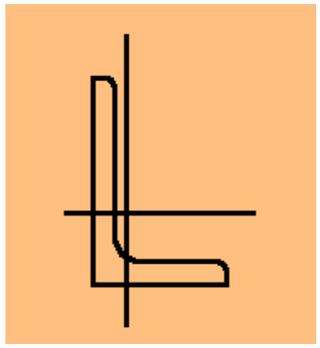
FlexoCompression Section Check of the Unequal Legs Angle

$F_y := 260 \cdot MPa$ $E := 200000 \cdot MPa$ $\nu := 0.3$ $h := 100 \cdot mm$ $b := 65 \cdot mm$ $t_h := 11 \cdot mm$ $t_b := t_h$ $t := t_h$



$P_u := 2 \cdot ton$ $\phi_c := 0.9$

$L_u := 4 \cdot m$ $L_z := 4 \cdot m$ principal axes

$M_{ux} := 0.3 \cdot m \cdot ton$

$K_u := 1$ $K_z := 1$

enter moments with sign $\phi_b := 0.9$ $C_b := 1$

$M_{uy} := 0.1 \cdot m \cdot ton$

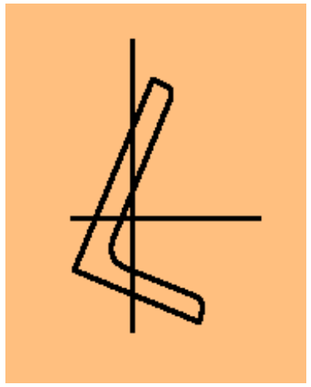
$C_m := 1$ calculate C_m as per LRFD $L_u := 4 \cdot m$ unbraced length

$P_n = 3.67\,ton$ Limit axial Load Evaluated

$$\begin{pmatrix} M_{uu} \\ M_{uz} \end{pmatrix} := \begin{pmatrix} \cos(\alpha) & \sin(\alpha) \\ -\sin(\alpha) & \cos(\alpha) \end{pmatrix} \cdot \left(\begin{pmatrix} M_{ux} \\ M_{uy} \end{pmatrix} \right)$$

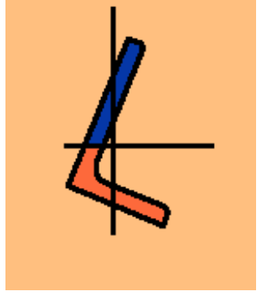
Establishing through a rotation the moments on principal axes that will drive our analyses in the interaction check

$M_{uz} = -0.02\,m \cdot ton$ if positive compresses right half



$M_{uu} = 0.32\,m{\cdot}ton$ if positive compresses top half

Evaluate the moment strengths for the four classes of bending

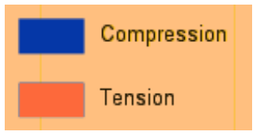


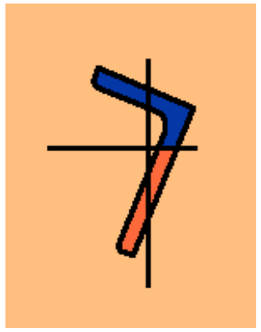
$M_{n1} = 0.67\,m{\cdot}ton$

$M_{nLTB} = 0.67\,m{\cdot}ton$

$M_{nLB} = 0.83\,m{\cdot}ton$

$\phi_b{\cdot}M_{n1} = 0.6\,m{\cdot}ton$



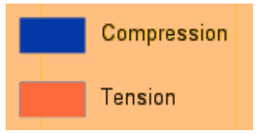


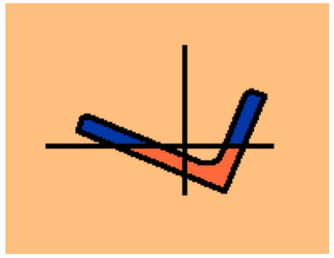
$M_{n2} = 0.83\,m{\cdot}ton$

$M_{nLTB} = 0.93\,m{\cdot}ton$

$M_{nLB} = 0.83\,m{\cdot}ton$

$\phi_b{\cdot}M_{n2} = 0.75\,m{\cdot}ton$

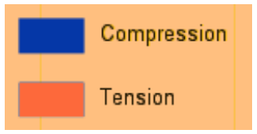


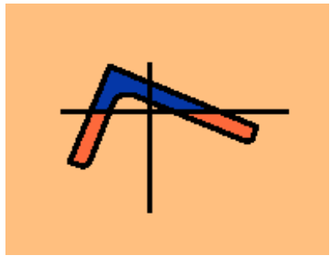


$M_{n3} = 0.35\,m{\cdot}ton$

$M_{nLB} = 0.35\,m{\cdot}ton$

$\phi_b{\cdot}M_{n3} = 0.32\,m{\cdot}ton$

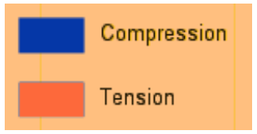




$M_{n4} = 0.35\,m{\cdot}ton$

$M_{nYIELD} = 0.35\,m{\cdot}ton$

$\phi_b{\cdot}M_{n4} = 0.32\,m{\cdot}ton$



Finding the limiting moments for the interaction

$$M_{nU} := \begin{cases} M_{n1} & \text{if } M_{uu} \geq 0{\cdot}m{\cdot}ton \\ M_{n2} & \text{otherwise} \end{cases} \qquad M_{nZ} := \begin{cases} M_{n3} & \text{if } M_{uz} \geq 0{\cdot}m{\cdot}ton \\ M_{n4} & \text{otherwise} \end{cases}$$

$B_1 := \max\left(\begin{pmatrix} 1 \\ C_m \end{pmatrix}\right)$ when there is no compression

Interaction

$$Ratio := \begin{cases} \dfrac{P_u}{\phi_c{\cdot}P_n} + \dfrac{8}{9}{\cdot}\left(\dfrac{B_1{\cdot}\left|M_{uu}\right|{\cdot}\cos(\alpha)}{\phi_b{\cdot}M_{nU}} + \dfrac{B_1{\cdot}\left|M_{uz}\right|{\cdot}\sin(\alpha)}{\phi_b{\cdot}M_{nZ}}\right) & \text{if } \dfrac{P_u}{\phi_c{\cdot}P_n} \geq 0.2 \\ \dfrac{P_u}{2{\cdot}\phi_c{\cdot}P_n} + \dfrac{B_1{\cdot}\left|M_{uu}\right|{\cdot}\cos(\alpha)}{\phi_b{\cdot}M_{nU}} + \dfrac{B_1{\cdot}\left|M_{uz}\right|{\cdot}\sin(\alpha)}{\phi_b{\cdot}M_{nZ}} & \text{otherwise} \end{cases}$$

$Ratio = 1.06$ must be less than or equal to 1 for the strength of the section be OK per the LRFD angle specification