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SPAN TABLES FOR ROOF BEAMS from "MAXbeam" Structural Laminated Veneer Lumber Report for INDEPENDENT TIMBER SUPPLIES November 2003

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Report for INDEPENDENT TIMBER SUPPLIES
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1. BACKGROUND

Following the production of span tables for carport and alfresco beams, Independent Timber Supplies received queries from a builder asking whether the same beams could be used for exposed roof beams. The product can be used for this purpose, but new span tables are required.

The properties of MAXbeam materials had previously been agreed for the production of the Carport and Alfresco beams. The same properties were used for this work.

Roof beams as defined in AS1684.1 are under the main roof and loaded by roof and ceiling materials. The beams can be used as:

- Ridge beams – exposed beams under the line of the roof ridge
- Intermediate beams – exposed beams within the length of a roof span (if specified).

The table was modelled on Table 30 in AS1684.2 - 1999:

The following combined roof and ceiling weights were used in the preparation of the tables:

- 10 kg/m² for support of sheet roofs (ceiling support off different beams)
- 40 kg/m² for sheet roofs with cathedral ceilings
- 60 kg/m² for support of tiled roofs (ceiling support off different beams)
- 90 kg/m² for tiled roofs with cathedral ceilings

The following roof load widths (RLW) were used:

- 1500 mm
- 3000 mm
- 4500 mm
- 6000 mm
- 7500 mm

Span tables have been produced in accordance with AS1684.1 for N1/N2 houses. Conventions and nomenclature used in the report are those used in AS1684

2. PREPARATION OF SPAN TABLES

2.1 Properties

The following properties have been used in preparation of the span tables:

- $f'_b = 66.0$ MPa
- $f'_s = 5.0$ MPa
- $E = 18,500$ MPa
- $\rho_b = 1.07$

These properties are consistent with the properties used in the preparation of carport beam span tables for the same material, and have been agreed with Jack Taylor report Monash University.

2.2 Basis of Span table preparation

The span tables were prepared using a spreadsheet that was created in accordance with the load cases, constraints and requirements for roof beams and lintels in AS1684.1:1999.

- Roof Beam tables complied with requirements for Roof beams and Intermediate beams – and considered both roof loads and ceiling loads.

The following additional assumptions were made:

- No overhangs were considered for the roof beams. (None of the example plans provided included overhangs on the beams.)
- Exposed beams had both ceiling and roof attached to the upper side of the beam. This gives lateral restraint only to the upper edge. It is a conservative assumption, and will provide a safe solution for the case of beams within the ceiling space, and for exposed beams with rafters framing into the side of the roof beams.

2.3 Roof construction

The span tables can be used with a number of different types of roof construction. The different types mean that different load paths would result, and cause different loading patterns on the beams to be designed. The concept of roof load width allows for different load paths to the roof beams, but the design is ultimately dependent on the area of roof and ceiling supported.

2.3.1 AS1684.1 Residential Timber Framed Construction – Design criteria

The design criteria for the preparation of the span tables was drawn from AS1684.1-1999.

The tables for the roof beams require designers to calculate the roof load width. This distance is defined in AS1684.2-1999.

Bending moment, shear force and deflection calculations were performed based on the theory of elasticity. Appropriate duration of load factors are defined in AS1684.1 to account for inelastic behaviour of timber.

3. SPAN TABLES

Preliminary span tables were prepared based on the results of running software that matched performance against the criteria shown in the Design Criteria document AS1684.1. The software was calibrated against timber species for which tables are published in AS1684.2. The spread sheet gave generally conservative results.

After the successful calibration of the software, the spreadsheet was used to determine the complete span tables for material with "MaxBEAM" properties.

The resulting table is presented as Table 1 and gave a maximum spanning capability of greater than 8 m. All of the roof beam spans in AS1684 have been truncated at 7.2 m. If spans greater than 7.2 m are required, this represents a rather non-typical case, and should have special structural attention. Table 2 gives the recommended span table in which five entries have been held at the maximum value of 7200 mm.

Table 1 MaxBEAM span tables for Roof Beams

Ridge beams N1/N2 wind		Roof Load Width (mm)				
		1500	3000	4500	6000	7500
Size D x B (mm)	Roof & ceiling mass (kg/m ²)	Max Beam Span (mm) single span				
		200x50	10	6400	5100	4300
	40	4700	3700	3200	2900	2600
	60	4200	3300	2900	2600	2400
	90	3700	2900	2500	2300	2100
240x50	10	<i>7600</i>	6100	5200	4500	4100
	40	5600	4500	3800	3400	3100
	60	5000	4000	3400	3100	2800
	90	4400	3500	3100	2700	2500
240x65	10	<i>8100</i>	6600	5600	4900	4400
	40	6100	4800	4200	3700	3400
	60	5400	4300	3700	3400	3100
	90	4800	3800	3300	3000	2800
280x80	10	<i>9600</i>	<i>8000</i>	6800	6100	5500
	40	<i>7400</i>	6000	5200	4700	4300
	60	6700	5400	4700	4200	3900
	90	6000	4800	4200	3800	3500

Notes: Beams can be installed as exposed beams
Spans greater than 7200 mm have been shown in italics

4. RECOMMENDED SPAN TABLES

Recommended spans are shown in Table 2. This differs from Table 1 in that all of the spans that were greater than 7.2 m (Italics in Table 1) were held to 7.2 in Table 2.

Table 2 Recommended MaxBEAM span tables for Roof Beams

Ridge beams N1/N2 wind		Roof Load Width (mm)				
		1500	3000	4500	6000	7500
Size D x B (mm)	Roof & ceiling mass (kg/m ²)	Max Beam Span (mm) single span				
		200x50	10	6400	5100	4300
40	4700		3700	3200	2900	2600
60	4200		3300	2900	2600	2400
90	3700		2900	2500	2300	2100
240x50	10	7200	6100	5200	4500	4100
	40	5600	4500	3800	3400	3100
	60	5000	4000	3400	3100	2800
	90	4400	3500	3100	2700	2500
240x65	10	7200	6600	5600	4900	4400
	40	6100	4800	4200	3700	3400
	60	5400	4300	3700	3400	3100
	90	4800	3800	3300	3000	2800
280x80	10	7200	7200	6800	6100	5500
	40	7200	6000	5200	4700	4300
	60	6700	5400	4700	4200	3900
	90	6000	4800	4200	3800	3500

Notes: Beams can be installed as exposed beams

The span tables are valid provided the MaxBeam properties remain unchanged.



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