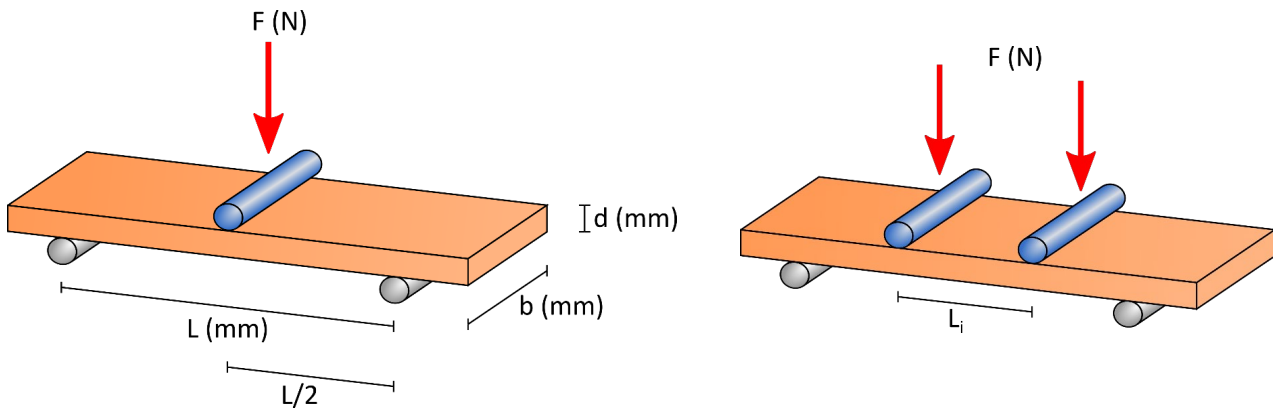


# Bending Test – Formulas



$E_f$  = Elastic Modulus (MPa)

$\sigma_f$  = Flexural stress

$\epsilon_f$  = Flexural strain

$L$  = length of beam between supports (mm)

$L_i$  = distance between loading span (4 – point bend)

$b$  = width of beam (mm)

$d$  = thickness of beam (mm)

$F$  = load applied (N)

$D$  = deflection of beam at load (mm)

$x$  = distance away from support

$m = \frac{N}{mm}$  initial straight line of load deflection

Property	Formula
Elastic Modulus	$E_f = \frac{L^3 m}{4bd^3}$
Flexural Stress (3-point)	$\sigma_f = \frac{3FL}{2bd^2} \quad \text{Rectangular}$ $\sigma_f = \frac{FL}{\pi R^3} \quad \text{Circular}$
Flexural Stress (4-point)	$\sigma_f = \frac{3F(L - L_i)}{2bd^2}$
Flexural Strain – outer surface (surface under tension)	$\epsilon_f = \frac{6Dd}{L^2}$
Bending Moment (3-point)	$M = \frac{Fx}{2}$
Second Moment of Area	$M = \frac{FL}{4} \quad \text{moment at load}$