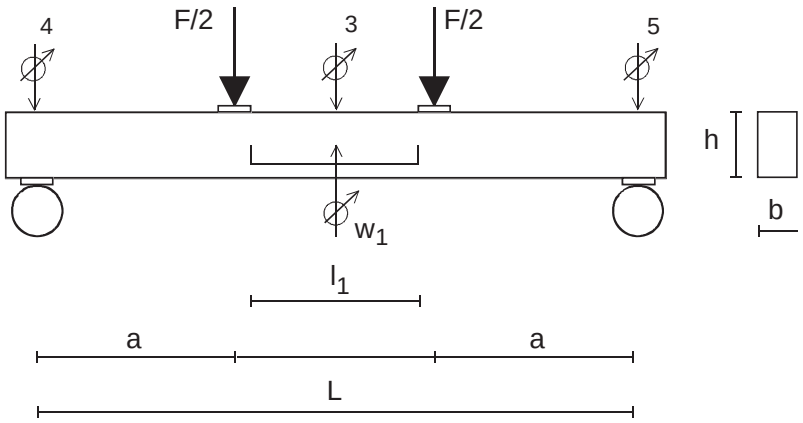
Explanation of Apparent and True MOE

In the standard testing method for LVL, ASTM D 5456, there is the following requirement:

- "5.5.1 Bending-modulus of rupture (MOR) and apparent modulus of elasticity (MOE) shall be determined for both flatwise and edgewise bending in accordance with principles of Test Methods D 198 or Test Methods D 4761...
- 6.2.2 The average value for apparent modulus of elasticity from test results of 5.5.1 shall be the characteristic value for apparent modulus of elasticity."
- VTT tests the MOE of LVL following ASTM D 5456 as follows:



The true modulus of elasticity E_m was calculated from the equation

$$E_m = \frac{3al_1^2}{4bh^3}\frac{\Delta F}{\Delta w}$$

where l_1 is the gauge length. $\Delta F/\Delta w$ was calculated from the equation

$$\frac{\Delta F}{\Delta w} = \frac{F_{0.4} - F_{0.1}}{w(F_{0.4}) - w(F_{0.1})}$$

where $F_{0.4}$ is approximately 40 % of the ultimate load and $F_{0.1}$ is approximately 10 % of the ultimate load. $w(F_{0.4})$ is the deformation of w_1 at $F_{0.4}$ and $w(F_{0.1})$ is the deformation of w_1 at $F_{0.1}$.

Contact a Finnforest USA representative for more information about Master Plank® LVL boards.

32205 Little Mack Avenue
Roseville, Michigan 48066
Phone: 800/622-5850 • Fax: 586/296-8773
www.finnforestus.com

Finnforest USA, Engineered Wood Division

The apparent modulus of elasticity $E_{m,app}$ was calculated from the equation

$$E_{m,app} = \frac{23L^3}{108bh^3}\frac{\Delta F}{\Delta w_{app}}$$

$\Delta F/\Delta w_{app}$ was calculated from the equation

$$\frac{\Delta F}{\Delta w_{app}} = \frac{F_{0.4} - F_{0.1}}{w_{app}(F_{0.4}) - w_{app}(F_{0.1})}$$

where $F_{0.4}$ is approximately 40 % of the ultimate load and $F_{0.1}$ is approximately 10 % of the ultimate load. $w_{app}(F_{0.4})$ is the total deformation of the beam (= w_3 - $w_4/2$ - $w_5/2$) at $F_{0.4}$ and $w_{app}(F_{0.1})$ is the total deformation at $F_{0.1}$.

◇ The National Evaluation Service National Evaluation Reports use ASTM D5456 for determining properties of LVL. For Master Plank the MOE values based on this testing are as follows:

- MOE - Beam - True = 14079 N/mm² = 2.0 million psi
- MOE - Beam - Apparent = 12926 N/mm² = 1.9 million psi
- MOE - Plank - True = 13667 N/mm² = 2.0 million psi
- MOE - Plank - Apparent = 12942 N/mm² = 1.9 million psi

◇ The difference between the true and apparent MOE values is the deflection contribution due to shear. Apparent MOE includes the shear deflection contribution and the true value does not. Many companies publish the true MOE value and then take into account shear deflection or use the apparent MOE in their design calculations.

◇ It is the opinion of VTT, the third party quality assurance agency, that the true MOE of Master Plank in both beam and plank applications is 2.0 million psi while the apparent MOE in both beam and plank applications is 1.9 million psi.

Contact a Finnforest USA representative for more information about Master Plank® LVL boards.

32205 Little Mack Avenue
Roseville, Michigan 48066
Phone: 800/622-5850 • Fax: 586/296-8773
www.finnforestus.com

Finnforest USA, Engineered Wood Division