13.

Department of Conservation
and Land Management

Date:
Reference:

Wood Utilisation Research Centre

SAWMILLING STUDY OF TASMANIAN BLUE GUM GROWN IN WESTERN AUSTRALIA

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February 1990
W.U.R.C. Technical Report No 13.
Limited Distribution

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SAWMILLING STUDY OF TASMANIAN BLUE GUM GROWN IN WESTERN AUSTRALIA

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SUMMARY

Twenty-four-year-old *Eucalyptus globulus* Labill. subsp. *globulus* logs from Willow Springs Arboretum, Nannup District, were sawn into 40 and 50 mm thick structural sizes or 30 mm thick appearance grade boards. Recovery of green sawn timber was 30.5 per cent. All sawn timber was treated against lyctid attack.

When the structural timber was graded to Australian Standard AS 2082-1979, 64.2 per cent met the requirements of Structural Grade No 3 or better. Limited docking of merchantable grade timber would increase the proportion of Structural Grade No 3 or better to 79.0 per cent.

The boards were air- and then kiln-dried to 8 per cent moisture content and then graded for appearance using the W.U.R.C. draft grading rules. Only 3.4 per cent of this material made Clear grade while 16.7 per cent made Feature and 10.5 per cent made Processing grade. The largest recovery was 68.7 per cent in Merchantable grade material owing mainly to knots and gum veins.

INTRODUCTION

The Western Australian Government, in association with the Department of Conservation and Land Management and private industry, proposes to establish Tasmanian blue gum(*Eucalyptus globulus* Labill. subsp. *globulus*) as the major species in approximately 100 000 ha of plantations in the south-west of Western Australia. Although planted primarily as a source of pulp wood, the species can provide significant ecological benefits by reducing the effects of salination and eutrophication through soil rehabilitation, and by providing habitats for fauna.

In addition, the species can provide sawlogs for structural or appearance timber if the stands are managed well, and grown for about thirty years. This trial examines the sawmilling and seasoning of Western Australian-grown trees of Tasmanian blue gum, and the ability of the sawn timber to meet the requirements of the relevant Australian Standards.

METHODS

Log Supplies

Thirty-two 24-year-old Tasmanian blue gum trees were harvested from Willow Springs Arboretum, Nannup District, in August 1988. The arboretum is situated in the northern extremity of the karri forest in the south-west of W.A. where the annual rainfall is about 990 mm.

The logs were transported to the Wood Utilisation Research Centre (W.U.R.C.) at Harvey, and stored under continuous water sprays in a stockpile for four months before they were processed at the W.U.R.C. sawmill.

Prior to milling the logs were debarked by axe and docked to 3.6 m or less (with 10 mm overcut) to produce 41 logs for milling. Length, small end diameter under bark (s.e.d.u.b.), large end diameter under bark (l.e.d.u.b.) and comments on log quality were recorded.

Sawmilling

Thirty-nine of the logs were broken down by two passes through twin edger circular saws , to produce a rectangular centre cant and four roundback wings, which were resawn on a narrow kerf vertical band resaw. Two logs exceeding the capacity of the twin edger saw (400 mm l.e.d.u.b.) were broken down on a horizontal bandsaw and resawn on the vertical band resaw.

The following thicknesses and widths of structural or appearance timber were produced:

thickness	-	30, 40 or 50 mm
width	-	50, 75, 100, 125, or 150 mm.

The sawn timber was docked to remove defects where necessary, and cut to a maximum of 3.6 m in multiples of 0.3 m. The sawn timber was stacked with pieces of the same thickness in individual bundles, and placed in a covered storage shed.

Grading

The structural thicknesses i.e. 40 and 50 mm, were graded green to Australian Standard AS 2082 (Standards Association of Australia 1979). Timber producers in Western Australia routinely grade indigenous hardwood timber to Structural Grade No 3. Because jarrah is strength group S4 (green) and karri is S3, grading these species to Structural Grade 3 produces stress grades of F8 and F11 respectively for the two species. Tasmanian blue gum has the same strength group as karri (Standards Association of Australia 1986) and it was decided that Structural Grade 3 would be the appropriate lowest grade used for grading the structural size timber, while also separating out Structural Grades 1 and 2. Timber not meeting the requirements of Structural Grades 1, 2 or 3 was classified as merchantable.

After grading, the timber was treated by using a borax dip of 1 per cent concentration and then block stacked for six weeks, to prevent lyctid attack.

The 30 mm thick appearance grade timber was treated similarly to prevent lyctid attack. After block stacking for six weeks, the timber was air and then kiln-dried to 8 per cent moisture content before a processing evaluation.

RESULTS

Log Quality

The estimated total volume of the 41 mill logs was 6.88 m^3. Most logs were either 2.4 or 3.6 m long (Table 1), with l.e.d.u.b. 300 mm or less and s.e.d.u.b. 250 mm or less (Table 2).

Table 1
Length distribution of Tasmanian blue gum logs from Willow Springs Arboretum

Length (m)	No. logs	Total (%)
2.1	2	5
2.4	16	40
2.7	4	10
3.0	3	7
3.3	1	3
3.6	14	35
Total	40	100

Table 2
Distribution of l.e.d.u.b. and s.e.d.u.b.

Diameter (cm)	s.e.d.u.b. (frequency)	l.e.d.u.b. (frequency)
16-20	2	0
21-25	25	14
26-30	11	18
31-35	3	5
36-40	2	3
41-45	0	0
46-50	0	1

Sweep was the most common defect found in the logs, but swellings or irregularities associated with branches were also frequent (Table 3). Decay was found in one butt log. Every log had some degree of end splitting, even when freshly docked during preparation prior to milling. These end splits caused some loss in recovery, because sawn timber containing these had to be docked.

Table 3
Defects observed in 41 Tasmanian blue gum mill logs from 24-year-old trees from Willow Springs Arboretum

Defect	No logs
Sweep	10
Large branches/ irregular swellings	7
Decay	1

Sawing Behaviour

Tasmanian blue gum is apparently a tougher timber to saw than the regrowth jarrah and karri which are routinely sawn at the W.U.R.C. sawmill, and a slower feed speed through the saws was necessary.

The amount of deflection (generally bow) of sawn timber after milling on the bandsaw was comparable to that of regrowth karri. In most logs the heart was eccentric and associated with kino, brown, straw and white rot and the discolouration commonly known as brownwood. This combination of defects often resulted in discarding of the middle 75 x 75 mm or 100 x 100 mm section of the centre cant containing the heart.

Recovery of Sawn Timber

Recovery of all sawn timber was 30.5 per cent, with structural timber (i.e. 40 and 50 mm thick) comprising 14.6 per cent and appearance timber (i.e. 30 mm thick) 15.9 per cent (Table 4).

Table 4
Recovery of sawn timber from Tasmanian blue gum logs

Timber thickness (mm)	Recovery (% log vol)
30	15.9
40	9.6
50	5.0

Structural Timber

Of the sawn recovery, 64.2 per cent of the timber met the requirements of Structural Grade 3 or better, and 39.0 per cent made Structural Grade 1. If merchantable material was docked to remove faults located near the ends of the pieces,the recovery of Structural Grade 3 timber or better would increase to 79.0 per cent (Table 5). Excessive bow was the worst fault, while knots, knots in combination, kino, borer holes, spring and shakes also caused downgrading of timber (Table 6). Kino was present in most pieces of timber in the form of tight gum veins, loose gum veins, pockets and overgrowths of injury. Knots were also common, and although generally small, often contained kino pockets. Borer damage was of the gallery type associated with *Tryphocaria* attack in karri, and generally confined to the surface sapwood. Brownwood was observed in almost half of the pieces graded, being most common in pieces originating near the heart.

Table 5
Structural grades of Tasmanian blue gum timber before and after docking (%)

Grade	Initial recovery (%)	Recovery after docking (%)
Structural grade 1	39.0	
Docked ex merchantable		9.0
Structural grade 2	8.2	
Structural grade 3	17.0	
Docked ex merchantable		5.8
Total	64.2	79.0
Merchantable	35.8	

Table 6
Defects occurring in Tasmanian blue gum structural timber (%)

	Grade		
Defect	Structural grade 2	Structural grade 3	Merchantable
Knot size	1.1	5.1	1.0
Knot combination	-	3.2	1.4
Tight gum	2.6	-	-
Gum pocket	3.1	7.6	3.2
Borer hole	1.4	1.5	-
Shake	-	-	1.4
Bow	-	-	28.6
Spring	-	-	0.2

Appearance Timber

Grading of the 30 mm boards was by the phantom docking method, in which a board is graded into one or more grades. The position for docking is marked without docking actually being done. This allows estimates of the volume of timber in each grade. Recovery of high quality timber by volume was poor (Table 7), with only 20 per cent making Clear or Feature grades. Table 8 gives the frequency of various defects in the recovered boards.

Table 7
Graded recoveries of 30 mm marri boards

Grade	Volume (m^3)	Percentage (%)
Clear	0.041	3.4
Feature	0.204	16.7
Processing	0.128	10.5
Merchantable	0.836	68.7
Reject	0.008	0.7
Total	1.217	100

Table 8
Defects found in 30 mm Tasmanian blue gum boards

Defect	No. boards affected	%
Kino	129	136.3
Knots	115	32.2
Checks	84	23.6
Cup	80	22.5
Skip	74	20.8
Spring	38	10.7
Birdseyes	35	9.8
Bow	33	9.3
Borers	24	6.7
Splits	12	3.4
Collapse	5	1.4
Wane	5	1.4
Shatter	4	1.1
Twist	3	0.8
Stain	2	0.6
Rot	1	0.3
Total	644	
Total number of phantom docked boards		356
Average number of defects per board		1.8

Note: Individual boards may have more than one defect.

DISCUSSION

While the results from the structural timber were pleasing (Table 5), the appearance graded boards failed to come up to the same high standard (Table 7). A majority of the downgrade in the appearance material can be attributed to knot size and kino which were over 68 per cent of the recorded defects (Table 8). However, knot size and kino were not sufficient to adversely affect the recovery in structural material. Whilst excessive deflection (bow) was a major problem for the structural material it only ranked eighth amongst the defects in the appearance material with only 9.3 per cent of the boards affected. At 24-years-old and from an arboretum, the trees were relatively fast-grown and subject to high levels of growth stresses. If fast-grown logs are to be used for sawn timber, conversion techniques to minimize the effect of growth stresses must be used. Alternatively, a longer rotation period may be considered.

Very little brownwood was noticed in the graded material, mainly due to the practice of discarding the core material of each log, but also because graders had difficulty in identifying brownwood in borax-treated material.

Recoveries would improve with larger log diameters, less end splitting, less eccentric heart associated with decay, and less kino and brownwood. End splitting presumably resulted from high levels of growth stresses in association with small log diameters which are a function of age, site and silviculture. The eccentric heart, decay, kino, and brownwood association may also be related to site and silviculture.

A further problem with the appearance boards was the amount of shrinkage which occurred. According to Bootle (1983), Tasmanian blue gum has shrinkage figures of 6 per cent radial and 12 per cent tangential before reconditioning, with these figures dropping to 4 per cent radial and 7 per cent tangential after reconditioning. Kingston and Risdon (1961) quote pre-reconditioning figures of 6.9 per cent radial and 14.4 per cent tangential, and post-reconditioning figures of 4.6 per cent radial and 9.4 per cent tangential, for logs 17 to 23-years-old. As can be seen in the results, many boards contained skip which could be avoided by cutting oversize, but this also decreases the sawn recovery.

In summary, the conversion of Tasmanian blue gum logs to sawn timber produced a recovery of 30.5 per cent. The structural timber produced was generally of a high quality and the sawing behaviour was considered to be similar to that of regrowth karri, but only a small percentage of appearance boards were of high quality. These results therefore indicate that marri timber could be used, for structural material but that appearance grade timber suitable for furniture use must be selected carefully.

ACKNOWLEDGEMENTS

Thanks go to Mr. R. Rule who assisted with the grading of the 30 mm boards.

REFERENCES

BOOTLE, K.R. (1983). *Wood in Australia - Types, properties and uses.* McGraw - Hill Book Company, Sydney.

KINGSTON, R.S.T., and RISDON C. JUNE E. (1961). Shrinkage and density of Australian and other South-west Pacific Woods. CSIRO Australia. Division of Forest Products Technological Paper No. 13.

STANDARDS ASSOCIATION OF AUSTRALIA (1979). Visually stress graded hardwood for structural purposes. AS2082-1979.

STANDARDS ASSOCIATION OF AUSTRALIA (1986). Timbers - Classification into strength groups. AS2878-1986.