Lecture 14.
CALCULATION OF CANTINIVALE BEAMS

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Plan of lecture

- 1. The building of diagram of shearing forces for given cantilever beam
- 2. The building of diagram of bending moments for given beam
- 3. The selection of cross-section for a given beam

The building of diagram of shearing forces for given cantilever beam

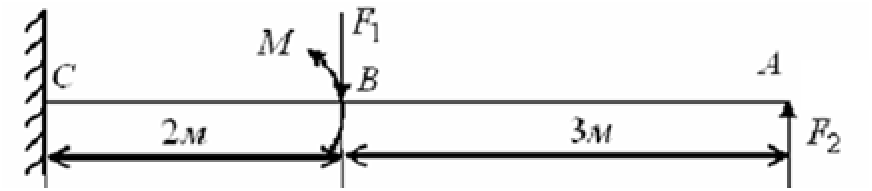

Fig.1

Given

$[\sigma] = 160$ **MPa**

$F_1 = 2$ **kN** $F_2 = 1$ **kN**

$M = 12$ **kNm**

Let us divide a beam into portions by characteristic cross - sections A, B, C

The building of diagram of shearing forces for given cantilever beam

Let us define the value of shearing force Qy in characteristic sections

$$Q_{y_A}^{lt} = -F_2 = -1 \text{ kN}$$

$$Q_{y_B}^{rt} = -F_2 = -1 \text{ kN}$$

$$Q_{y_B}^{lt} = -F_2 + F_1 = -1 + 2 = 1 \text{ kN}$$

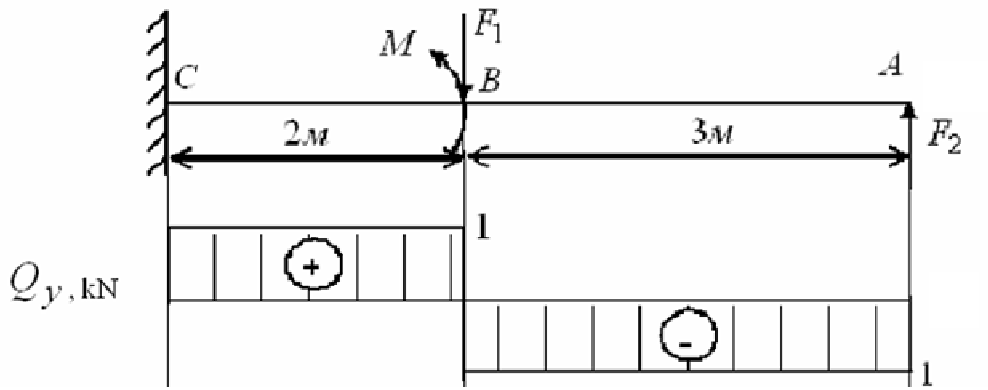

Fig. 2

The building of diagram of bending moments for given beam

Let us define the value of bending moment Mx in characteristic sections**:**

$$M_A = 0 \qquad M_B^{rt} = F_2 \cdot AB = 1 \cdot 3 = 3 \text{ kNm}$$

$$M_B^{lt} = F_2 \cdot AB + M = 1 \cdot 3 + 12 = 15 \text{ kNm}$$

$$M_C^{rt} = F_2 \cdot AC + M - F_1 \cdot BC = 1 \cdot 5 + 12 - 2 \cdot 2 = 13 \text{ kNm}$$

The building of diagram of bending moments for given beam

The diagram of bending moment Mx for a given beam:

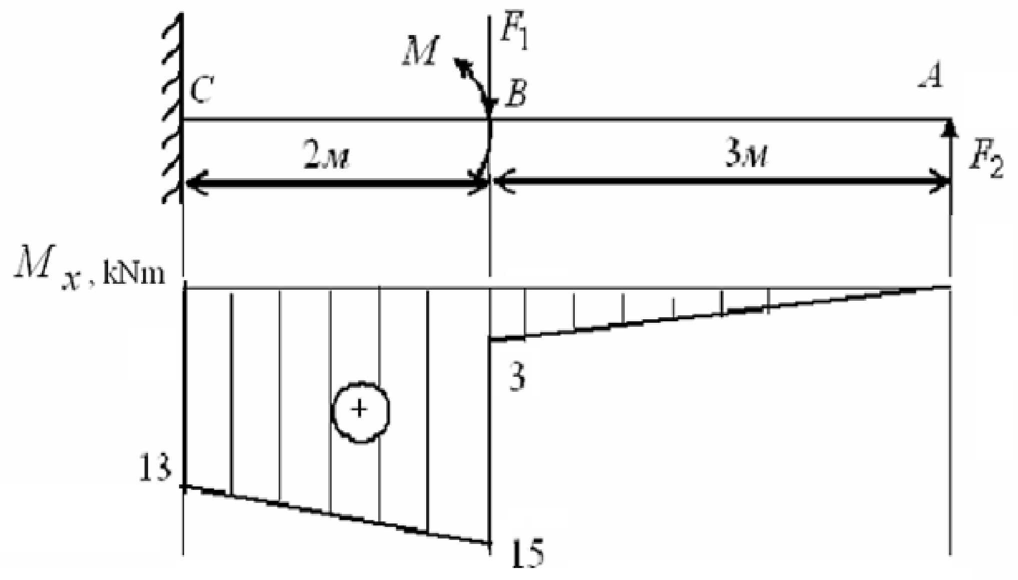

Fig. 3

The selection of cross-section

From diagram Mx**:** $M_{x_{\max}} = 15$ **kNm**

Then from the condition of durability by normal tensions, we have:

$$W_x \geq \frac{M_{x_{\max}}}{[\sigma]} = \frac{15 \cdot 10^3}{160 \cdot 10^6} = 0{,}0938 \cdot 10^{-3} \text{ m}^3$$

Double T beams № 16 was selected from the assortment of rental steel, which is $W_x = 109$ cm^3

Thank you!

Good bye!