	Solid	Thin-walled Open	Thin-walled Closed
Bending Direct stress	$\sigma_z = \frac{M_y\, I_{xx} + M_x\, I_{xy}}{I_{xy}^2 - I_{xx}\, I_{yy}}\, x + \frac{M_x\, I_{yy} + M_y\, I_{xy}}{I_{xx}\, I_{yy} - I_{xy}^2}\, y$		
Shear Shear stress / Shear flow	$\tau_{zy} = \frac{S_y}{I\, b_1} \int_{y_1}^{h} y\, \mathrm{d}A$	$-q_s^{\mathrm{open}} = \left(\frac{S_x\, I_{xx} + S_y\, I_{xy}}{I_{xy}^2 - I_{xx}\, I_{yy}}\right) \int_0^s x\, t\, \mathrm{d}s + \left(\frac{S_y\, I_{yy} + S_x\, I_{xy}}{I_{xx}\, I_{yy} - I_{xy}^2}\right) \int_0^s y\, t\, \mathrm{d}s$	$-q_s^{\mathrm{closed}} = -q_s^{\mathrm{open}} + q_0$ $q_0 = \frac{\oint q_s^{\mathrm{open}}\, \mathrm{d}s}{\oint \mathrm{d}s}$
Shear centre	- Intersection of lines of symmetry - Numerical methods	- Intersection of lines of symmetry - 'Inspection' of 2-member sections - From: $S_y\, e_x - S_x\, e_y = \int r_s\, q_s\, \mathrm{d}s$	- Intersection of lines of symmetry - From shear flow: $S_y\, e_x - S_x\, e_y = \oint q_s^{\mathrm{open}}\, r_s\, \mathrm{d}s + 2\, A\, q_0$
Twist	$\frac{\mathrm{d}\theta}{\mathrm{d}z} = \frac{M_z}{G\, J}$	$J = \frac{1}{3} \int t^3\, \mathrm{d}s = \sum \left(\frac{b_i\, t_i^3}{3}\right)$	$\frac{\mathrm{d}\theta}{\mathrm{d}z} = \frac{1}{2A} \oint \frac{q_s}{G\, t}\, \mathrm{d}s$ $\quad J = \frac{4\, A^2}{\oint \frac{\mathrm{d}s}{t}}$
Warp		$w_s = -\frac{\mathrm{d}\theta}{\mathrm{d}z} \int_0^s r_s\, \mathrm{d}s$ $w_t = s \cdot n \cdot \frac{\mathrm{d}\theta}{\mathrm{d}z}$	$w_s - w_0 = \int_0^s \frac{q_s^{\mathrm{open}}}{G\, t}\, \mathrm{d}s - \frac{A_s}{A} \oint \frac{q_s^{\mathrm{open}}}{G\, t}\, \mathrm{d}s$
Torsion Shear stress / Shear flow	- St Venant's torsion: $\frac{\mathrm{d}^2\psi}{\mathrm{d}x^2} + \frac{\mathrm{d}^2\psi}{\mathrm{d}y^2} = 0$ $\tau_{zx} = G \frac{\mathrm{d}\theta}{\mathrm{d}z} \left(\frac{\mathrm{d}\psi}{\mathrm{d}x} - y\right)$ $\tau_{zy} = G \frac{\mathrm{d}\theta}{\mathrm{d}z} \left(\frac{\mathrm{d}\psi}{\mathrm{d}y} - x\right)$	$\tau_{zs} = 2\, G\, n \frac{\mathrm{d}\theta}{\mathrm{d}z}$ $\tau_{zn} = 0$	$T = M_z = \bar{q} \oint r_s\, \mathrm{d}s = 2\, A\, \bar{q}$
Twist	$\frac{\mathrm{d}\theta}{\mathrm{d}z} = \frac{T}{G\, J}$ $J = \iint \left[\left(\frac{\mathrm{d}\psi}{\mathrm{d}y} + x\right) x - \left(\frac{\mathrm{d}\psi}{\mathrm{d}x} + y\right) y\right] \mathrm{d}x\, \mathrm{d}y$	$J = \frac{1}{3} \int t^3\, \mathrm{d}s = \sum \left(\frac{b_i\, t_i^3}{3}\right)$	$\frac{\mathrm{d}\theta}{\mathrm{d}z} = \frac{T}{4\, A^2} \oint \frac{\mathrm{d}s}{G\, t}$ $\quad J = \frac{4\, A^2}{\oint \frac{\mathrm{d}s}{t}}$
Warp	$w = \frac{\mathrm{d}\theta}{\mathrm{d}z} \psi(x, y)$	$w_s = -\frac{\mathrm{d}\theta}{\mathrm{d}z} \int_0^s r_s\, \mathrm{d}s$ $w_t = s \cdot n \cdot \frac{\mathrm{d}\theta}{\mathrm{d}z}$	$w_s - w_0 = \bar{q} \left(\int_0^s \frac{\mathrm{d}s}{G\, t} - \frac{A_s}{A} \oint \frac{\mathrm{d}s}{G\, t}\right)$