

Continuous CW system

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file := "E:\Profile.xlsx"

h := READEXCEL (file, "mullion!B3:B22")

Ixx := READEXCEL (file, "mullion!D3:D22")

Zx := READEXCEL (file, "mullion!F3:F22")

Profile := READEXCEL (file, "mullion!A3:A22")
    
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Selection profile

$$h = \begin{bmatrix} 50 \\ 65 \\ 85 \\ 105 \\ 125 \\ 150 \\ 175 \\ 175 \\ 200 \\ 225 \\ 250 \\ 250 \\ 250 \\ 250 \\ 300 \\ 250 \\ 250 \\ 250 \\ 250 \\ 250 \\ 300 \end{bmatrix} \quad I_{xx} := I_{xx} \cdot \text{cm}^4 = \begin{bmatrix} 31.35 \\ 55.55 \\ 108.42 \\ 167.25 \\ 278.59 \\ 423.76 \\ 663 \\ 731 \\ 1010.13 \\ 1352.44 \\ 1759.43 \\ 2518.27 \\ 3160.6 \\ 3592.17 \\ 5160.6 \\ 5560.6 \\ 6360.6 \\ 7160.6 \\ 7312.43 \\ 13441.17 \end{bmatrix} \text{cm}^4 \quad \text{Profile} = \begin{bmatrix} \text{"FW 50/50 322 250"} \\ \text{"FW 50/65 322 260"} \\ \text{"FW 50/85 322 270"} \\ \text{"FW 50/105 322 280"} \\ \text{"FW 50/125 322 290"} \\ \text{"FW 50/150 322 300"} \\ \text{"FW 50/175 322 310"} \\ \text{"FW 50/175 326 250"} \\ \text{"FW 50/200 326 030"} \\ \text{"FW 50/225 336 230"} \\ \text{"FW 50/250 336 240"} \\ \text{"FW 50/250 336 240+336260"} \\ \text{"FW 50/250 336 240+484010"} \\ \text{"FW 50/300 903 7712"} \\ \text{"FW 50/250 336 240+484010+ 2- MS 5mm"} \\ \text{"FW 50/250 336 240+484010+ 2- MS 6mm"} \\ \text{"FW 50/250 336 240+484010+ 2- MS 8mm"} \\ \text{"FW 50/250 336 240+484010+ 2- MS 10mm"} \\ \text{"FW 50/250 336 240+STEEL STIFFINER"} \\ \text{"FW 50/300 903 7712 +steel Stiffiner"} \end{bmatrix}$$

Given

Material Properties

Continuous	CASE	WL (kPa)	Lt (mm)	L _{BR} (mm)
1	"case1"	1.4	2500	4300
	"Case2"	1.31	1200	5000

E _{al} (MPa)	p _{O6063T6} (MPa)	γ _m
70000	160	1.2

$$L_{BR} = \begin{bmatrix} 4.3 \\ 5 \end{bmatrix} \text{ m} \quad w_{WL} := \overrightarrow{WL} \cdot Lt = \begin{bmatrix} 3.5 \\ 1.572 \end{bmatrix} \frac{\text{kN}}{\text{m}} \quad CASE = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix}$$

$$\delta_{case} := \left(\frac{1}{185 E_{al} \cdot I_{xx}} \right) \cdot \left(w_{WL} \cdot L_{BR}^4 \right)^T = \begin{bmatrix} 294.737 & 242.006 \\ 166.337 & 136.577 \\ 85.224 & 69.977 \\ 55.247 & 45.362 \\ 33.167 & 27.233 \\ 21.805 & 17.904 \\ 13.937 & 11.443 \\ 12.64 & 10.379 \\ 9.147 & 7.511 \\ 6.832 & 5.61 \\ 5.252 & 4.312 \\ 3.669 & 3.013 \\ 2.923 & 2.4 \\ 2.572 & 2.112 \\ 1.79 & 1.47 \\ 1.662 & 1.364 \\ 1.453 & 1.193 \\ 1.29 & 1.06 \\ 1.264 & 1.038 \\ 0.687 & 0.564 \end{bmatrix} \text{ mm}$$

$$TOL := 10^{-4}$$

$$i := 0 \dots \text{last}(CASE)$$

$$\Delta_i := \max \left(\text{lookup} \left(\begin{array}{l} \text{if } L_{BR_i} < 4.1 \text{ m} \\ \left\| \frac{L_{BR_i}}{175} \right\| \\ \text{else if } 4.1 \text{ m} < L_{BR_i} < 7.5 \text{ m} \\ \left\| \frac{L_{BR_i}}{240} + 6.4 \text{ mm} \right\| \\ \text{else} \\ \left\| \frac{L_{BR_i}}{240} \right\| \end{array} \right), \delta_{case}^{(i)}, \delta_{case}^{(i)}, \text{"1t"} \right)$$

$$\begin{array}{l}
 \text{profile} := \text{for } i \in \text{ORIGIN} \dots \text{last}(\Delta) \\
 \left\| \begin{array}{l} R_i \leftarrow \text{Profile}_{\left(\text{match}(\Delta_i, \delta_{\text{case}}^{(i)})_{\text{ORIGIN}}\right)} \\ R \end{array} \right\|
 \end{array}$$

$$\begin{array}{l}
 \text{Zxs} := \text{for } i \in \text{ORIGIN} \dots \text{last}(\Delta) \\
 \left\| \left\| \begin{array}{l} R_i \leftarrow \text{Zx}_{\left(\text{match}(\Delta_i, \delta_{\text{case}}^{(i)})_{\text{ORIGIN}}\right)} \\ R \end{array} \right\| \right\|
 \end{array}$$

$$\Delta = \begin{bmatrix} 21.805 \\ 17.904 \end{bmatrix} \text{ mm} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix} \quad \text{profile} = \begin{bmatrix} \text{"FW 50/150 322 300"} \\ \text{"FW 50/150 322 300"} \end{bmatrix}$$

$$\text{Zxs} = \begin{bmatrix} 48.89 \\ 48.89 \end{bmatrix}$$

$$\text{Wx} := \text{Zxs} \cdot \text{cm}^3 = \begin{bmatrix} 48.89 \\ 48.89 \end{bmatrix} \text{ cm}^3$$

$$\begin{array}{l}
 R_1 = V_1 = R_3 = V_3 \dots \dots \dots = \frac{3w\ell}{8} \\
 R_2 \dots \dots \dots = \frac{10w\ell}{8} \\
 V_2 = V_{\text{max}} \dots \dots \dots = \frac{5w\ell}{8} \\
 M_1 \dots \dots \dots = \frac{w\ell^2}{8} \\
 M_2 \left(\text{at } \frac{3\ell}{8} \right) \dots \dots \dots = \frac{9w\ell^2}{128} \\
 \Delta_{\text{max}} \left(\text{at } 0.4215 \ell, \text{ approx. from } R_1 \text{ and } R_3 \right) \dots = \frac{w\ell^4}{185EI}
 \end{array}$$

Check for bending moment

$$\phi m_1 := \frac{1.2 \cdot w_{WL} \cdot L_{BR}^2}{8} = \begin{bmatrix} 9.707 \\ 5.895 \end{bmatrix} \text{ kN} \cdot \text{m} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix}$$

$$\phi m_2 := \frac{9 \cdot 1.2 \cdot w_{WL} \cdot L_{BR}^2}{128} = \begin{bmatrix} 5.46 \\ 3.316 \end{bmatrix} \text{ kN} \cdot \text{m} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix}$$

$$Mx_{RS} := \frac{p_{06063T6} \cdot Wx}{\gamma m} = \begin{bmatrix} 6.519 \\ 6.519 \end{bmatrix} \text{ kN} \cdot \text{m} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix}$$

Utilization

Bending Moment

$$\text{moment}_1 := \frac{\phi m_1}{Mx_{RS}} = \begin{bmatrix} 1.489 \\ 0.904 \end{bmatrix} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix} \quad \text{profile} = \begin{bmatrix} \text{"FW 50/150 322 300"} \\ \text{"FW 50/150 322 300"} \end{bmatrix}$$

$$\text{moment}_2 := \frac{\phi m_2}{Mx_{RS}} = \begin{bmatrix} 0.838 \\ 0.509 \end{bmatrix} \quad \text{CASE} = \begin{bmatrix} \text{"case1"} \\ \text{"Case2"} \end{bmatrix} \quad \text{profile} = \begin{bmatrix} \text{"FW 50/150 322 300"} \\ \text{"FW 50/150 322 300"} \end{bmatrix}$$