.4 | 15.4 |

| Accoya™ wood (CL) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0 | 1.0 | 1.3 | 2.1 | 2.7 | 3.3 | 6.1 | 105 |
| LG135 RP3 | 0 | 1.1 | 1.5 | 2.2 | 3.0 | 3.6 | 6.6 | 91 |
| LG135 RP5a | 0 | 1.0 | 1.4 | 2.1 | 2.8 | 3.4 | 5.9 | 101 |
| LG135 RP5b | 0 | 1.1 | 1.4 | 2.1 | 2.8 | 3.4 | 6.1 | 102 |
| LG135 RP7 | 0 | 1.2 | 1.6 | 2.3 | 3.1 | 3.8 | 6.8 | 78 |
| LG135 RP8 | 0 | 1.6 | 2.0 | 2.9 | 3.9 | 4.7 | 8.7 | 89 |
| LG135 RP9 | 0 | 1.1 | 1.4 | 2.1 | 2.9 | 3.5 | 6.2 | 93 |
| LG135 RP11 | 0 | 1.1 | 1.3 | 2.0 | 2.7 | 3.2 | 6.5 | 133 |
| LG135 RP12 | 0 | 1.2 | 1.4 | 2.1 | 2.9 | 3.4 | 6.3 | 97 |
| LG135 RP100 | 0 | 1.1 | 1.2 | 1.9 | 2.6 | 3.1 | 6.0 | 114 |
| Avg | 0 | 1.2 | 1.4 | 2.2 | 2.9 | 3.5 | 6.5 | 100 |
| Stdev | 0 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.8 | 15.1 |

| Radiata pine (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|------------|------------|------------|-------------|-------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 0 | 4.5 | 5.4 | 7.1 | 9.6 | 11.7 | 22.2 | 161 |
| REF - LG118 RP3 | 0 | 4.6 | 5.5 | 7.2 | 9.8 | 11.9 | 23.2 | 169 |
| REF - LG118 RP7 | 0 | 4.6 | 5.6 | 7.2 | 9.7 | 11.7 | 22.7 | 146 |
| REF - LG118 RP9 | 0 | 4.6 | 5.6 | 7.3 | 9.8 | 11.9 | 23.4 | 154 |
| REF - LG118 RP11 | 0 | 4.7 | 5.7 | 7.3 | 9.8 | 11.8 | 22.9 | 155 |
| REF - LG118 RP14 | 0 | 4.8 | 5.7 | 7.4 | 9.9 | 11.9 | 23.9 | 168 |
| REF - LG118 RP15 | 0 | 4.7 | 5.6 | 7.3 | 9.7 | 11.7 | 22.8 | 146 |
| REF - LG118 RP16 | 0 | 4.8 | 5.7 | 7.4 | 9.9 | 12.0 | 24.1 | 139 |
| REF - LG118 RP21 | 0 | 4.7 | 5.6 | 7.2 | 9.8 | 12.0 | 23.5 | 158 |
| REF - LG118 RP23 | 0 | 4.5 | 5.2 | 6.9 | 9.4 | 11.6 | 23.2 | 185 |
| Avg | 0 | 4.6 | 5.6 | 7.2 | 9.8 | 11.8 | 23.2 | 158 |
| Stdev | 0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.6 | 13.5 |

Appendix 3 EMC desorption

| Accoya™ wood (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 0 | 1.7 | 2.3 | 3.5 | 4.2 | 4.8 | 7.1 | 117 |
| LG118 RP3 | 0 | 1.7 | 2.3 | 3.5 | 4.2 | 5.0 | 6.9 | 142 |
| LG118 RP5 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 108 |
| LG118 RP7 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.2 | 7.5 | 117 |
| LG118 RP8 | 0 | 2.2 | 3.0 | 4.4 | 5.4 | 6.3 | 8.9 | 110 |
| LG118 RP9 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 133 |
| LG118 RP11 | 0 | 1.8 | 2.5 | 3.7 | 4.6 | 5.4 | 7.5 | 112 |
| LG118 RP14 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.2 | 7.2 | 140 |
| LG118 RP15 | 0 | 1.9 | 2.6 | 3.8 | 4.7 | 5.5 | 7.7 | 103 |
| LG118 RP16 | 0 | 1.9 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 107 |
| LG118 RP17 | 0 | 1.9 | 2.6 | 3.8 | 4.7 | 5.4 | 7.5 | 108 |
| LG118 RP21 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.2 | 7.3 | 108 |
| LG118 RP22 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.2 | 117 |
| LG118 RP23 | 0 | 1.8 | 2.5 | 3.8 | 4.7 | 5.5 | 7.6 | 119 |
| LG118 RP24 | 0 | 1.9 | 2.6 | 3.9 | 4.8 | 5.6 | 7.7 | 112 |
| Avg | 0 | 1.8 | 2.5 | 3.7 | 4.6 | 5.4 | 7.5 | 117 |
| Stdev | 0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 12.2 |

| Accoya™ wood (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 0 | 1.7 | 2.3 | 3.5 | 4.2 | 5.0 | 6.9 | 129 |
| LG122 RP5 | 0 | 1.9 | 2.5 | 3.9 | 4.7 | 5.6 | 7.9 | 126 |
| LG122 RP6 | 0 | 1.8 | 2.3 | 3.6 | 4.4 | 5.1 | 7.2 | 95 |
| LG122 RP8 | 0 | 1.8 | 2.4 | 3.6 | 4.5 | 5.2 | 7.3 | 124 |
| LG122 RP9 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 123 |
| LG122 RP10 | 0 | 1.9 | 2.5 | 3.8 | 4.6 | 5.4 | 7.5 | 103 |
| LG122 RP11 | 0 | 1.9 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 136 |
| LG122 RP13 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 130 |
| LG122 RP14 | 0 | 1.9 | 2.5 | 3.8 | 4.6 | 5.4 | 7.6 | 107 |
| LG122 RP15 | 0 | 1.9 | 2.5 | 3.8 | 4.6 | 5.4 | 7.6 | 111 |
| LG122 RP16 | 0 | 1.9 | 2.5 | 3.7 | 4.6 | 5.4 | 7.6 | 109 |
| LG122 RP17 | 0 | 2.0 | 2.6 | 3.8 | 4.7 | 5.6 | 7.8 | 120 |
| LG122 RP20 | 0 | 1.9 | 2.5 | 3.7 | 4.6 | 5.4 | 7.6 | 128 |
| LG122 RP21 | 0 | 1.7 | 2.2 | 3.3 | 4.1 | 4.7 | 6.9 | 96 |
| LG122 RP22 | 0 | 2.0 | 2.6 | 3.9 | 4.8 | 5.6 | 7.9 | 131 |
| Avg | 0 | 1.8 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 118 |
| Stdev | 0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 13.3 |



| Accoya™ wood (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 0 | 1.7 | 2.3 | 3.4 | 4.3 | 5.0 | 6.9 | 147 |
| LG123 RP3 | 0 | 1.9 | 2.5 | 3.8 | 4.7 | 5.5 | 7.7 | 118 |
| LG123 RP4 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 137 |
| LG123 RP5 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.2 | 7.2 | 136 |
| LG123 RP6 | 0 | 1.8 | 2.4 | 3.7 | 4.5 | 5.3 | 7.4 | 114 |
| LG123 RP8 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.2 | 7.3 | 103 |
| LG123 RP9 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.2 | 7.3 | 121 |
| LG123 RP10 | 0 | 1.8 | 2.4 | 3.6 | 4.5 | 5.3 | 7.4 | 125 |
| LG123 RP11 | 0 | 1.8 | 2.4 | 3.6 | 4.4 | 5.1 | 7.3 | 125 |
| LG123 RP12 | 0 | 1.8 | 2.4 | 3.5 | 4.3 | 5.1 | 7.1 | 147 |
| LG123 RP14 | 0 | 2.1 | 2.8 | 4.0 | 5.0 | 5.8 | 8.1 | 112 |
| LG123 RP15 | 0 | 2.1 | 2.8 | 4.2 | 5.1 | 6.0 | 8.5 | 112 |
| LG123 RP16 | 0 | 1.9 | 2.6 | 3.8 | 4.7 | 5.4 | 7.7 | 109 |
| LG123 RP18 | 0 | 1.8 | 2.4 | 3.6 | 4.5 | 5.2 | 7.4 | 122 |
| LG123 RP19 | 0 | 1.8 | 2.4 | 3.6 | 4.5 | 5.2 | 7.3 | 131 |
| Avg | 0 | 1.9 | 2.5 | 3.7 | 4.5 | 5.3 | 7.5 | 124 |
| <i>Stdev</i> | <i>0</i> | <i>0.1</i> | <i>0.1</i> | <i>0.2</i> | <i>0.2</i> | <i>0.3</i> | <i>0.4</i> | <i>13.5</i> |

| Accoya™ wood (CL) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|------------|------------|------------|------------|------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0 | 1.2 | 1.7 | 2.7 | 3.4 | 4.0 | 5.5 | 118 |
| LG135 RP3 | 0 | 1.4 | 2.0 | 3.1 | 3.8 | 4.5 | 6.2 | 106 |
| LG135 RP5a | 0 | 1.4 | 1.9 | 2.9 | 3.6 | 4.1 | 5.7 | 113 |
| LG135 RP5b | 0 | 1.4 | 1.9 | 3.0 | 3.6 | 4.2 | 5.8 | 112 |
| LG135 RP7 | 0 | 1.6 | 2.2 | 3.3 | 4.1 | 4.7 | 6.6 | 83 |
| LG135 RP8 | 0 | 2.2 | 2.9 | 4.3 | 5.3 | 6.1 | 8.9 | 74 |
| LG135 RP9 | 0 | 1.4 | 1.8 | 2.9 | 3.6 | 4.1 | 5.9 | 100 |
| LG135 RP11 | 0 | 1.4 | 1.9 | 2.8 | 3.5 | 4.0 | 6.4 | 122 |
| LG135 RP12 | 0 | 1.4 | 1.9 | 2.9 | 3.6 | 4.2 | 5.9 | 100 |
| LG135 RP100 | 0 | 1.3 | 1.7 | 2.7 | 3.4 | 3.9 | 5.5 | 123 |
| Avg | 0 | 1.5 | 2.0 | 3.1 | 3.8 | 4.4 | 6.2 | 105 |
| <i>Stdev</i> | <i>0</i> | <i>0.3</i> | <i>0.4</i> | <i>0.5</i> | <i>0.6</i> | <i>0.7</i> | <i>1.0</i> | <i>16.3</i> |

| Radiata pine (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 0 | 6.7 | 8.5 | 11.5 | 14.0 | 16.1 | 22.8 | 185 |
| REF - LG118 RP3 | 0 | 6.7 | 8.5 | 11.5 | 14.0 | 16.2 | 24.1 | 192 |
| REF - LG118 RP7 | 0 | 6.6 | 8.4 | 11.3 | 13.7 | 15.9 | 23.5 | 167 |
| REF - LG118 RP9 | 0 | 6.7 | 8.5 | 11.5 | 13.9 | 16.1 | 24.1 | 180 |
| REF - LG118 RP11 | 0 | 6.9 | 8.7 | 11.7 | 14.2 | 16.3 | 23.7 | 167 |
| REF - LG118 RP14 | 0 | 6.9 | 8.7 | 11.7 | 14.2 | 16.3 | 24.5 | 188 |
| REF - LG118 RP15 | 0 | 6.8 | 8.6 | 11.6 | 14.0 | 16.1 | 23.6 | 169 |
| REF - LG118 RP16 | 0 | 6.9 | 8.7 | 11.7 | 14.2 | 16.4 | 24.9 | 153 |
| REF - LG118 RP21 | 0 | 6.7 | 8.5 | 11.5 | 13.9 | 16.1 | 24.1 | 175 |
| REF - LG118 RP23 | 0 | 6.3 | 8.1 | 11.0 | 13.5 | 15.6 | 23.6 | 199 |
| Avg | 0 | 6.7 | 8.5 | 11.5 | 14.0 | 16.1 | 23.9 | 178 |
| <i>Stdev</i> | <i>0</i> | <i>0.2</i> | <i>0.2</i> | <i>0.2</i> | <i>0.2</i> | <i>0.2</i> | <i>0.6</i> | <i>13.9</i> |

Appendix 4 Percentage of reduction of the adsorption and desorption of Accoya™ (relative to the untreated Radiata Pine)

Adsorption

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|---------------------|----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | adsorption → | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | red. EMC [%] | 0 | 72 | 69 | 66 | 65 | 65 | 66 | 25 |
| | LG122 | red. EMC [%] | 0 | 72 | 69 | 66 | 66 | 66 | 68 | 25 |
| | LG123 | red. EMC [%] | 0 | 73 | 70 | 66 | 66 | 66 | 68 | 20 |
| | average | red. EMC [%] | 0 | 72 | 69 | 66 | 66 | 66 | 68 | 23 |
| Accoya™ wood (Chile) | LG135 | red. EMC [%] | 0 | 75 | 74 | 70 | 70 | 70 | 72 | 37 |

Desorption

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|---------------------|----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | ← desorption | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | red. EMC [%] | 0 | 72 | 71 | 68 | 67 | 67 | 69 | 34 |
| | LG122 | red. EMC [%] | 0 | 73 | 71 | 68 | 68 | 67 | 69 | 34 |
| | LG123 | red. EMC [%] | 0 | 72 | 71 | 68 | 67 | 67 | 69 | 30 |
| | average | red. EMC [%] | 0 | 72 | 71 | 68 | 67 | 67 | 69 | 33 |
| Accoya™ wood (Chile) | LG135 | red. EMC [%] | 0 | 78 | 77 | 73 | 73 | 73 | 74 | 0 |



Appendix 5 Radial swelling - adsorption

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | adsorption → | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 0 | 0.08 | 0.09 | 0.16 | 0.23 | 0.28 | 0.41 | 0.50 |
| LG118 RP3 | 0 | 0.08 | 0.09 | 0.11 | 0.21 | 0.25 | 0.45 | 0.52 |
| LG118 RP5 | 0 | 0.07 | 0.09 | 0.11 | 0.22 | 0.26 | 0.44 | 0.50 |
| LG118 RP7 | 0 | 0.11 | 0.14 | 0.18 | 0.32 | 0.39 | 0.71 | 0.81 |
| LG118 RP8 | 0 | 0.12 | 0.15 | 0.21 | 0.35 | 0.44 | 0.78 | 0.87 |
| LG118 RP9 | 0 | 0.11 | 0.15 | 0.20 | 0.34 | 0.41 | 0.75 | 0.82 |
| LG118 RP11 | 0 | 0.14 | 0.12 | 0.19 | 0.28 | 0.33 | 0.61 | 0.66 |
| LG118 RP14 | 0 | 0.07 | 0.10 | 0.15 | 0.26 | 0.33 | 0.59 | 0.65 |
| LG118 RP15 | 0 | 0.11 | 0.12 | 0.14 | 0.35 | 0.34 | 0.66 | 0.73 |
| LG118 RP16 | 0 | 0.03 | 0.04 | 0.10 | 0.25 | 0.29 | 0.61 | 0.68 |
| LG118 RP17 | 0 | 0.12 | 0.14 | 0.18 | 0.30 | 0.37 | 0.65 | 0.71 |
| LG118 RP21 | 0 | 0.08 | 0.11 | 0.13 | 0.27 | 0.32 | 0.59 | 0.65 |
| LG118 RP22 | 0 | 0.11 | 0.12 | 0.14 | 0.27 | 0.31 | 0.53 | 0.57 |
| LG118 RP23 | 0 | 0.11 | 0.13 | 0.16 | 0.27 | 0.32 | 0.51 | 0.56 |
| LG118 RP24 | 0 | 0.09 | 0.11 | 0.16 | 0.31 | 0.39 | 0.75 | 0.82 |
| Avg | 0 | 0.10 | 0.11 | 0.16 | 0.28 | 0.34 | 0.60 | 0.67 |
| Stdev | 0 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 | 0.12 | 0.12 |

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | adsorption → | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 0 | 0.11 | 0.13 | 0.16 | 0.29 | 0.36 | 0.68 | 0.78 |
| LG122 RP5 | 0 | 0.11 | 0.15 | 0.19 | 0.31 | 0.43 | 0.75 | 0.89 |
| LG122 RP6 | 0 | 0.08 | 0.13 | 0.19 | 0.30 | 0.38 | 0.76 | 0.86 |
| LG122 RP8 | 0 | 0.07 | 0.12 | 0.15 | 0.26 | 0.32 | 0.57 | 0.64 |
| LG122 RP9 | 0 | 0.10 | 0.12 | 0.16 | 0.27 | 0.31 | 0.53 | 0.58 |
| LG122 RP10 | 0 | 0.11 | 0.15 | 0.19 | 0.34 | 0.42 | 0.81 | 0.93 |
| LG122 RP11 | 0 | 0.08 | 0.11 | 0.15 | 0.29 | 0.30 | 0.53 | 0.57 |
| LG122 RP13 | 0 | 0.09 | 0.13 | 0.16 | 0.29 | 0.35 | 0.66 | 0.73 |
| LG122 RP14 | 0 | 0.08 | 0.11 | 0.16 | 0.27 | 0.32 | 0.58 | 0.64 |
| LG122 RP15 | 0 | 0.09 | 0.14 | 0.17 | 0.32 | 0.39 | 0.79 | 0.83 |
| LG122 RP16 | 0 | 0.11 | 0.15 | 0.18 | 0.33 | 0.41 | 0.81 | 0.91 |
| LG122 RP17 | 0 | 0.10 | 0.13 | 0.16 | 0.28 | 0.34 | 0.60 | 0.69 |
| LG122 RP20 | 0 | 0.10 | 0.14 | 0.16 | 0.28 | 0.33 | 0.56 | 0.61 |
| LG122 RP21 | 0 | 0.10 | 0.14 | 0.15 | 0.25 | 0.30 | 0.53 | 0.56 |
| LG122 RP22 | 0 | 0.04 | 0.06 | 0.12 | 0.26 | 0.31 | 0.66 | 0.75 |
| Avg | 0 | 0.09 | 0.13 | 0.16 | 0.29 | 0.35 | 0.65 | 0.73 |
| Stdev | 0 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.11 | 0.13 |



| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 0 | 0.08 | 0.10 | 0.13 | 0.26 | 0.32 | 0.61 | 0.72 |
| LG123 RP3 | 0 | 0.09 | 0.10 | 0.10 | 0.21 | 0.23 | 0.50 | 0.54 |
| LG123 RP4 | 0 | 0.10 | 0.13 | 0.15 | 0.28 | 0.34 | 0.67 | 0.71 |
| LG123 RP5 | 0 | 0.12 | 0.14 | 0.17 | 0.30 | 0.34 | 0.55 | 0.63 |
| LG123 RP6 | 0 | 0.09 | 0.15 | 0.16 | 0.29 | 0.36 | 0.66 | 0.81 |
| LG123 RP8 | 0 | 0.13 | 0.16 | 0.16 | 0.30 | 0.33 | 0.56 | 0.61 |
| LG123 RP9 | 0 | 0.12 | 0.14 | 0.16 | 0.27 | 0.32 | 0.57 | 0.62 |
| LG123 RP10 | 0 | 0.10 | 0.15 | 0.14 | 0.25 | 0.31 | 0.54 | 0.61 |
| LG123 RP11 | 0 | 0.09 | 0.13 | 0.13 | 0.26 | 0.31 | 0.53 | 0.62 |
| LG123 RP12 | 0 | 0.12 | 0.13 | 0.14 | 0.26 | 0.30 | 0.51 | 0.57 |
| LG123 RP14 | 0 | 0.10 | 0.15 | 0.14 | 0.27 | 0.33 | 0.61 | 0.67 |
| LG123 RP15 | 0 | 0.12 | 0.15 | 0.20 | 0.36 | 0.44 | 0.87 | 0.99 |
| LG123 RP16 | 0 | 0.11 | 0.15 | 0.21 | 0.36 | 0.41 | 0.76 | 0.83 |
| LG123 RP18 | 0 | 0.06 | 0.08 | 0.09 | 0.20 | 0.24 | 0.43 | 0.49 |
| LG123 RP19 | 0 | 0.07 | 0.08 | 0.13 | 0.25 | 0.31 | 0.71 | 0.74 |
| Avg | 0 | 0.10 | 0.13 | 0.15 | 0.27 | 0.32 | 0.61 | 0.68 |
| Stdev | 0 | 0.02 | 0.03 | 0.03 | 0.05 | 0.05 | 0.11 | 0.13 |

| Accoya™ wood (CL) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0 | 0.14 | 0.14 | 0.18 | 0.27 | 0.32 | 0.55 | 0.63 |
| LG135 RP3 | 0 | 0.11 | 0.12 | 0.18 | 0.32 | 0.35 | 0.65 | 0.75 |
| LG135 RP5a | 0 | 0.07 | 0.09 | 0.14 | 0.24 | 0.28 | 0.53 | 0.60 |
| LG135 RP5b | 0 | 0.13 | 0.14 | 0.18 | 0.29 | 0.35 | 0.60 | 0.67 |
| LG135 RP7 | 0 | 0.11 | 0.16 | 0.23 | 0.38 | 0.48 | 0.97 | 1.10 |
| LG135 RP8 | 0 | 0.20 | 0.26 | 0.31 | 0.47 | 0.55 | 1.03 | 1.16 |
| LG135 RP9 | 0 | 0.14 | 0.15 | 0.14 | 0.26 | 0.28 | 0.47 | 0.53 |
| LG135 RP11 | 0 | 0.08 | 0.09 | 0.08 | 0.17 | 0.20 | 0.33 | 0.36 |
| LG135 RP12 | 0 | 0.09 | 0.08 | 0.15 | 0.30 | 0.37 | 0.83 | 0.93 |
| LG135 RP100 | 0 | 0.06 | 0.08 | 0.13 | 0.23 | 0.29 | 0.63 | 0.71 |
| Avg | 0 | 0.11 | 0.13 | 0.17 | 0.29 | 0.35 | 0.66 | 0.74 |
| Stdev | 0 | 0.04 | 0.05 | 0.06 | 0.09 | 0.10 | 0.22 | 0.25 |

| Radiata pine (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|----------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 0 | 0.42 | 0.48 | 0.60 | 0.83 | 0.97 | 1.59 | 1.82 |
| REF - LG118 RP3 | 0 | 0.53 | 0.61 | 0.81 | 1.15 | 1.42 | 2.77 | 3.25 |
| REF - LG118 RP7 | 0 | 0.63 | 0.77 | 1.02 | 1.41 | 1.73 | 3.43 | 3.97 |
| REF - LG118 RP9 | 0 | 0.68 | 0.81 | 1.04 | 1.48 | 1.77 | 3.51 | 4.01 |
| REF - LG118 RP11 | 0 | 0.57 | 0.72 | 0.91 | 1.29 | 1.55 | 2.88 | 3.31 |
| REF - LG118 RP14 | 0 | 0.48 | 0.61 | 0.76 | 1.15 | 1.40 | 2.91 | 3.35 |
| REF - LG118 RP15 | 0 | 0.62 | 0.73 | 0.93 | 1.29 | 1.54 | 2.94 | 3.26 |
| REF - LG118 RP16 | 0 | 0.56 | 0.70 | 0.91 | 1.33 | 1.63 | 3.33 | 3.88 |
| REF - LG118 RP21 | 0 | 0.60 | 0.73 | 0.95 | 1.34 | 1.63 | 3.23 | 3.74 |
| REF - LG118 RP23 | 0 | 0.43 | 0.49 | 0.70 | 1.08 | 1.38 | 2.94 | 3.41 |
| Avg | 0 | 0.55 | 0.67 | 0.86 | 1.23 | 1.50 | 2.95 | 3.40 |
| Stdev | 0 | 0.09 | 0.11 | 0.14 | 0.19 | 0.23 | 0.54 | 0.63 |

Appendix 6 Tangential swelling – adsorption

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 0 | 0.10 | 0.16 | 0.24 | 0.38 | 0.50 | 1.03 | 1.24 |
| LG118 RP3 | 0 | 0.13 | 0.15 | 0.25 | 0.40 | 0.56 | 1.18 | 1.39 |
| LG118 RP5 | 0 | 0.12 | 0.17 | 0.25 | 0.43 | 0.53 | 1.09 | 1.27 |
| LG118 RP7 | 0 | 0.08 | 0.11 | 0.20 | 0.37 | 0.48 | 1.08 | 1.27 |
| LG118 RP8 | 0 | 0.15 | 0.24 | 0.39 | 0.65 | 0.84 | 1.97 | 2.34 |
| LG118 RP9 | 0 | 0.14 | 0.19 | 0.31 | 0.48 | 0.61 | 1.36 | 1.52 |
| LG118 RP11 | 0 | 0.12 | 0.20 | 0.28 | 0.48 | 0.62 | 1.34 | 1.52 |
| LG118 RP14 | 0 | 0.10 | 0.15 | 0.26 | 0.42 | 0.54 | 1.20 | 1.39 |
| LG118 RP15 | 0 | 0.14 | 0.20 | 0.28 | 0.48 | 0.61 | 1.37 | 1.60 |
| LG118 RP16 | 0 | 0.15 | 0.23 | 0.32 | 0.55 | 0.68 | 1.52 | 1.69 |
| LG118 RP17 | 0 | 0.09 | 0.17 | 0.22 | 0.42 | 0.53 | 1.19 | 1.37 |
| LG118 RP21 | 0 | 0.12 | 0.19 | 0.25 | 0.40 | 0.52 | 1.06 | 1.20 |
| LG118 RP22 | 0 | 0.11 | 0.13 | 0.21 | 0.37 | 0.46 | 0.98 | 1.12 |
| LG118 RP23 | 0 | 0.14 | 0.20 | 0.27 | 0.42 | 0.54 | 1.08 | 1.21 |
| LG118 RP24 | 0 | 0.04 | 0.10 | 0.25 | 0.45 | 0.61 | 1.50 | 1.77 |
| Avg | 0 | 0.12 | 0.17 | 0.27 | 0.45 | 0.58 | 1.26 | 1.46 |
| Stdev | 0 | 0.03 | 0.04 | 0.05 | 0.07 | 0.10 | 0.26 | 0.31 |

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 0 | 0.13 | 0.18 | 0.26 | 0.39 | 0.51 | 1.09 | 1.34 |
| LG122 RP5 | 0 | 0.13 | 0.22 | 0.29 | 0.47 | 0.61 | 1.28 | 1.50 |
| LG122 RP6 | 0 | 0.13 | 0.21 | 0.30 | 0.51 | 0.67 | 1.49 | 1.72 |
| LG122 RP8 | 0 | 0.11 | 0.18 | 0.26 | 0.45 | 0.58 | 1.25 | 1.45 |
| LG122 RP9 | 0 | 0.15 | 0.23 | 0.33 | 0.54 | 0.69 | 1.47 | 1.73 |
| LG122 RP10 | 0 | 0.12 | 0.21 | 0.28 | 0.46 | 0.59 | 1.25 | 1.45 |
| LG122 RP11 | 0 | 0.09 | 0.16 | 0.26 | 0.42 | 0.55 | 1.18 | 1.35 |
| LG122 RP13 | 0 | 0.13 | 0.18 | 0.26 | 0.45 | 0.57 | 1.24 | 1.43 |
| LG122 RP14 | 0 | 0.13 | 0.18 | 0.29 | 0.52 | 0.64 | 1.41 | 1.64 |
| LG122 RP15 | 0 | 0.19 | 0.22 | 0.34 | 0.59 | 0.73 | 1.67 | 1.96 |
| LG122 RP16 | 0 | 0.15 | 0.20 | 0.31 | 0.51 | 0.66 | 1.45 | 1.69 |
| LG122 RP17 | 0 | 0.14 | 0.20 | 0.30 | 0.51 | 0.66 | 1.44 | 1.67 |
| LG122 RP20 | 0 | 0.13 | 0.18 | 0.26 | 0.45 | 0.56 | 1.19 | 1.38 |
| LG122 RP21 | 0 | 0.08 | 0.14 | 0.19 | 0.32 | 0.42 | 0.82 | 0.91 |
| LG122 RP22 | 0 | 0.07 | 0.10 | 0.23 | 0.41 | 0.52 | 1.25 | 1.49 |
| Avg | 0 | 0.12 | 0.18 | 0.28 | 0.47 | 0.60 | 1.30 | 1.51 |
| Stdev | 0 | 0.03 | 0.03 | 0.04 | 0.07 | 0.08 | 0.20 | 0.24 |



| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 0 | 0.10 | 0.16 | 0.22 | 0.37 | 0.47 | 1.08 | 1.29 |
| LG123 RP3 | 0 | 0.13 | 0.17 | 0.23 | 0.42 | 0.54 | 1.23 | 1.44 |
| LG123 RP4 | 0 | 0.13 | 0.18 | 0.27 | 0.46 | 0.59 | 1.23 | 1.43 |
| LG123 RP5 | 0 | 0.14 | 0.20 | 0.30 | 0.47 | 0.59 | 1.24 | 1.42 |
| LG123 RP6 | 0 | 0.13 | 0.18 | 0.27 | 0.46 | 0.60 | 1.27 | 1.49 |
| LG123 RP8 | 0 | 0.11 | 0.13 | 0.21 | 0.34 | 0.41 | 0.89 | 1.06 |
| LG123 RP9 | 0 | 0.13 | 0.20 | 0.29 | 0.48 | 0.62 | 1.33 | 1.56 |
| LG123 RP10 | 0 | 0.09 | 0.13 | 0.24 | 0.42 | 0.55 | 1.26 | 1.46 |
| LG123 RP11 | 0 | 0.13 | 0.18 | 0.28 | 0.46 | 0.59 | 1.26 | 1.47 |
| LG123 RP12 | 0 | 0.11 | 0.16 | 0.24 | 0.43 | 0.53 | 1.12 | 1.31 |
| LG123 RP14 | 0 | 0.17 | 0.17 | 0.25 | 0.47 | 0.58 | 1.32 | 1.49 |
| LG123 RP15 | 0 | 0.14 | 0.19 | 0.30 | 0.51 | 0.66 | 1.48 | 1.71 |
| LG123 RP16 | 0 | 0.14 | 0.22 | 0.33 | 0.54 | 0.70 | 1.48 | 1.71 |
| LG123 RP18 | 0 | 0.11 | 0.13 | 0.22 | 0.41 | 0.49 | 1.07 | 1.26 |
| LG123 RP19 | 0 | 0.05 | 0.07 | 0.18 | 0.37 | 0.49 | 1.18 | 1.40 |
| Avg | 0 | 0.12 | 0.17 | 0.26 | 0.44 | 0.56 | 1.23 | 1.43 |
| Stdev | 0 | 0.03 | 0.04 | 0.04 | 0.06 | 0.07 | 0.15 | 0.17 |

| Accoya™ wood (CL) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0 | 0.09 | 0.13 | 0.18 | 0.30 | 0.36 | 0.88 | 0.91 |
| LG135 RP3 | 0 | 0.10 | 0.10 | 0.27 | 0.45 | 0.54 | 1.20 | 1.45 |
| LG135 RP5a | 0 | 0.16 | 0.17 | 0.26 | 0.42 | 0.48 | 0.95 | 1.13 |
| LG135 RP5b | 0 | 0.09 | 0.15 | 0.25 | 0.39 | 0.48 | 1.05 | 1.22 |
| LG135 RP7 | 0 | 0.18 | 0.21 | 0.32 | 0.54 | 0.67 | 1.42 | 1.68 |
| LG135 RP8 | 0 | 0.27 | 0.36 | 0.53 | 0.84 | 1.05 | 2.23 | 2.67 |
| LG135 RP9 | 0 | 0.11 | 0.14 | 0.18 | 0.32 | 0.38 | 0.72 | 0.82 |
| LG135 RP11 | 0 | 0.09 | 0.10 | 0.14 | 0.26 | 0.31 | 0.64 | 0.71 |
| LG135 RP12 | 0 | 0.21 | 0.14 | 0.24 | 0.42 | 0.52 | 1.17 | 1.32 |
| LG135 RP100 | 0 | 0.07 | 0.06 | 0.16 | 0.31 | 0.40 | 0.97 | 1.14 |
| Avg | 0 | 0.14 | 0.16 | 0.25 | 0.42 | 0.52 | 1.12 | 1.30 |
| Stdev | 0 | 0.06 | 0.08 | 0.11 | 0.17 | 0.21 | 0.45 | 0.56 |

| Radiata pine (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 0 | 0.81 | 1.06 | 1.39 | 2.03 | 2.51 | 5.29 | 6.78 |
| REF - LG118 RP3 | 0 | 0.83 | 1.01 | 1.37 | 2.06 | 2.57 | 5.66 | 7.67 |
| REF - LG118 RP7 | 0 | 0.96 | 1.16 | 1.51 | 2.16 | 2.68 | 5.63 | 7.42 |
| REF - LG118 RP9 | 0 | 0.93 | 1.14 | 1.51 | 2.17 | 2.71 | 5.76 | 7.77 |
| REF - LG118 RP11 | 0 | 0.92 | 1.14 | 1.53 | 2.23 | 2.77 | 5.83 | 7.37 |
| REF - LG118 RP14 | 0 | 0.97 | 1.17 | 1.54 | 2.22 | 2.77 | 6.14 | 8.55 |
| REF - LG118 RP15 | 0 | 1.05 | 1.27 | 1.68 | 2.39 | 2.93 | 6.24 | 7.79 |
| REF - LG118 RP16 | 0 | 1.06 | 1.28 | 1.68 | 2.47 | 3.05 | 6.85 | 9.59 |
| REF - LG118 RP21 | 0 | 0.92 | 1.13 | 1.51 | 2.18 | 2.74 | 5.96 | 8.08 |
| REF - LG118 RP23 | 0 | 0.65 | 0.86 | 1.25 | 1.97 | 2.51 | 5.82 | 7.92 |
| Avg | 0 | 0.91 | 1.12 | 1.50 | 2.19 | 2.73 | 5.92 | 7.89 |
| Stdev | 0 | 0.12 | 0.12 | 0.13 | 0.15 | 0.17 | 0.42 | 0.76 |

Appendix 7 Radial shrinking - desorption

| Accoya™ wood (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 0.56 | 0.52 | 0.46 | 0.38 | 0.36 | 0.29 | 0.18 | 0 |
| LG118 RP3 | 0.49 | 0.43 | 0.35 | 0.28 | 0.25 | 0.17 | 0.05 | 0 |
| LG118 RP5 | 0.46 | 0.40 | 0.35 | 0.29 | 0.26 | 0.18 | 0.08 | 0 |
| LG118 RP7 | 0.73 | 0.64 | 0.56 | 0.44 | 0.39 | 0.26 | 0.09 | 0 |
| LG118 RP8 | 0.84 | 0.72 | 0.63 | 0.50 | 0.43 | 0.30 | 0.10 | 0 |
| LG118 RP9 | 0.68 | 0.68 | 0.59 | 0.41 | 0.42 | 0.27 | 0.07 | 0 |
| LG118 RP11 | 0.62 | 0.52 | 0.48 | 0.36 | 0.31 | 0.23 | 0.07 | 0 |
| LG118 RP14 | 0.63 | 0.56 | 0.48 | 0.38 | 0.35 | 0.23 | 0.07 | 0 |
| LG118 RP15 | 0.70 | 0.62 | 0.54 | 0.43 | 0.40 | 0.28 | 0.09 | 0 |
| LG118 RP16 | 0.74 | 0.65 | 0.58 | 0.46 | 0.41 | 0.29 | 0.12 | 0 |
| LG118 RP17 | 0.67 | 0.58 | 0.52 | 0.39 | 0.37 | 0.26 | 0.11 | 0 |
| LG118 RP21 | 0.65 | 0.58 | 0.51 | 0.41 | 0.38 | 0.25 | 0.11 | 0 |
| LG118 RP22 | 0.53 | 0.47 | 0.42 | 0.32 | 0.31 | 0.15 | 0.07 | 0 |
| LG118 RP23 | 0.50 | 0.44 | 0.39 | 0.29 | 0.28 | 0.17 | 0.08 | 0 |
| LG118 RP24 | 0.81 | 0.70 | 0.62 | 0.48 | 0.42 | 0.31 | 0.08 | 0 |
| Avg | 0.64 | 0.57 | 0.50 | 0.39 | 0.36 | 0.24 | 0.09 | 0 |
| Stdev | 0.12 | 0.10 | 0.09 | 0.07 | 0.06 | 0.05 | 0.03 | 0 |

| Accoya™ wood (NZ) Board | Oven dry | ← desorption Relative Humidity | | | | | | Water saturated |
|----------------------------|-------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 0.80 | 0.70 | 0.61 | 0.51 | 0.45 | 0.34 | 0.18 | 0 |
| LG122 RP5 | 0.90 | 0.78 | 0.71 | 0.55 | 0.51 | 0.35 | 0.16 | 0 |
| LG122 RP6 | 0.89 | 0.76 | 0.71 | 0.56 | 0.50 | 0.37 | 0.07 | 0 |
| LG122 RP8 | 0.65 | 0.56 | 0.52 | 0.41 | 0.39 | 0.27 | 0.11 | 0 |
| LG122 RP9 | 0.55 | 0.48 | 0.43 | 0.34 | 0.31 | 0.19 | 0.02 | 0 |
| LG122 RP10 | 0.93 | 0.83 | 0.75 | 0.60 | 0.52 | 0.36 | 0.13 | 0 |
| LG122 RP11 | 0.51 | 0.47 | 0.42 | 0.32 | 0.30 | 0.20 | 0.09 | 0 |
| LG122 RP13 | 0.69 | 0.60 | 0.55 | 0.42 | 0.38 | 0.25 | 0.09 | 0 |
| LG122 RP14 | 0.72 | 0.68 | 0.61 | 0.51 | 0.48 | 0.37 | 0.20 | 0 |
| LG122 RP15 | 0.86 | 0.76 | 0.66 | 0.55 | 0.49 | 0.36 | 0.11 | 0 |
| LG122 RP16 | 0.88 | 0.74 | 0.26 | 0.53 | 0.47 | 0.36 | 0.14 | 0 |
| LG122 RP17 | 0.62 | 0.57 | 0.52 | 0.41 | 0.36 | 0.27 | 0.14 | 0 |
| LG122 RP20 | 0.54 | 0.49 | 0.45 | 0.36 | 0.25 | 0.20 | 0.09 | 0 |
| LG122 RP21 | 0.41 | 0.47 | 0.42 | 0.33 | 0.30 | 0.20 | 0.07 | 0 |
| LG122 RP22 | 0.94 | 0.82 | 0.76 | 0.63 | 0.57 | 0.42 | 0.23 | 0 |
| Avg | 0.73 | 0.65 | 0.56 | 0.47 | 0.42 | 0.30 | 0.12 | 0 |
| Stdev | 0.18 | 0.13 | 0.15 | 0.10 | 0.10 | 0.08 | 0.06 | 0 |



| Accoya™ wood (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 0.88 | 0.80 | 0.73 | 0.62 | 0.57 | 0.46 | 0.28 | 0 |
| LG123 RP3 | 0.57 | 0.50 | 0.45 | 0.35 | 0.32 | 0.22 | 0.09 | 0 |
| LG123 RP4 | 0.70 | 0.61 | 0.54 | 0.35 | 0.38 | 0.28 | 0.11 | 0 |
| LG123 RP5 | 0.58 | 0.52 | 0.43 | 0.33 | 0.32 | 0.20 | 0.06 | 0 |
| LG123 RP6 | 0.77 | 0.68 | 0.60 | 0.48 | 0.42 | 0.30 | 0.12 | 0 |
| LG123 RP8 | 0.52 | 0.48 | 0.42 | 0.33 | 0.31 | 0.21 | 0.06 | 0 |
| LG123 RP9 | 0.61 | 0.54 | 0.49 | 0.38 | 0.33 | 0.24 | 0.10 | 0 |
| LG123 RP10 | 0.59 | 0.52 | 0.46 | 0.36 | 0.31 | 0.20 | 0.08 | 0 |
| LG123 RP11 | 0.60 | 0.53 | 0.48 | 0.36 | 0.33 | 0.23 | 0.08 | 0 |
| LG123 RP12 | 0.56 | 0.50 | 0.45 | 0.35 | 0.32 | 0.22 | 0.09 | 0 |
| LG123 RP14 | 0.65 | 0.57 | 0.50 | 0.39 | 0.34 | 0.24 | 0.09 | 0 |
| LG123 RP15 | 0.95 | 0.82 | 0.73 | 0.59 | 0.49 | 0.36 | 0.12 | 0 |
| LG123 RP16 | 0.79 | 0.70 | 0.61 | 0.49 | 0.43 | 0.31 | 0.09 | 0 |
| LG123 RP18 | 0.70 | 0.62 | 0.56 | 0.45 | 0.41 | 0.30 | 0.14 | 0 |
| LG123 RP19 | 0.55 | 0.50 | 0.45 | 0.30 | 0.32 | 0.23 | 0.12 | 0 |
| Avg | 0.67 | 0.59 | 0.53 | 0.41 | 0.37 | 0.27 | 0.11 | 0 |
| Stdev | 0.13 | 0.11 | 0.10 | 0.10 | 0.08 | 0.07 | 0.05 | 0 |

| Accoya™ wood (CL) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0.55 | 0.50 | 0.45 | 0.36 | 0.29 | 0.24 | -0.03 | 0 |
| LG135 RP3 | 0.70 | 0.61 | 0.54 | 0.43 | 0.39 | 0.25 | 0.09 | 0 |
| LG135 RP5a | 0.58 | 0.49 | 0.44 | 0.34 | 0.33 | 0.21 | 0.07 | 0 |
| LG135 RP5b | 0.61 | 0.52 | 0.46 | 0.35 | 0.34 | 0.23 | 0.08 | 0 |
| LG135 RP7 | 1.14 | 1.01 | 0.89 | 0.70 | 0.61 | 0.46 | 0.16 | 0 |
| LG135 RP8 | 1.07 | 0.87 | 0.81 | 0.63 | 0.56 | 0.39 | 0.13 | 0 |
| LG135 RP9 | 0.50 | 0.42 | 0.38 | 0.31 | 0.27 | 0.19 | 0.08 | 0 |
| LG135 RP11 | 0.38 | 0.32 | 0.28 | 0.18 | 0.20 | 0.14 | 0.05 | 0 |
| LG135 RP12 | 0.97 | 0.82 | 0.73 | 0.59 | 0.51 | 0.37 | 0.11 | 0 |
| LG135 RP100 | 0.76 | 0.65 | 0.58 | 0.47 | 0.43 | 0.30 | 0.13 | 0 |
| Avg | 0.73 | 0.62 | 0.55 | 0.43 | 0.39 | 0.28 | 0.09 | 0 |
| Stdev | 0.26 | 0.22 | 0.20 | 0.16 | 0.13 | 0.10 | 0.05 | 0 |

| Radiata pine (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 1.71 | 1.17 | 1.01 | 0.76 | 0.60 | 0.49 | 0.15 | 0 |
| REF - LG118 RP3 | 3.23 | 2.43 | 2.17 | 1.80 | 1.51 | 1.20 | 0.37 | 0 |
| REF - LG118 RP7 | 3.93 | 2.94 | 2.62 | 2.14 | 1.80 | 1.45 | 0.38 | 0 |
| REF - LG118 RP9 | 3.94 | 2.96 | 2.68 | 2.17 | 1.82 | 1.41 | 0.43 | 0 |
| REF - LG118 RP11 | 3.10 | 2.25 | 1.95 | 1.53 | 1.26 | 0.95 | 0.22 | 0 |
| REF - LG118 RP14 | 3.24 | 2.40 | 2.14 | 1.75 | 1.48 | 1.18 | 0.36 | 0 |
| REF - LG118 RP15 | 3.18 | 2.31 | 2.05 | 1.64 | 1.24 | 1.08 | 0.28 | 0 |
| REF - LG118 RP16 | 3.94 | 2.99 | 2.69 | 2.23 | 1.87 | 1.51 | 0.49 | 0 |
| REF - LG118 RP21 | 3.73 | 2.81 | 2.52 | 2.09 | 1.76 | 1.44 | 0.45 | 0 |
| REF - LG118 RP23 | 3.35 | 2.54 | 2.32 | 1.92 | 1.65 | 1.28 | 0.44 | 0 |
| Avg | 3.33 | 2.48 | 2.22 | 1.80 | 1.50 | 1.20 | 0.36 | 0 |
| Stdev | 0.66 | 0.54 | 0.50 | 0.43 | 0.39 | 0.31 | 0.11 | 0 |

Appendix 8 Tangential shrinking - desorption

| Accoya™ wood (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 1.22 | 1.08 | 0.97 | 0.79 | 0.68 | 0.57 | 0.19 | 0 |
| LG118 RP3 | 1.35 | 1.17 | 1.05 | 0.84 | 0.69 | 0.52 | 0.18 | 0 |
| LG118 RP5 | 1.28 | 1.09 | 0.99 | 0.79 | 0.66 | 0.46 | 0.13 | 0 |
| LG118 RP7 | 1.34 | 1.15 | 1.04 | 0.83 | 0.70 | 0.51 | 0.17 | 0 |
| LG118 RP8 | 2.45 | 2.07 | 1.86 | 1.54 | 1.29 | 0.99 | 0.33 | 0 |
| LG118 RP9 | 1.53 | 1.31 | 1.18 | 0.95 | 0.80 | 0.59 | 0.19 | 0 |
| LG118 RP11 | 1.49 | 1.29 | 1.15 | 0.93 | 0.76 | 0.53 | 0.15 | 0 |
| LG118 RP14 | 1.42 | 1.21 | 1.09 | 0.89 | 0.75 | 0.55 | 0.17 | 0 |
| LG118 RP15 | 1.57 | 1.34 | 1.20 | 0.97 | 0.82 | 0.57 | 0.14 | 0 |
| LG118 RP16 | 1.70 | 1.45 | 1.32 | 1.05 | 0.91 | 0.66 | 0.24 | 0 |
| LG118 RP17 | 1.40 | 1.19 | 1.07 | 0.86 | 0.72 | 0.52 | 0.15 | 0 |
| LG118 RP21 | 1.27 | 1.06 | 0.96 | 0.77 | 0.66 | 0.49 | 0.16 | 0 |
| LG118 RP22 | 1.16 | 0.99 | 0.90 | 0.72 | 0.63 | 0.47 | 0.15 | 0 |
| LG118 RP23 | 1.19 | 1.02 | 0.93 | 0.73 | 0.65 | 0.44 | 0.14 | 0 |
| LG118 RP24 | 1.94 | 1.66 | 1.50 | 1.23 | 1.06 | 0.80 | 0.35 | 0 |
| Avg | 1.49 | 1.27 | 1.15 | 0.93 | 0.78 | 0.58 | 0.19 | 0 |
| Sdev | 0.34 | 0.28 | 0.25 | 0.22 | 0.18 | 0.15 | 0.07 | 0 |

| Accoya™ wood (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|--------------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 1.30 | 1.14 | 1.02 | 0.85 | 0.70 | 0.55 | 0.17 | 0 |
| LG122 RP5 | 1.51 | 1.22 | 1.19 | 0.96 | 0.81 | 0.61 | 0.20 | 0 |
| LG122 RP6 | 1.74 | 1.49 | 1.35 | 1.09 | 0.91 | 0.67 | 0.16 | 0 |
| LG122 RP8 | 1.43 | 1.22 | 1.11 | 0.90 | 0.76 | 0.54 | 0.16 | 0 |
| LG122 RP9 | 1.71 | 1.46 | 1.32 | 1.07 | 0.90 | 0.66 | 0.18 | 0 |
| LG122 RP10 | 1.50 | 1.27 | 1.16 | 0.94 | 0.80 | 0.59 | 0.20 | 0 |
| LG122 RP11 | 1.37 | 1.16 | 1.04 | 0.84 | 0.72 | 0.51 | 0.16 | 0 |
| LG122 RP13 | 1.46 | 1.23 | 1.12 | 0.92 | 0.77 | 0.56 | 0.18 | 0 |
| LG122 RP14 | 1.68 | 1.40 | 1.26 | 1.05 | 0.89 | 0.66 | 0.23 | 0 |
| LG122 RP15 | 2.04 | 1.76 | 1.59 | 1.31 | 1.09 | 0.84 | 0.28 | 0 |
| LG122 RP16 | 1.70 | 1.48 | 1.32 | 1.09 | 0.93 | 0.71 | 0.26 | 0 |
| LG122 RP17 | 1.65 | 1.41 | 1.27 | 1.04 | 0.87 | 0.65 | 0.21 | 0 |
| LG122 RP20 | 1.45 | 1.23 | 1.12 | 0.90 | 0.77 | 0.59 | 0.21 | 0 |
| LG122 RP21 | 0.94 | 0.80 | 0.71 | 0.58 | 0.42 | 0.38 | 0.14 | 0 |
| LG122 RP22 | 1.53 | 1.34 | 1.23 | 0.99 | 0.84 | 0.61 | 0.22 | 0 |
| Avg | 1.53 | 1.31 | 1.19 | 0.97 | 0.81 | 0.61 | 0.20 | 0 |
| Sdev | 0.25 | 0.21 | 0.19 | 0.16 | 0.15 | 0.10 | 0.04 | 0 |



| Accoya™ wood (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 1.29 | 1.13 | 1.00 | 0.83 | 0.71 | 0.55 | 0.20 | 0 |
| LG123 RP3 | 1.53 | 1.31 | 1.19 | 0.98 | 0.84 | 0.63 | 0.22 | 0 |
| LG123 RP4 | 1.46 | 1.24 | 1.11 | 0.89 | 0.73 | 0.56 | 0.17 | 0 |
| LG123 RP5 | 1.36 | 1.17 | 1.04 | 0.84 | 0.72 | 0.52 | 0.14 | 0 |
| LG123 RP6 | 1.52 | 1.30 | 1.16 | 0.95 | 0.80 | 0.58 | 0.20 | 0 |
| LG123 RP8 | 1.10 | 0.96 | 0.85 | 0.70 | 0.56 | 0.43 | 0.17 | 0 |
| LG123 RP9 | 1.61 | 1.38 | 1.24 | 1.00 | 0.84 | 0.62 | 0.20 | 0 |
| LG123 RP10 | 1.51 | 1.30 | 1.16 | 0.95 | 0.79 | 0.58 | 0.18 | 0 |
| LG123 RP11 | 1.46 | 1.23 | 1.15 | 0.88 | 0.75 | 0.57 | 0.11 | 0 |
| LG123 RP12 | 1.30 | 1.08 | 1.00 | 0.81 | 0.67 | 0.50 | 0.14 | 0 |
| LG123 RP14 | 1.56 | 1.28 | 1.19 | 0.98 | 0.82 | 0.62 | 0.14 | 0 |
| LG123 RP15 | 1.76 | 1.51 | 1.37 | 1.12 | 0.95 | 0.71 | 0.23 | 0 |
| LG123 RP16 | 1.74 | 1.49 | 1.35 | 1.11 | 0.93 | 0.70 | 0.21 | 0 |
| LG123 RP18 | 1.36 | 1.15 | 1.05 | 0.85 | 0.71 | 0.49 | 0.17 | 0 |
| LG123 RP19 | 1.22 | 1.07 | 0.97 | 0.79 | 0.67 | 0.49 | 0.17 | 0 |
| Avg | 1.45 | 1.24 | 1.12 | 0.91 | 0.77 | 0.57 | 0.18 | 0 |
| Stdev | 0.18 | 0.15 | 0.14 | 0.12 | 0.10 | 0.08 | 0.04 | 0 |

| Accoya™ wood (CL) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 0.92 | 0.83 | 0.76 | 0.63 | 0.53 | 0.43 | 0.19 | 0 |
| LG135 RP3 | 1.45 | 1.26 | 1.15 | 0.89 | 0.77 | 0.58 | 0.19 | 0 |
| LG135 RP5a | 1.12 | 0.95 | 0.87 | 0.70 | 0.59 | 0.43 | 0.13 | 0 |
| LG135 RP5b | 1.21 | 1.02 | 0.91 | 0.74 | 0.57 | 0.44 | 0.08 | 0 |
| LG135 RP7 | 1.67 | 1.43 | 1.31 | 1.06 | 0.89 | 0.67 | 0.22 | 0 |
| LG135 RP8 | 2.65 | 2.26 | 2.05 | 1.68 | 1.38 | 1.10 | 0.37 | 0 |
| LG135 RP9 | 0.87 | 0.74 | 0.68 | 0.54 | 0.47 | 0.34 | 0.12 | 0 |
| LG135 RP11 | 0.67 | 0.57 | 0.52 | 0.41 | 0.36 | 0.24 | 0.07 | 0 |
| LG135 RP12 | 1.35 | 1.15 | 1.04 | 0.86 | 0.71 | 0.53 | 0.18 | 0 |
| LG135 RP100 | 1.24 | 1.08 | 0.98 | 0.81 | 0.67 | 0.51 | 0.21 | 0 |
| Avg | 1.32 | 1.13 | 1.03 | 0.83 | 0.69 | 0.53 | 0.18 | 0 |
| Stdev | 0.55 | 0.47 | 0.43 | 0.35 | 0.29 | 0.23 | 0.09 | 0 |

| Radiata pine (NZ) Board | Oven dry | ← desorption | | | | | | Water saturated |
|----------------------------|-------------|-------------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| | | Relative Humidity | | | | | | |
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 5.91 | 4.57 | 4.09 | 3.43 | 2.88 | 2.40 | 1.02 | 0 |
| REF - LG118 RP3 | 7.09 | 5.73 | 5.27 | 4.59 | 3.99 | 3.42 | 1.50 | 0 |
| REF - LG118 RP7 | 6.92 | 5.52 | 5.09 | 4.39 | 3.78 | 3.21 | 1.33 | 0 |
| REF - LG118 RP9 | 7.13 | 5.80 | 5.33 | 4.61 | 4.06 | 3.49 | 1.54 | 0 |
| REF - LG118 RP11 | 6.79 | 5.27 | 4.78 | 4.00 | 3.38 | 2.80 | 1.05 | 0 |
| REF - LG118 RP14 | 7.60 | 6.14 | 5.67 | 4.92 | 4.27 | 3.68 | 1.62 | 0 |
| REF - LG118 RP15 | 7.11 | 5.49 | 5.09 | 4.24 | 3.67 | 3.04 | 1.18 | 0 |
| REF - LG118 RP16 | 8.95 | 7.37 | 6.89 | 6.08 | 5.40 | 4.74 | 2.25 | 0 |
| REF - LG118 RP21 | 7.28 | 5.88 | 5.44 | 4.73 | 4.14 | 3.52 | 1.57 | 0 |
| REF - LG118 RP23 | 6.95 | 5.75 | 5.35 | 4.65 | 4.05 | 3.50 | 1.56 | 0 |
| Avg | 7.17 | 5.75 | 5.30 | 4.56 | 3.96 | 3.38 | 1.46 | 0 |
| Stdev | 0.76 | 0.71 | 0.71 | 0.68 | 0.65 | 0.62 | 0.36 | 0 |

Appendix 9 Anti-Shrinking (Swelling)-Efficiency

Radial swelling

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|----------------|----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | adsorption → | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | ASE [%] | 0 | 83 | 83 | 82 | 77 | 78 | 80 | 80 |
| | LG122 | ASE [%] | 0 | 84 | 81 | 81 | 77 | 77 | 78 | 78 |
| | LG123 | ASE [%] | 0 | 82 | 81 | 83 | 78 | 78 | 80 | 80 |
| | average | ASE [%] | 0 | 83 | 81 | 82 | 77 | 78 | 79 | 80 |
| Accoya™ wood (Chile) | LG135 | ASE [%] | 0 | 80 | 80 | 80 | 76 | 77 | 78 | 78 |

Tangential swelling

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|----------------|----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | adsorption → | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | ASE [%] | 0 | 87 | 85 | 82 | 80 | 79 | 79 | 81 |
| | LG122 | ASE [%] | 0 | 86 | 84 | 81 | 79 | 78 | 78 | 81 |
| | LG123 | ASE [%] | 0 | 87 | 85 | 83 | 80 | 79 | 79 | 82 |
| | average | ASE [%] | 0 | 87 | 84 | 82 | 79 | 79 | 79 | 81 |
| Accoya™ wood (Chile) | LG135 | ASE [%] | 0 | 85 | 86 | 83 | 81 | 81 | 81 | 83 |

Radial shrinking

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|----------------|-----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | desorption ← | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | ASE [%] | 81 | 77 | 77 | 78 | 76 | 80 | 74 | 0 |
| | LG122 | ASE [%] | 78 | 74 | 75 | 74 | 72 | 75 | 66 | 0 |
| | LG123 | ASE [%] | 80 | 76 | 76 | 77 | 75 | 78 | 70 | 0 |
| | average | ASE [%] | 80 | 76 | 76 | 77 | 74 | 77 | 70 | 0 |
| Accoya™ wood (Chile) | LG135 | ASE [%] | 78 | 75 | 75 | 76 | 74 | 77 | 75 | 0 |

Tangential shrinking

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|----------------|-----------|-------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | | | desorption ← | | | | | | |
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | ASE [%] | 79 | 78 | 78 | 80 | 80 | 83 | 87 | 0 |
| | LG122 | ASE [%] | 79 | 77 | 78 | 79 | 80 | 82 | 87 | 0 |
| | LG123 | ASE [%] | 80 | 78 | 79 | 80 | 81 | 83 | 88 | 0 |
| | average | ASE [%] | 79 | 78 | 78 | 80 | 80 | 83 | 87 | 0 |
| Accoya™ wood (Chile) | LG135 | ASE [%] | 82 | 80 | 81 | 82 | 83 | 84 | 88 | 0 |



Appendix 10 Density

| Species | Batch | | Oven dry | Relative Humidity | | | | | | Water saturated |
|-------------------------------|----------------|------------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | | | 25% | 35% | 50% | 65% | 80% | 95% | |
| Accoya™ wood (New Zealand) | LG118 | Density [kg/m ³] | 505 | 511 | 513 | 516 | 519 | 521 | 535 | 1074 |
| | | <i>stdev</i> | 31 | 31 | 32 | 32 | 32 | 32 | 33 | 13 |
| | LG122 | Density [kg/m ³] | 506 | 511 | 513 | 516 | 519 | 522 | 533 | 1079 |
| | | <i>stdev</i> | 39 | 40 | 40 | 40 | 40 | 40 | 40 | 16 |
| | LG123 | Density [kg/m ³] | 480 | 485 | 487 | 490 | 493 | 495 | 506 | 1064 |
| <i>stdev</i> | 34 | 34 | 34 | 35 | 35 | 35 | 36 | 16 | | |
| | average | Density [kg/m ³] | 497 | 503 | 504 | 507 | 510 | 513 | 525 | 1072 |
| | <i>stdev</i> | 35 | 35 | 35 | 36 | 36 | 36 | 36 | 15 | |
| Accoya™ wood (Chile) | LG135 | Density [kg/m ³] | 543 | 548 | 549 | 553 | 555 | 557 | 568 | 1059 |
| | <i>stdev</i> | 57 | 58 | 58 | 58 | 58 | 59 | 59 | 50 | |
| Radiata Pine (New Zealand) | Ref-LG122 | Density [kg/m ³] | 440 | 453 | 456 | 460 | 466 | 471 | 496 | 1014 |
| | <i>stdev</i> | 29 | 29 | 30 | 30 | 30 | 30 | 31 | 19 | |

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG118 RP2 | 496 | 502 | 503 | 506 | 509 | 512 | 525 | 1082 |
| LG118 RP3 | 448 | 452 | 454 | 457 | 459 | 461 | 473 | 1060 |
| LG118 RP5 | 515 | 521 | 522 | 526 | 529 | 532 | 545 | 1082 |
| LG118 RP7 | 511 | 517 | 518 | 522 | 524 | 527 | 540 | 1064 |
| LG118 RP8 | 516 | 522 | 524 | 528 | 531 | 533 | 545 | 1067 |
| LG118 RP9 | 473 | 479 | 480 | 483 | 486 | 488 | 500 | 1067 |
| LG118 RP11 | 522 | 527 | 529 | 533 | 536 | 538 | 552 | 1084 |
| LG118 RP14 | 458 | 463 | 464 | 467 | 469 | 471 | 483 | 1050 |
| LG118 RP15 | 562 | 568 | 570 | 574 | 576 | 580 | 594 | 1099 |
| LG118 RP16 | 529 | 535 | 537 | 540 | 543 | 546 | 559 | 1062 |
| LG118 RP17 | 520 | 525 | 527 | 531 | 534 | 536 | 550 | 1069 |
| LG118 RP21 | 545 | 551 | 552 | 556 | 559 | 562 | 577 | 1084 |
| LG118 RP22 | 485 | 490 | 492 | 495 | 498 | 501 | 515 | 1070 |
| LG118 RP23 | 488 | 493 | 495 | 498 | 501 | 504 | 519 | 1084 |
| LG118 RP24 | 512 | 518 | 519 | 523 | 526 | 528 | 541 | 1086 |
| Avg | 505 | 511 | 513 | 516 | 519 | 521 | 535 | 1074 |
| <i>Stdev</i> | 31 | 31 | 32 | 32 | 32 | 32 | 33 | 13 |

| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG122 RP1 | 492 | 497 | 498 | 501 | 504 | 506 | 517 | 1105 |
| LG122 RP5 | 486 | 491 | 493 | 496 | 499 | 501 | 513 | 1072 |
| LG122 RP6 | 585 | 591 | 593 | 596 | 599 | 602 | 613 | 1104 |
| LG122 RP8 | 478 | 484 | 485 | 488 | 491 | 493 | 505 | 1066 |
| LG122 RP9 | 495 | 500 | 502 | 505 | 507 | 510 | 521 | 1074 |
| LG122 RP10 | 543 | 548 | 550 | 554 | 557 | 559 | 571 | 1080 |
| LG122 RP11 | 451 | 456 | 457 | 460 | 463 | 465 | 476 | 1057 |
| LG122 RP13 | 472 | 477 | 479 | 482 | 484 | 487 | 498 | 1056 |
| LG122 RP14 | 536 | 542 | 544 | 547 | 550 | 553 | 565 | 1084 |
| LG122 RP15 | 519 | 524 | 526 | 529 | 532 | 534 | 545 | 1072 |
| LG122 RP16 | 530 | 536 | 537 | 541 | 543 | 546 | 557 | 1076 |
| LG122 RP17 | 499 | 505 | 506 | 510 | 512 | 515 | 528 | 1075 |
| LG122 RP20 | 467 | 472 | 473 | 476 | 479 | 481 | 494 | 1069 |
| LG122 RP21 | 569 | 574 | 576 | 579 | 582 | 585 | 598 | 1108 |
| LG122 RP22 | 469 | 474 | 476 | 479 | 481 | 484 | 495 | 1084 |
| Avg | 506 | 511 | 513 | 516 | 519 | 522 | 533 | 1079 |
| <i>Stdev</i> | 39 | 40 | 40 | 40 | 40 | 40 | 40 | 16 |



| Accoya™ wood (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG123 RP2 | 433 | 437 | 438 | 441 | 443 | 445 | 455 | 1100 |
| LG123 RP3 | 488 | 493 | 495 | 499 | 502 | 504 | 516 | 1076 |
| LG123 RP4 | 447 | 451 | 453 | 456 | 458 | 460 | 470 | 1062 |
| LG123 RP5 | 457 | 461 | 463 | 465 | 468 | 470 | 481 | 1057 |
| LG123 RP6 | 518 | 523 | 525 | 528 | 531 | 533 | 545 | 1069 |
| LG123 RP8 | 529 | 534 | 536 | 540 | 543 | 546 | 557 | 1068 |
| LG123 RP9 | 484 | 489 | 490 | 493 | 496 | 498 | 509 | 1055 |
| LG123 RP10 | 473 | 478 | 479 | 482 | 485 | 487 | 499 | 1045 |
| LG123 RP11 | 468 | 473 | 474 | 478 | 480 | 482 | 493 | 1041 |
| LG123 RP12 | 427 | 432 | 433 | 436 | 438 | 440 | 451 | 1044 |
| LG123 RP14 | 506 | 512 | 514 | 517 | 520 | 523 | 536 | 1064 |
| LG123 RP15 | 514 | 520 | 522 | 525 | 528 | 531 | 543 | 1069 |
| LG123 RP16 | 522 | 527 | 529 | 532 | 535 | 537 | 549 | 1085 |
| LG123 RP18 | 444 | 448 | 450 | 453 | 455 | 458 | 469 | 1050 |
| LG123 RP19 | 498 | 503 | 504 | 508 | 510 | 513 | 524 | 1079 |
| Avg | 480 | 485 | 487 | 490 | 493 | 495 | 506 | 1064 |
| Stdev | 34 | 34 | 34 | 35 | 35 | 35 | 36 | 16 |

| Accoya™ wood (CL) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| LG135 RP1 | 515 | 519 | 520 | 524 | 526 | 528 | 539 | 1042 |
| LG135 RP3 | 571 | 576 | 578 | 581 | 584 | 586 | 598 | 1065 |
| LG135 RP5a | 543 | 548 | 549 | 553 | 555 | 557 | 567 | 1076 |
| LG135 RP5b | 536 | 540 | 542 | 545 | 547 | 549 | 559 | 1060 |
| LG135 RP7 | 649 | 655 | 657 | 660 | 663 | 666 | 677 | 1125 |
| LG135 RP8 | 530 | 536 | 537 | 541 | 544 | 546 | 558 | 962 |
| LG135 RP9 | 578 | 583 | 585 | 589 | 591 | 594 | 607 | 1101 |
| LG135 RP11 | 429 | 433 | 434 | 437 | 439 | 441 | 453 | 988 |
| LG135 RP12 | 572 | 577 | 578 | 581 | 584 | 586 | 596 | 1100 |
| LG135 RP100 | 507 | 512 | 512 | 515 | 517 | 519 | 529 | 1066 |
| Avg | 543 | 548 | 549 | 553 | 555 | 557 | 568 | 1059 |
| Stdev | 57 | 58 | 58 | 58 | 58 | 59 | 59 | 50 |

| Radiata pine (NZ) Board | Oven dry | Relative Humidity | | | | | | Water saturated |
|----------------------------|------------|-------------------|------------|------------|------------|------------|------------|-----------------|
| | | 25% | 35% | 50% | 65% | 80% | 95% | |
| REF - LG118 RP2 | 416 | 429 | 432 | 437 | 443 | 449 | 476 | 998 |
| REF - LG118 RP3 | 409 | 422 | 424 | 429 | 435 | 440 | 464 | 987 |
| REF - LG118 RP7 | 460 | 473 | 476 | 481 | 487 | 492 | 516 | 1013 |
| REF - LG118 RP9 | 438 | 451 | 454 | 458 | 464 | 469 | 494 | 994 |
| REF - LG118 RP11 | 452 | 466 | 469 | 474 | 480 | 485 | 510 | 1038 |
| REF - LG118 RP14 | 420 | 433 | 436 | 440 | 446 | 451 | 476 | 1001 |
| REF - LG118 RP15 | 458 | 472 | 474 | 479 | 485 | 489 | 514 | 1011 |
| REF - LG118 RP16 | 497 | 512 | 515 | 520 | 526 | 531 | 558 | 1042 |
| REF - LG118 RP21 | 445 | 459 | 461 | 466 | 472 | 477 | 502 | 1024 |
| REF - LG118 RP23 | 402 | 415 | 417 | 421 | 427 | 432 | 454 | 1027 |
| Avg | 440 | 453 | 456 | 460 | 466 | 471 | 496 | 1014 |
| Stdev | 29 | 29 | 30 | 30 | 30 | 30 | 31 | 19 |