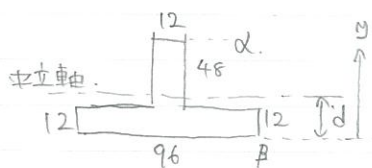


5.87



断面性能の計算

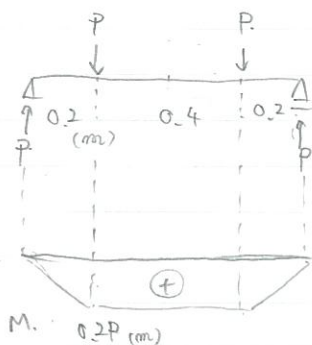
$$A = 96 \times 12 + 48 \times 12 = 1728 \text{ mm}^2$$

$$G = 96 \times 12^2/2 + 12 \times (60^2/2 - 12^2/2) = 27648 \text{ mm}^4$$

$$d = G/A = 16 \text{ mm}$$

$$I = 96(16^3 - 4^3)/3 + 12(4^3 + 44^3)/3 = 470016 \text{ mm}^4$$

$$y_d = 44 \text{ mm}, \quad y_B = 16 \text{ mm}$$



最大モーメントは等モーメント区間で一定なので

(引張)

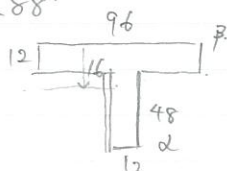
$$\sigma_B = \frac{M}{I} y_B = \frac{200P}{470016} 16 = 80 \Rightarrow P \approx 11.75 \text{ kN}$$

(圧縮)

$$\sigma_d = -\frac{M}{I} y_d = \frac{-200P}{470016} 44 = -140 \Rightarrow P \approx 7.48 \text{ kN}$$

$$\therefore P = 7.48 \text{ kN}$$

5.88

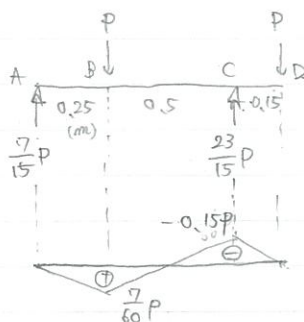


断面性能は 5.87 と同じ

A点まわりのモーメントより

$$0.25P + 0.9P = 0.75V_c \Rightarrow V_c = \frac{23}{15}P$$

$$\therefore V_A = 2P - V_c = \frac{7}{15}P$$



(B点, 引張)

$$\sigma_d = \frac{\frac{7000}{60}P}{470016} 44 = 80 \Rightarrow P \approx 7.32 \text{ kN}$$

(B点, 圧縮)

$$\sigma_B = -\frac{\frac{7000}{60}P}{470016} 16 = -140 \Rightarrow P \approx 35.3 \text{ kN}$$

(A点, 引張)

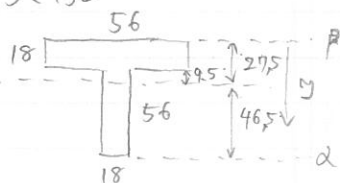
$$\sigma_B = \frac{150P}{470016} 16 = 80 \Rightarrow P \approx 15.7 \text{ kN}$$

(A点, 圧縮)

$$\sigma_d = -\frac{150P}{470016} 44 = -140 \Rightarrow P \approx 9.97 \text{ kN}$$

$$\therefore P = 7.32 \text{ kN}$$

5.153



断面性能

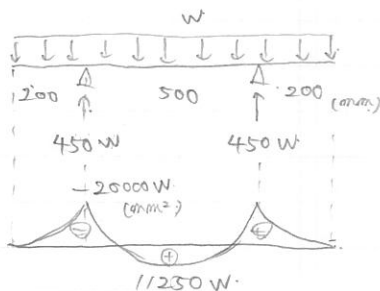
$$A = 56 \times 18 \times 2 = 2016$$

$$G = 56 \times 18^2 / 2 + 18 (174^2 - 18^2) / 2 = 55440$$

$$d = G/A = 27.5$$

$$I = 56 \times (27.5^3 - 9.5^3) / 3 + 18 \times (9.5^3 + 46.5^3) / 3 = 980616$$

$$y_d = 46.5 \quad y_p = 27.5$$



支間中央

$$\text{引張} \quad \sigma_d = \frac{11250 W}{I} y_d = 84 \Leftrightarrow W \approx 157 \text{ kN/m}$$

$$\text{圧縮} \quad \sigma_p = -\frac{11250 W}{I} y_p = -205 \Leftrightarrow W \approx 650 \text{ kN/m}$$

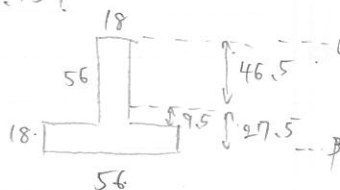
支点上

$$\text{引張} \quad \sigma_p = \frac{20000 W}{I} y_p = 84 \Leftrightarrow W \approx 150 \text{ kN/m}$$

$$\text{圧縮} \quad \sigma_d = -\frac{20000 W}{I} y_d = -205 \Leftrightarrow W \approx 216 \text{ kN/m}$$

$$\text{よって } W = 150 \text{ kN/m}$$

5.154



5.153 と断面性能, モーメント分布は同じ。
圧縮と引張が逆転する。

支間中央

$$\text{引張} \quad \sigma_p = \frac{11250 W}{I} y_p = 84 \Leftrightarrow W \approx 384 \text{ kN/m}$$

$$\text{圧縮} \quad \sigma_d = -\frac{11250 W}{I} y_d = -205 \Leftrightarrow W \approx 266 \text{ kN/m}$$

支点上

$$\text{引張} \quad \sigma_d = \frac{20000 W}{I} y_d = 84 \Leftrightarrow W \approx 88.6 \text{ kN/m}$$

$$\text{圧縮} \quad \sigma_p = -\frac{20000 W}{I} y_p = -205 \Leftrightarrow W \approx 366 \text{ kN/m}$$

$$\text{よって } W = 88.6 \text{ kN/m}$$