

INFORMATION SHEET

STRUCTURAL DESIGN



DESIGN METHODS

AVERAGE/LOWER BOUND MOE

The information provided below has been taken from the New Zealand Timber Design Guide 2007, published by the Timber Industry Federation and edited by Professor A H Buchanan. To purchase a copy of the Timber Design Guide, visit www.nztif.co.nz

The lower bound modulus of elasticity (E_{lb}) was introduced in NZS3603 Amendment 4. The concept is to recognise that single elements in a system are more likely to deform excessively than elements that are within a system that constrains them to deformations similar to that of their neighbours.

When a system consists of a single timber element, for example a window lintel, the modulus of elasticity to be used is E_{lb} . Where a system consists of 4 or more elements, for example floor joists, the average modulus of elasticity (E) should be used. Where the system consists of two or three elements the modulus of elasticity to be used should be:

$$E_{\text{component}} = (E + E_{lb}) / 2$$

An example of a 2 component system is a lintel formed from two 45mm wide components side by side. A comparison between the average modulus of elasticity and the lower bound can be seen in Table 1.

Table 1: Characteristic stiffness values for machine stress graded timber from NZS3603 Amendment 4

Modulus of Elasticity (GPa) for dry machine stress graded timber			
Species	Grade	Modulus of elasticity E	Lower bound modulus of elasticity E_{lb}
Radiata pine and Douglas fir	MSG15	15.2	11.5
	MSG12	12.0	9.0
	MSG10	10.0	7.5
	MSG8	8.0	5.4
	MSG6	6.0	4.0
Modulus of rigidity shall be taken as $G = E/15$.			

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