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## The Hardness of North Westland Red Beech (*Nothofagus fusca*)

### Introduction

Hardness is an important mechanical property of timber, especially in such applications as flooring. Hardness is a measure of strength defined as resistance to indentation. The hardness of wood varies with grain direction. Hardness is measured on the surface perpendicular to the grain in the radial direction, and is referred to as ‘side hardness.’ The Janka hardness test measures the load required to embed an 11.28mm steel ball to a depth one-half its diameter. Janka test results can be presented in a variety of units; the hardness ratings in this paper are given in kilonewtons (kN), as is standard throughout New Zealand and Australia.

The *Nothofagus* species are anatomically similar to maple, birch and European beech. They possess a fine, even texture and the associated characteristics of even-wearing as well as good machining, turning and finishing qualities. The structural basis for this is the evenness of distribution of the pores and their small size and abundance. *Nothofagus fusca* has good strength and durability properties which commends its use for light timber construction, sills, flooring, boat building, and manufacturing uses such as furniture and brushware.

Today red beech is used primarily in veneer, interior/exterior furniture, mouldings, flooring, panels, laminated products, decking, and exterior and landscape applications.<sup>1</sup>

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<sup>1</sup> <http://www.foreverbeech.co.nz/livingwith/usesofbeech.html> (20/10/04)

## **Aim**

To use the Janka hardness test to determine an average hardness value for red beech heartwood flooring timber in order to provide Forever Beech with additional product specifications.

## **Method**

The Janka hardness test was carried out under the climate controlled conditions of the wood technology laboratory, University of Canterbury. The Intstron 5500R compression reading instrument was set up with the standard Janka test 11.28mm diameter steel ball. Each sample was placed on the compression plate and the steel ball calibrated on the sample's surface. The ball was pressed into the surface of each sample at an extension rate of 0.0167 mm/s, to a depth of 5.64mm, indenting the wood over an average time period of 338.4 seconds. Using these input parameters and the Intstron compression recorder on which the sample was positioned; the load in kN was measured.

A total of 40 tongue and groove red beech flooring grade off cuts were measured. The load each second was recorded by the Intstron, with the final load at a depth of 5.64mm being recorded as the hardness rating for that sample.

## **Results**

The mean Janka hardness value of the 40 red beech samples is 5.4 kN (appendix 1). These data have a standard deviation of 1.36 kN which equates to a coefficient of variation of 25%.

## **Conclusion**

The average hardness of 40 red beech flooring timber samples from the Forever Beech mill is 5.4kN.

## Appendix 1

Sample No.	Load (kN)
1	4.01
2	4.02
3	4.82
4	4.53
5	4.60
6	4.68
7	5.15
8	4.65
9	6.06
10	3.58
11	6.09
12	9.15
13	4.82
14	6.43
15	7.87
16	4.90
17	6.31
18	5.54
19	6.92
20	4.71
21	4.36
22	4.53
23	5.68
24	4.45
25	4.75
26	4.87
27	4.09
28	9.75
29	4.20
30	4.56
31	5.49
32	4.75
33	4.43
34	5.15
35	7.35
36	6.97
37	4.76
38	6.23
39	5.48
40	4.43
Average	5.38
Std Dev	1.36