MODULUS OF ELASTICITY IN STRUCTURAL TIMBER

Technical Bulletin
Engineering Training Series

Understanding the role of a fundamental mechanical property MOE (Modulus of elasticity) and its role in structural timber products we design and supply.

The story behind MOE

The modulus of elasticity, also known as Young's modulus, is a fundamental mechanical property that describes the stiffness of a material. It is denoted by E and defined as the ratio of stress (σ) to strain (ϵ) within the elastic range of a material's behaviour.

The modulus of elasticity is expressed mathematically as:

$$E = \frac{\sigma}{\epsilon}$$

E = modulus of elasticity (Young's modulus) in Pascals (Pa) or megapascals (MPa).

σ = stress applied to the material in Pascals (Pa) or megapascals (MPa).

ϵ = strain (deformation) experienced by the material, a dimensionless quantity.

Key points about the modulus of elasticity:

Definition: The modulus of elasticity measures the stiffness of a material. It indicates how much a material will deform (strain) in response to a given applied force (stress). A higher modulus of elasticity means the material is stiffer and will deform less under a given load.

Elastic Behaviour: Young's modulus applies explicitly to the linear, elastic behaviour of materials within their proportional limit. This means it describes the material's response when stress is applied and removed, and the material returns to its original shape with no permanent deformation.

Material Property: Each material has a unique modulus of elasticity, which depends on its chemical composition, microstructure, and other factors. For example, metals generally have higher moduli of elasticity than polymers.

Units: Young's modulus is typically expressed in Pascals (Pa) or gigapascals (GPa) in the International System of Units (SI). It is sometimes reported in megapascals (MPa) for convenience (1 GPa = 1000 MPa).

Importance: The modulus of elasticity is crucial for engineers and designers in selecting materials for specific applications. Materials with higher moduli, such as structural components, are preferred for applications with critical stiffness and minimal deformation.

To summarise, the modulus of elasticity (Young's modulus) quantifies a material's resistance to deformation under applied stress and is a fundamental parameter used in material science and engineering.

LVL 'E' VALUES (MPa)					
LVL ID	Dindas	Meyer	Tilling	ITI	Wesbeam
10	10000	10000	10000	n/a	n/a
11	11500	n/a	n/a	11700	n/a
12	12000	12700	12000	n/a	n/a
13	13200	13200	13200	13200	13200
14	14000	14000	14000	14500	n/a
15	15500	15000	15300	n/a	n/a
16	n/a	16200	16000	n/a	n/a
19	n/a	n/a	19500	n/a	n/a

GLULAM 'E' VALUES (MPa) (BASED UPON AS/NZS 1328.2.1998)				
Glulam ID	Dindas	Hyne	Tilling	AS/NZS 1328.2
GL10	10000	n/a	10000	10000
GL12	11500	n/a	11500	11500
GL13	13300	13300	13300	13300
GL15*	15500	15500	15500	15500
GL17	16700	n/a	16700	16700
GL18	18500	n/a	18500	18500
GL19	n/a	n/a	19000	n/a
GL21	21000	21000	21000	21000

SOLID TIMBER 'E' VALUES (MPa) (AS 1720.1.2010)					
Timber ID	MOE	Type	Timber ID	MOE	Type
F5	6900	Softwood	F11	10500	Hardwood
F7	7900	Softwood	F14	12000	Hardwood
F8	9100	Softwood	F17	14000	Hardwood
MGP10	10000	Softwood	F22	16000	Hardwood
MGP12	12700	Softwood	F27	18500	Hardwood
MGP15	15200	Softwood	F34	21500	Hardwood

**GL15 Product Not specified in AS/NZS 1325.2*

Substitution of grades

Timber grades are designated based on factors like strength, appearance, and durability, and substituting one grade for another can impact your project's structural integrity and performance.

Remember that any substitution should be done with careful consideration and professional guidance to ensure your project's safety, integrity, and compliance.