

・曲げ終局耐力の算定式:

$$\text{予備計算: } bd^2 = 300 \cdot 600^2 = 108 \times 10^6 \text{ mm}^3, \quad pf_y = 0.01407 \cdot 345 = 4.85 \text{ N/mm}^2$$

$$\begin{aligned} \text{算定式 1: } M_u &= bd^2 \cdot pf_y \left(1 - \frac{pf_y}{1.7 f_c'}\right) \\ &= 108 \times 10^6 \text{ mm}^3 \cdot 4.85 \text{ N/mm}^2 \left(1 - \frac{1}{1.7} \cdot \frac{4.85 \text{ N/mm}^2}{27 \text{ N/mm}^2}\right) \\ &= 108 \cdot 4.85 (1 - 0.1057) \times 10^6 \text{ N} \cdot \text{mm} = 468 \times 10^6 \text{ N} \cdot \text{mm} = \underline{468 \text{ kN} \cdot \text{m}} \end{aligned}$$

$$\text{予備計算: } bd^2 f_c' = 300 \cdot 600^2 \cdot 27 = 2916 \times 10^6 \text{ N} \cdot \text{mm} = 2916 \text{ kN} \cdot \text{m}$$

$$\varphi = \frac{pf_y}{f_c'} = \frac{0.01407 \cdot 345}{27} = 0.1798 \quad (\varphi : \text{力学的鉄筋係数: 単位なし/無時元})$$

$$\text{算定式 2: } \frac{M_u}{bd^2 f_c'} = \varphi \left(1 - \frac{\varphi}{1.7}\right) = 0.1798 \left(1 - \frac{0.1798}{1.7}\right) = 0.1608$$

$$M_u = bd^2 f_c' \times 0.1608 = 2916 \text{ kN} \cdot \text{m} \times 0.1608 = \underline{469 \text{ kN} \cdot \text{m}}$$

コンクリート圧縮強度を $f_c' = 40 \text{ N/mm}^2$ に変更
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・破壊モードの判定:

$$\text{破壊モードの判定: } p (= 0.01407) < p_b (= 0.03565) \quad \underline{\text{鉄筋降伏先行型}} \quad (\text{前問} \quad \text{と同じ})$$

・曲げ終局耐力の算定

$$\text{予備計算: } bd^2 = 108 \times 10^6 \text{ mm}^3, \quad pf_y = 4.85 \text{ N/mm}^2 : \text{前問} \quad \text{と同じ}$$

$$\begin{aligned} \text{算定式 1: } M_u &= bd^2 \cdot pf_y \left(1 - \frac{pf_y}{1.7 f_c'}\right) \\ &= 108 \times 10^6 \text{ mm}^3 \cdot 4.85 \text{ N/mm}^2 \left(1 - \frac{1}{1.7} \cdot \frac{4.85 \text{ N/mm}^2}{40 \text{ N/mm}^2}\right) \\ &= 108 \cdot 4.85 (1 - 0.0713) \times 10^6 \text{ N} \cdot \text{mm} = 486 \times 10^6 \text{ N} \cdot \text{mm} = \underline{486 \text{ kN} \cdot \text{m}} \end{aligned}$$

$$\text{算定式 2: } bd^2 f_c' = 300 \cdot 600^2 \cdot 40 = 4320 \times 10^6 \text{ N} \cdot \text{mm} = 4320 \text{ kN} \cdot \text{m} \quad \text{‘曲げ’と同じ単位!}$$

$$\varphi \equiv \frac{pf_y}{f_c'} = \frac{4.85}{40} = 0.1213 \quad (\varphi : \text{力学的鉄筋係数: 単位なし/無時元})$$

$$\frac{M_u}{bd^2 f_c'} = \varphi \left(1 - \frac{\varphi}{1.7}\right) = 0.1213 \left(1 - \frac{0.1213}{1.7}\right) = 0.1126$$

$$M_u = bd^2 f_c' \times 0.1126 = 4320 \text{ kN} \cdot \text{m} \times 0.1126 = \underline{\underline{487 \text{ kN} \cdot \text{m}}}$$