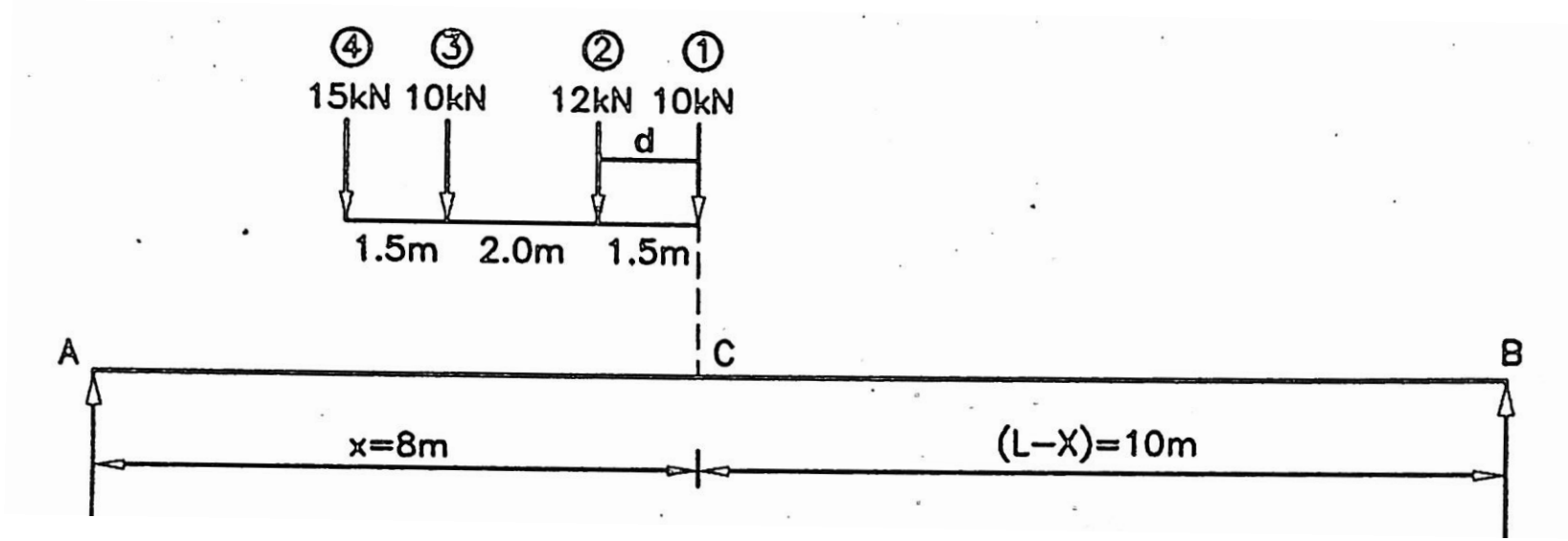
Example

A train of loads shown in figure below, crosses a simply supported girder of span 18m from left to right. Calculate the maximum S.F. and B.M. at section 8m away from support A.



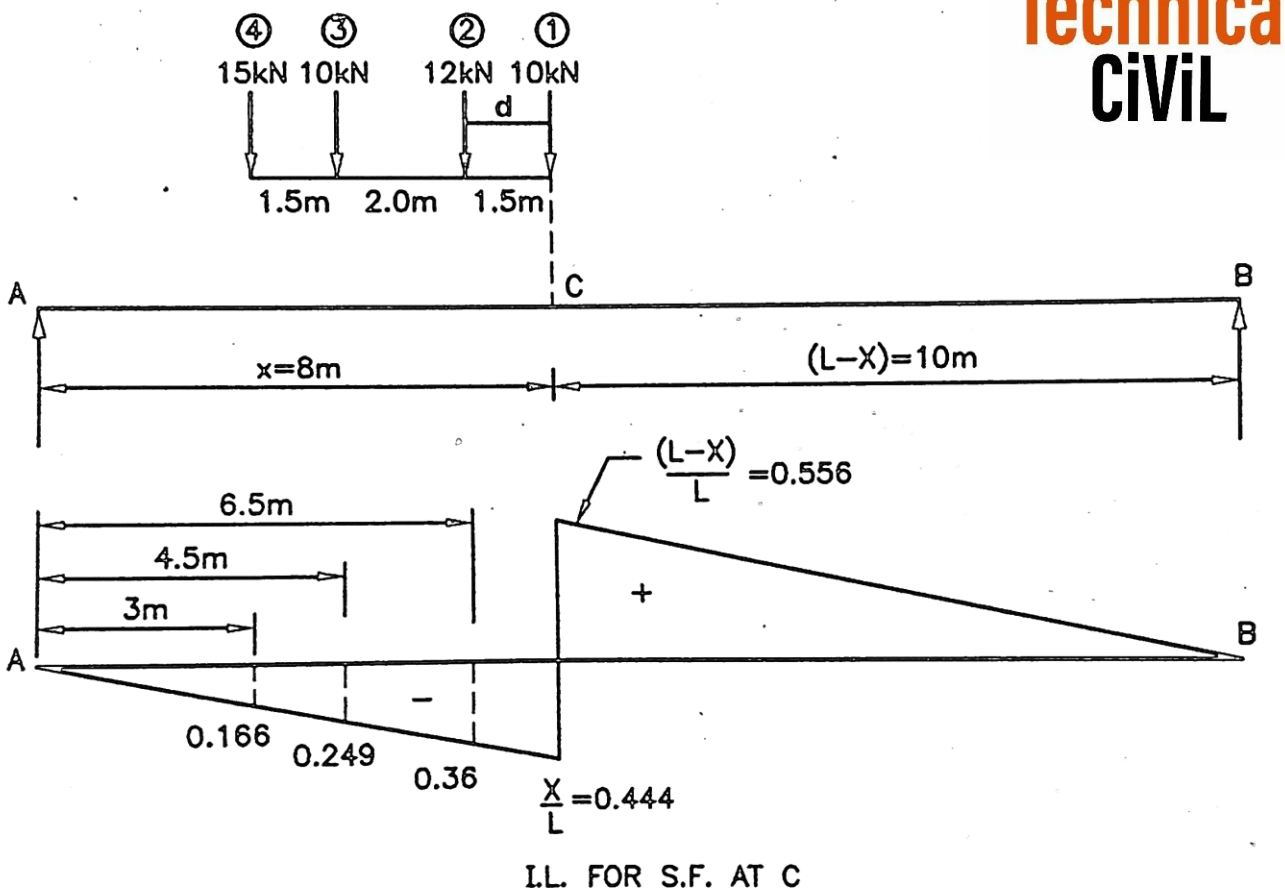
Solution:

(1) Maximum negative S.F. at C:

$$\delta V_c = \frac{W * d}{L} - w_1$$

$$= \frac{47 * 1.5}{18} - 10$$

$$= -6.08$$



I.L. FOR S.F. AT C

Since δVc is –ve, the S.F. will decreases.

$$\therefore Vc = -[(15 * 0.166) + (10 * 0.249) + (12 * 0.36) + (10 * 0.444)]$$

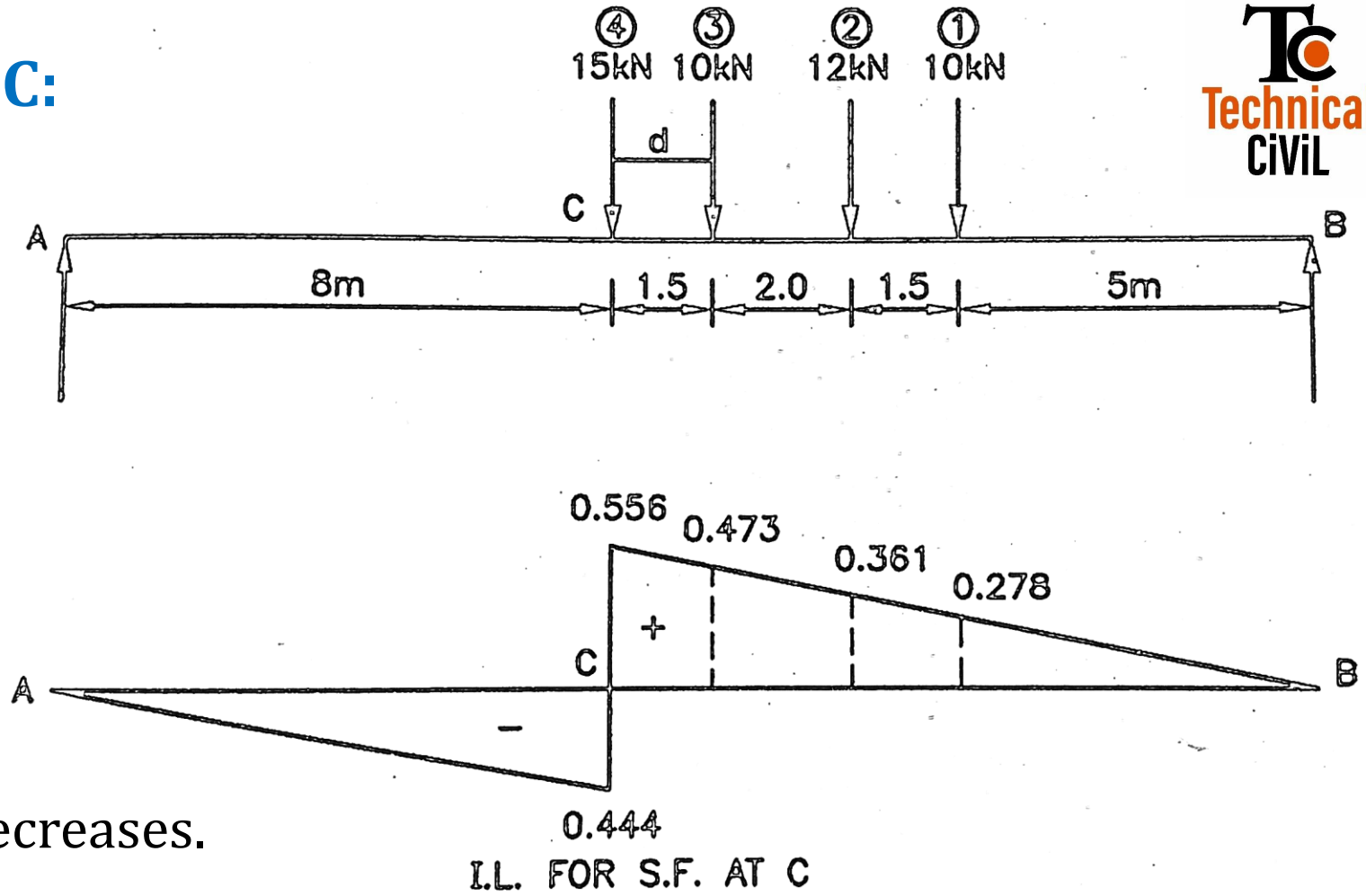
$$= -13.74 \text{ kN}$$

(2) Maximum Positive S.F. at C:

$$\delta Vc = \frac{W*d}{L} - w_1$$

$$= \frac{47*1.5}{18} - 15$$

$$= -11.08$$



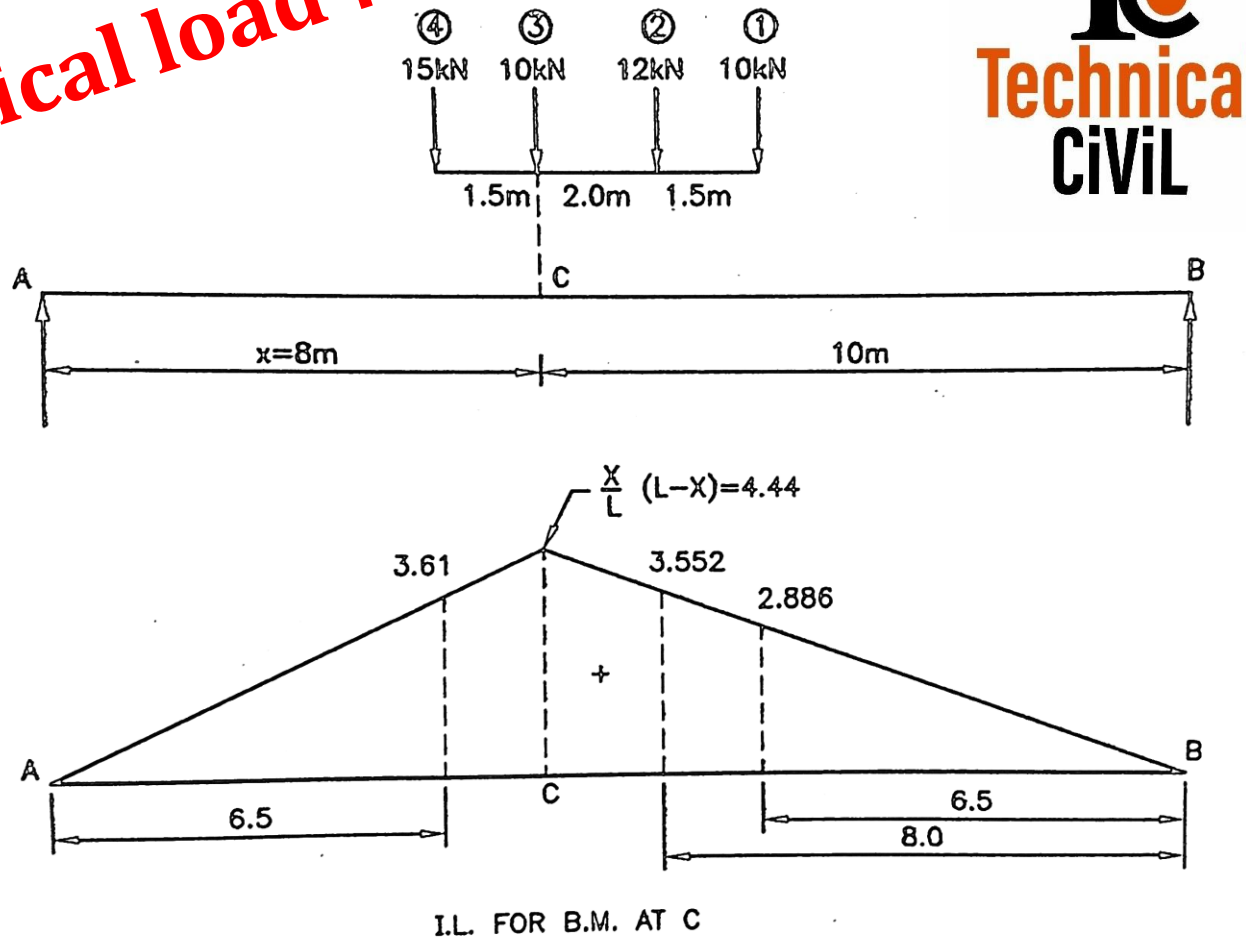
Since δVc is –ve, the +ve S.F. will decreases.

$$\therefore Vc = [\,(15 * 0.556) + (10 * 0.473) + (12 * 0.361) + (10 * 0.278)]$$

$$= 20.18 \text{ kN}$$

(3) Maximum B.M. at C:

Critical load ?



$$\frac{W_L}{x} - \frac{W_R}{L-x}$$

$$\text{LHS---} \frac{25}{8} - \frac{22}{10} = 0.925$$

$$\text{RHS---} \frac{15}{8} - \frac{32}{10} = -1.325$$

$$\therefore Mc = [\,(15 * 3.61) + (10 * 4.44) + (12 * 3.552) + (10 * 2.886)\,]$$

$$= 170\ \text{kN}$$

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