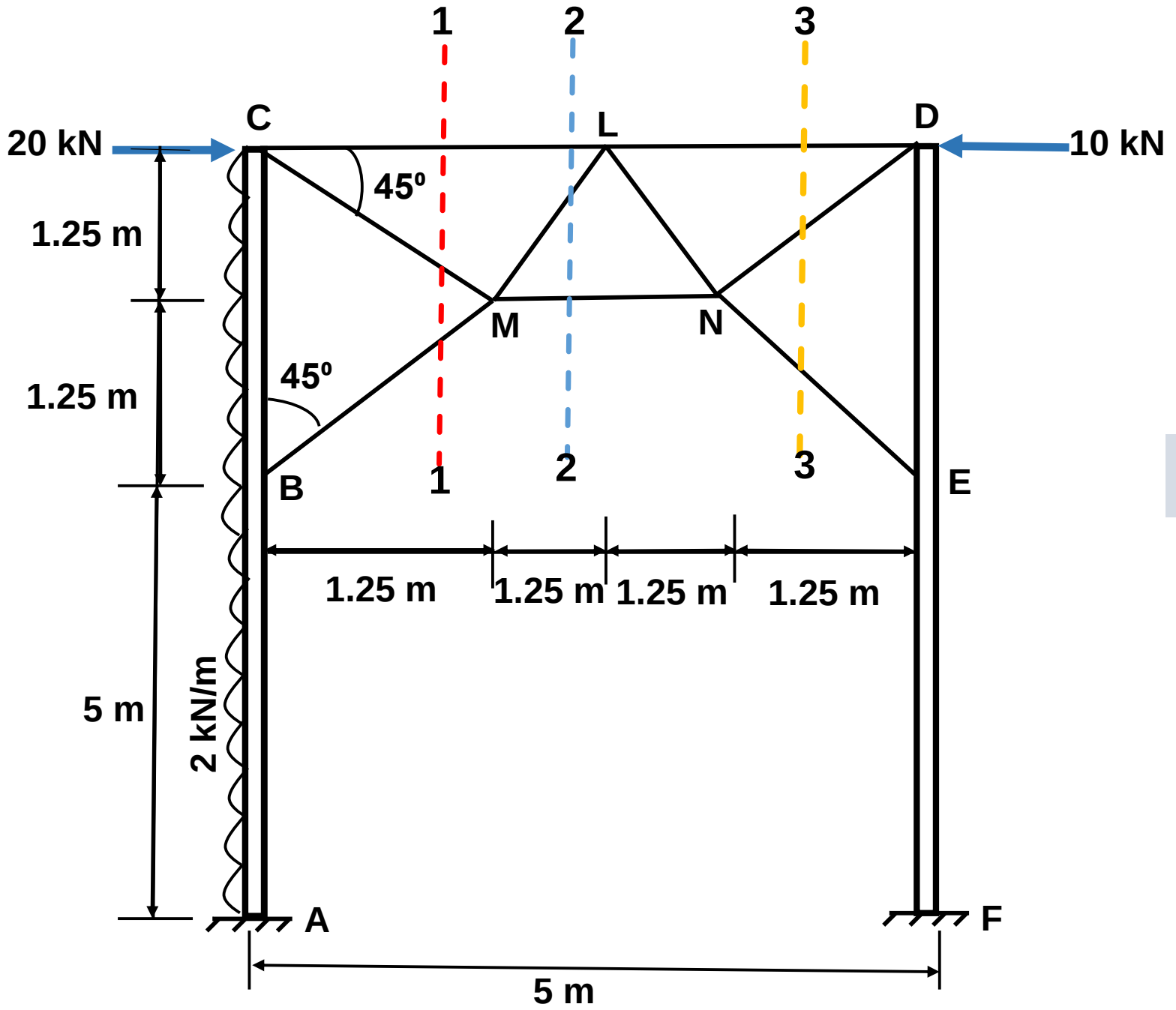
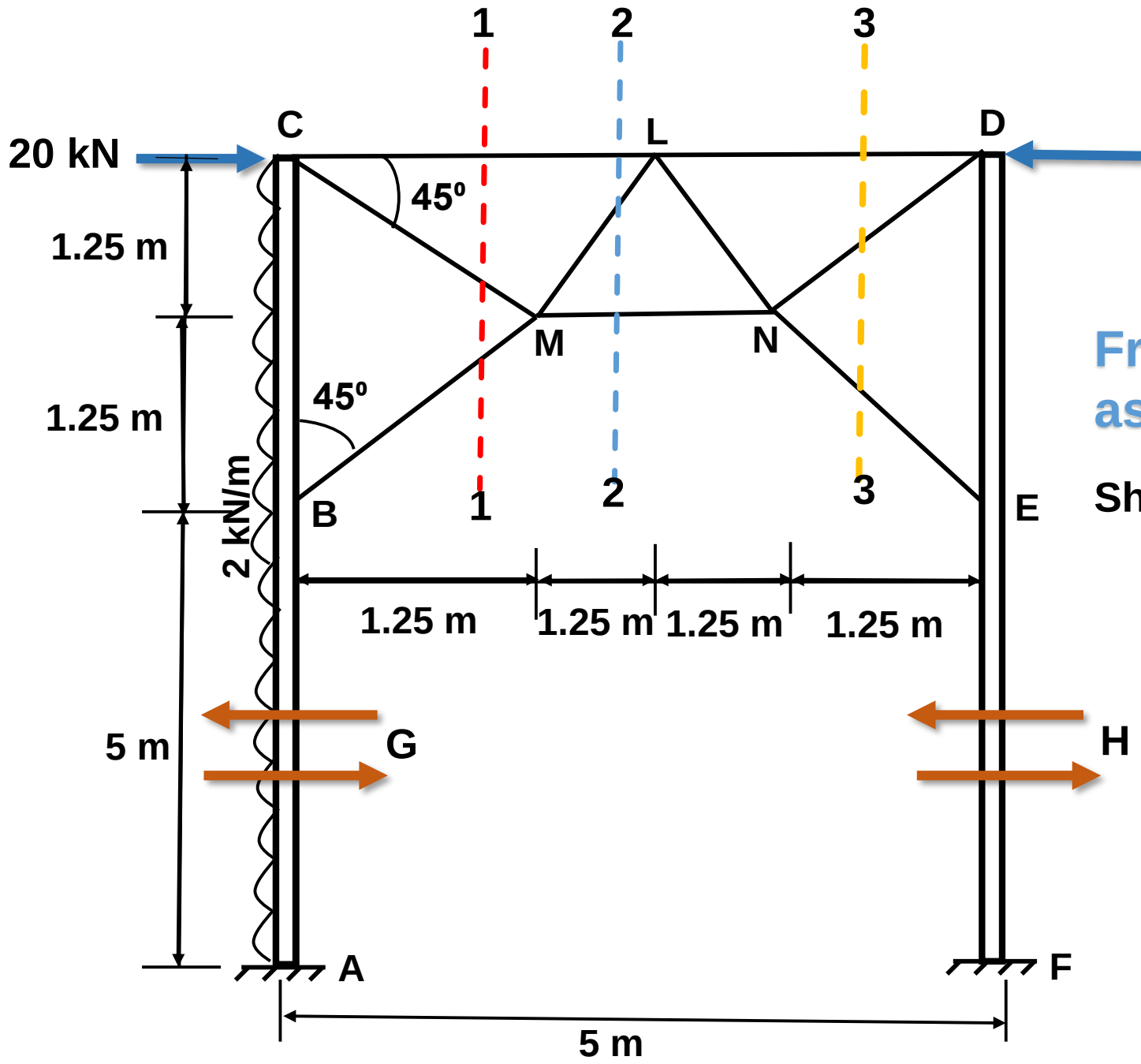


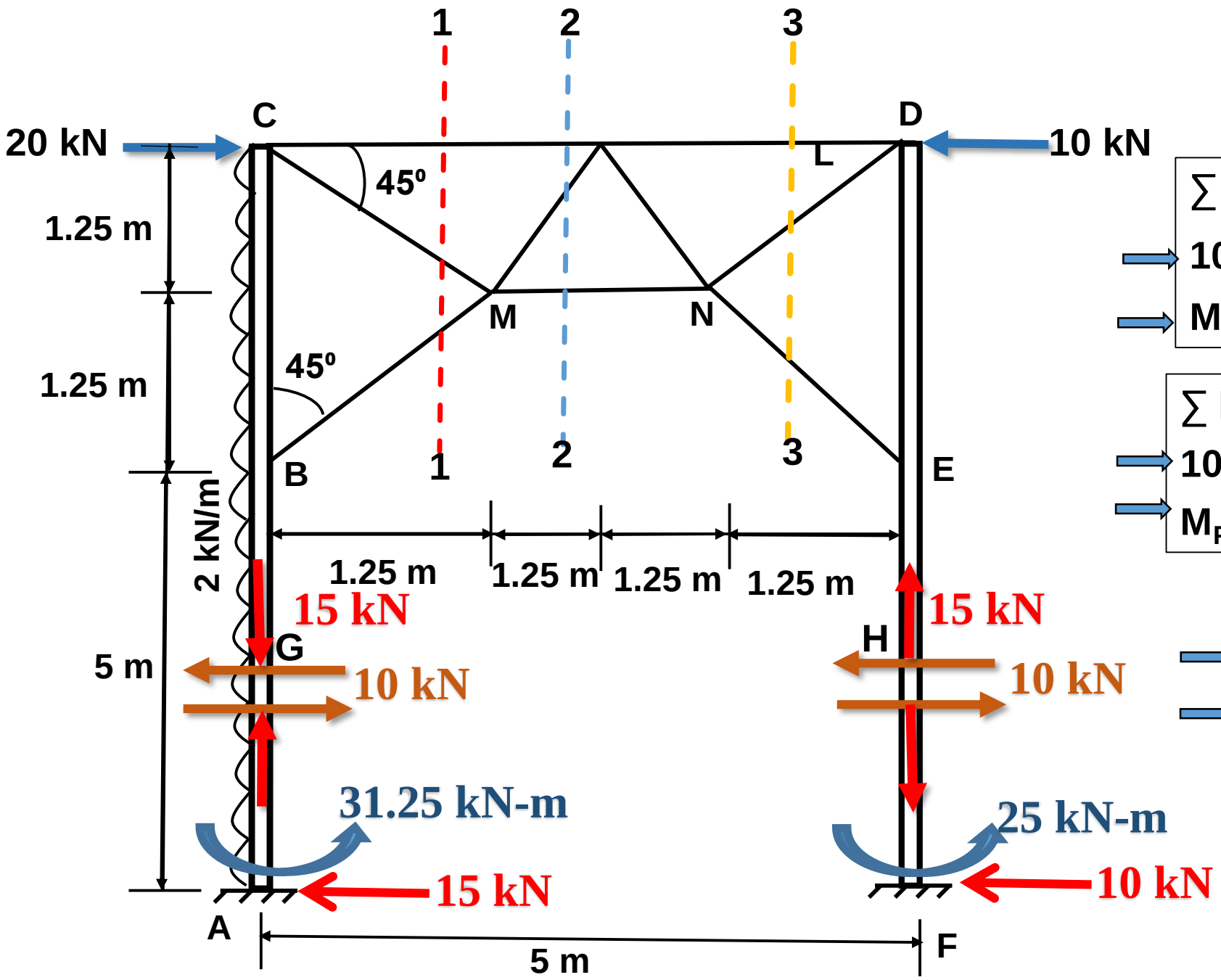
BRIDGE PORTAL



From portal method assumption,

Shear at hinges = $\frac{2*5+20-10}{2}$

= 10 kN



$\sum M_A = 0$

$10 \times 2.5 + 2 \times 2.5 \times \frac{2.5}{2} - M_A = 0$

$M_A = 31.25$ kN-m

$\sum M_F = 0$

$10 \times 2.5 - M_F = 0$

$M_F = 25$ kN-m

$\sum M_G = 0$

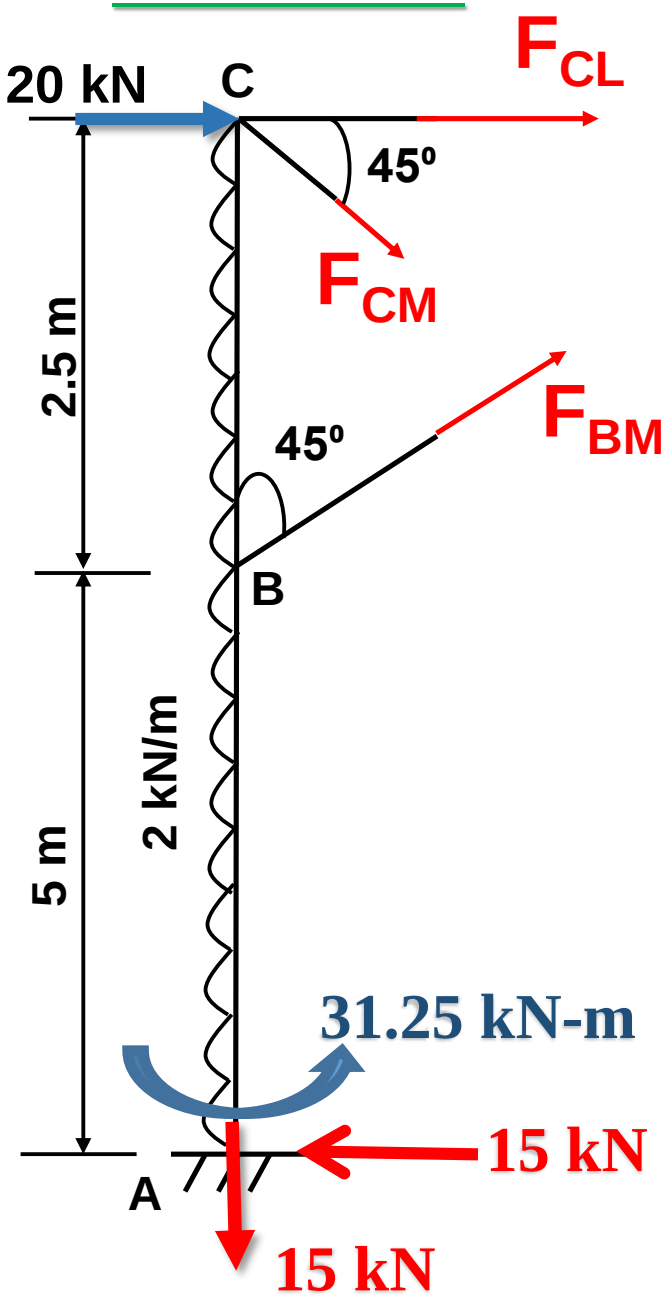
$20 \times 5 - 10 \times 5 + 2 \times 5 \times 2.5 - R_H \times 5 = 0$

$R_H = 15$ kN

Total lateral force = 20-10+2x5

= 20

Section 1-1:



$\sum M_c = 0$

$\Rightarrow$ $- F_{BM} \times \sin45^0 \times 2.5 - 31.25 + 15 \times 7.5 - 2 \times 7.5 \times \frac{7.5}{2} = 0$

$\Rightarrow$ $F_{BM} = 14.14$ kN (T)

$\sum F_y = 0$ ($\uparrow$ +ve)

$\Rightarrow$ $-15 + F_{BM} \times \cos45^0 - F_{CM} \times \sin45^0 = 0$

$\Rightarrow$ $F_{CM} = -5\sqrt{2}$ kN (C)

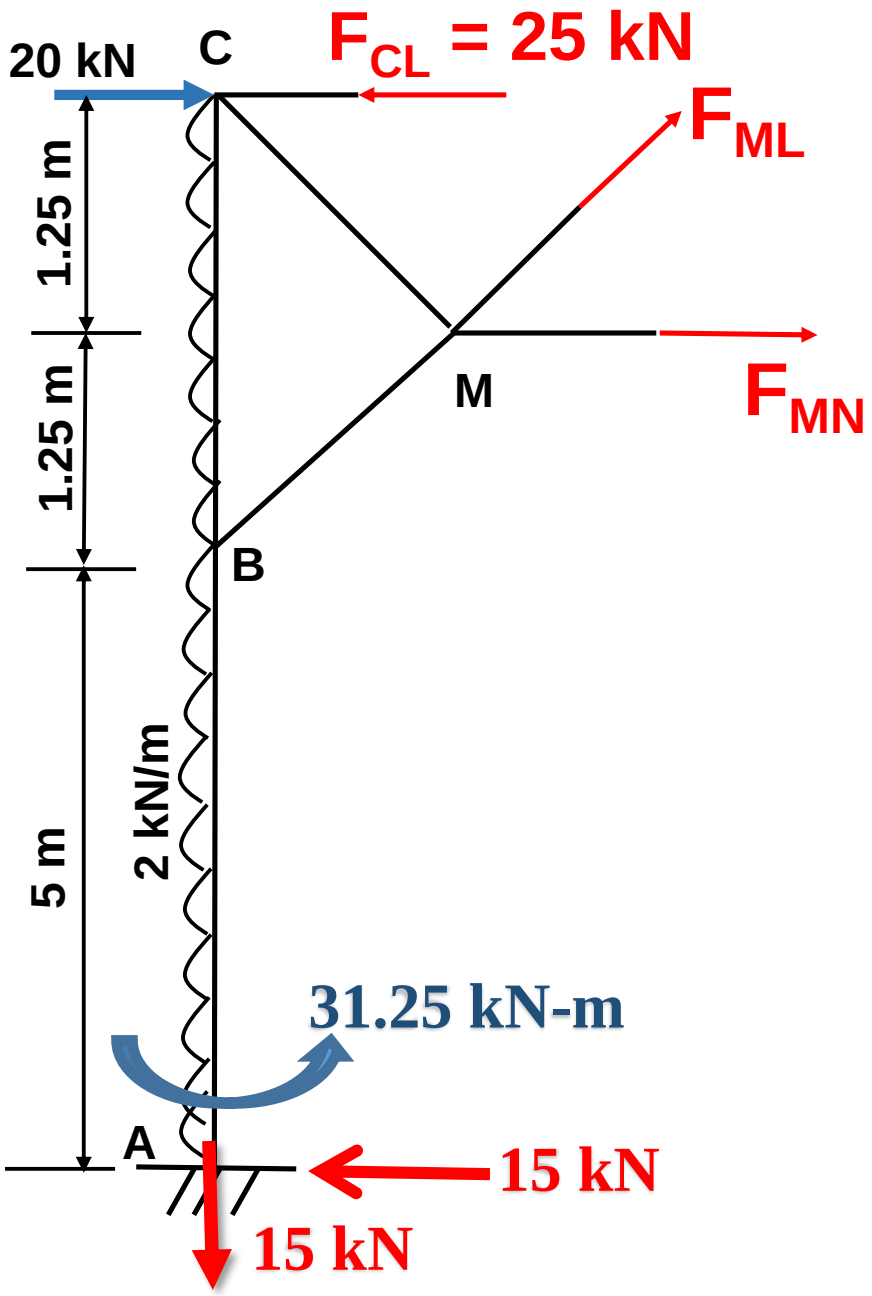
$\sum F_x = 0$ ($\rightarrow$ +ve)

$\Rightarrow$ $-15 + F_{BM} \times \sin45^0 - F_{CM} \times \cos45^0 + F_{CL} + 2 \times 7.5 + 20 = 0$

$\Rightarrow$ $-15 + 14.14 \times \sin45^0 - 5\sqrt{2} \times \cos45^0 + F_{CL} + 2 \times 7.5 + 20 = 0$

$\Rightarrow$ $F_{CL} = -25$ kN (C)

Considering left part of Section 2-2:



$\sum F_y = 0$ ($\uparrow$ +ve)

$\Longrightarrow F_{ML} \times \sin 45^0 - 15 = 0$

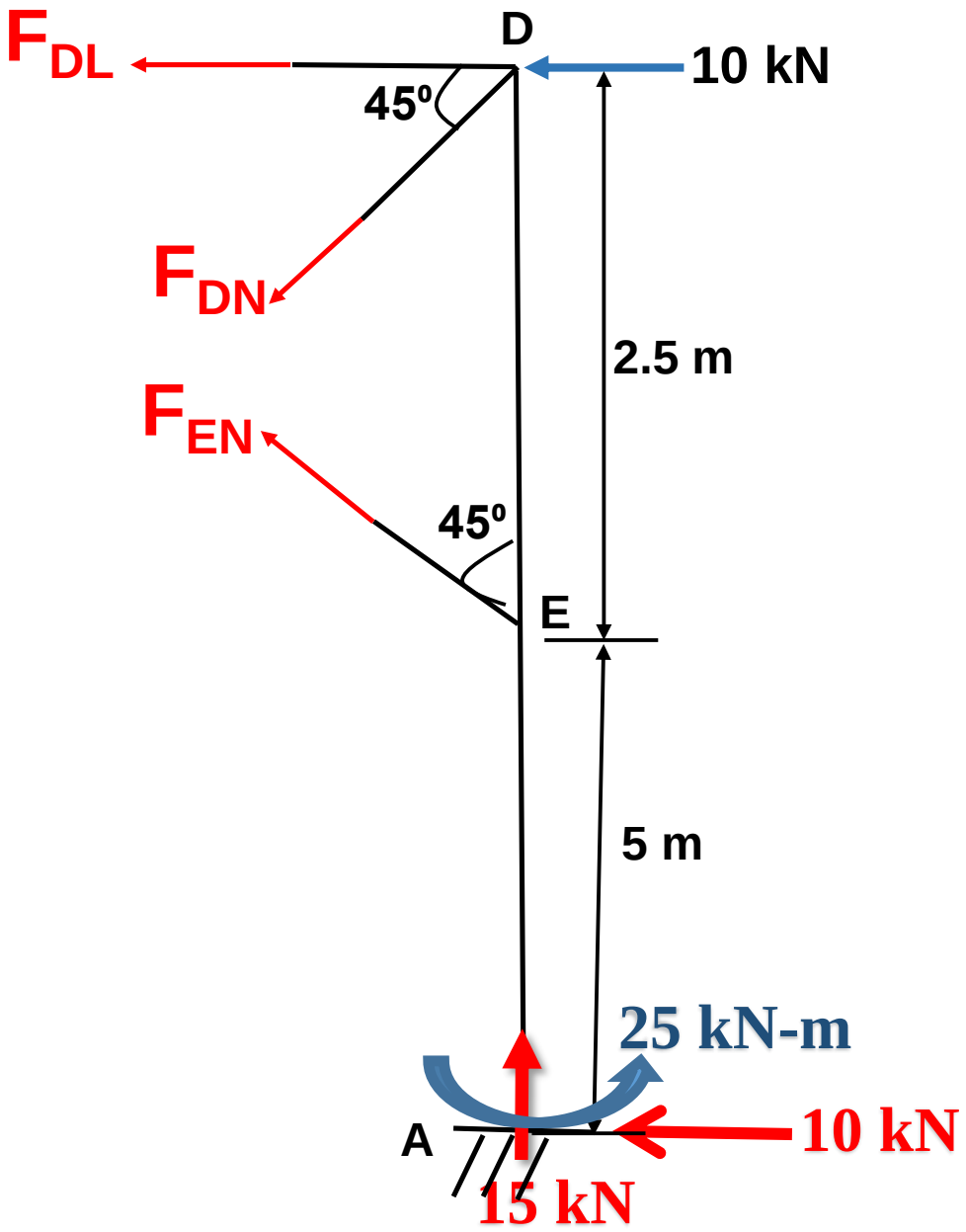
$\Longrightarrow F_{ML} = 21.21$ kN (T)

$\sum F_x = 0$ ($\rightarrow$ +ve)

$\Longrightarrow 20 - F_{CL} + F_{ML} \times \cos 45^0 + F_{MN} + 2 \times 7.5 - 15 = 0$

$\Longrightarrow F_{MN} = -10$ kN (C)

Considering right part of Section 3-3:



$\sum M_D = 0$

$\Rightarrow F_{EN} \times \sin45^0 \times 2.5 - 25 + 10 \times 7.5 = 0$

$\Rightarrow F_{EN} = -20\sqrt{2}$ kN (C)

$\sum F_y = 0$ ($\uparrow$ +ve)

$\Rightarrow 15 - F_{EN} \times \cos45^0 - F_{DN} \times \sin45^0 = 0$

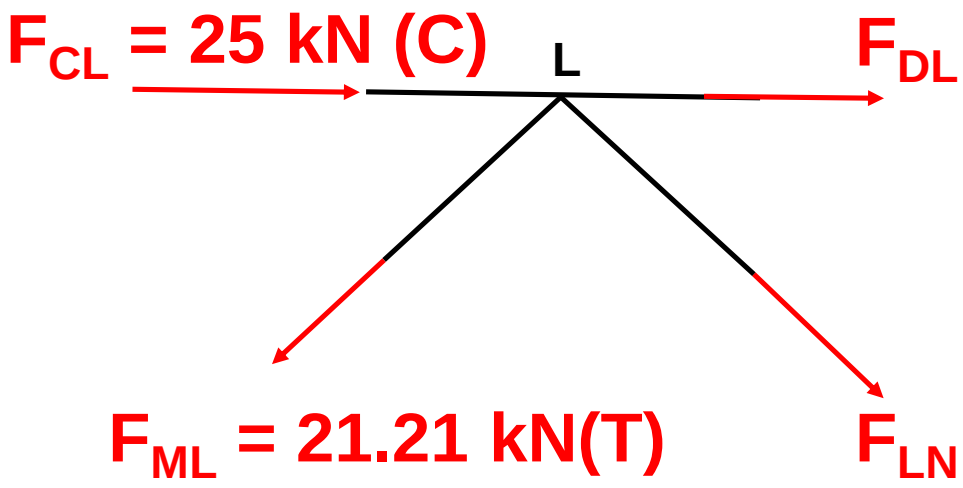
$\Rightarrow F_{DN} = -7.07$ kN (C)

$\sum F_x = 0$ ($\rightarrow$ +ve)

$\Rightarrow -10 - F_{DL} + F_{DN} \times \cos45^0 + F_{EN} \times \cos45^0 - 10 = 0$

$\Rightarrow F_{DL} = 5$ kN (T)

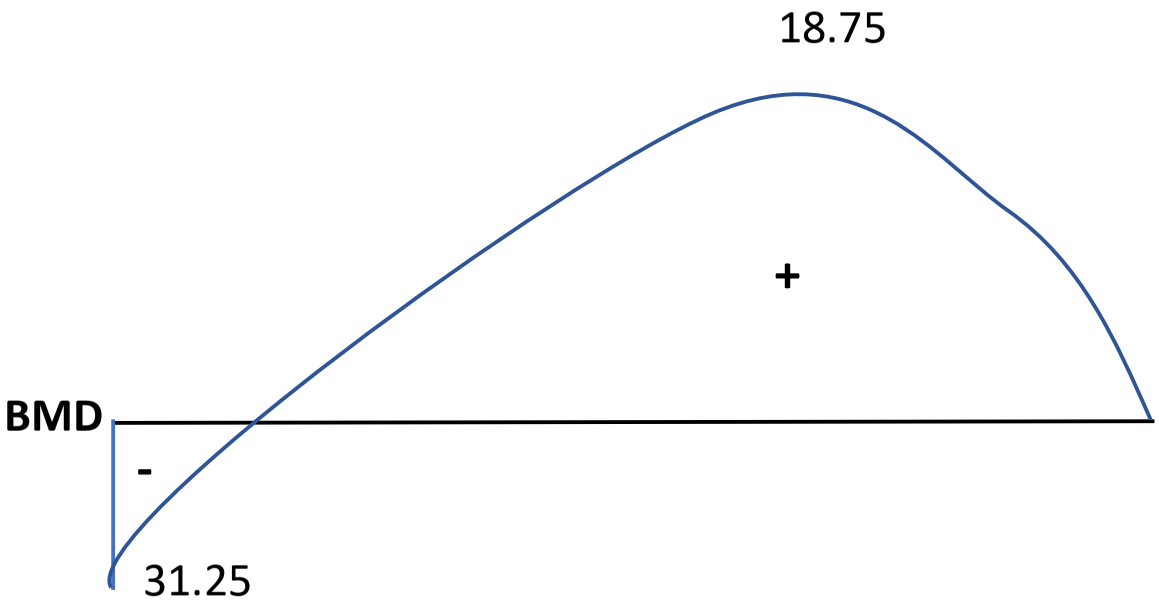
At Joint L:

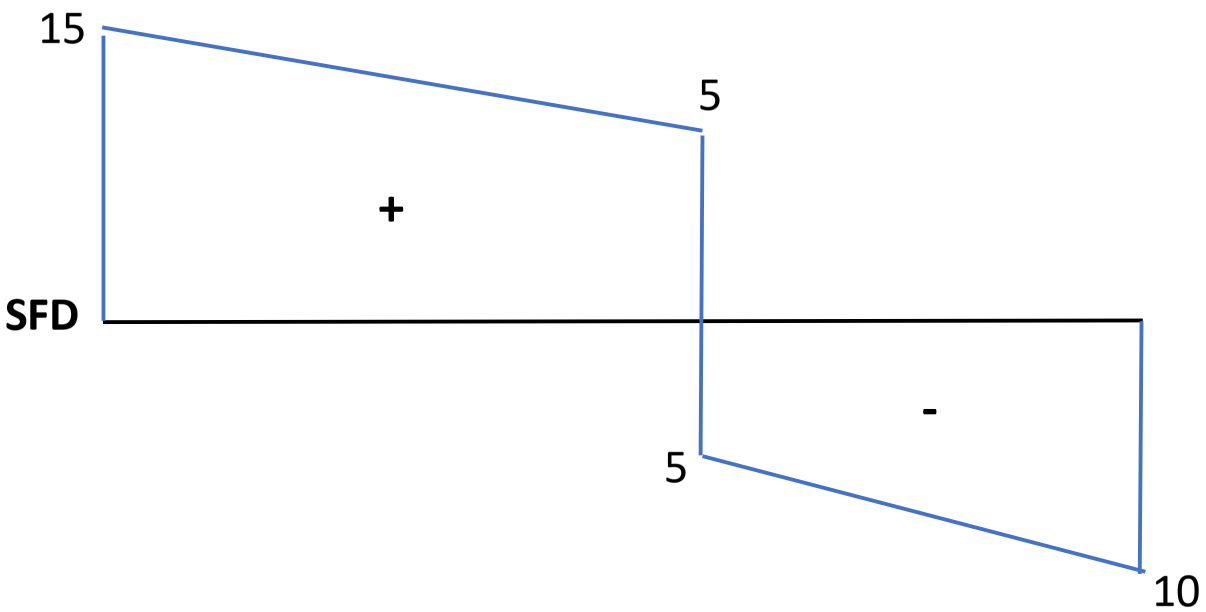


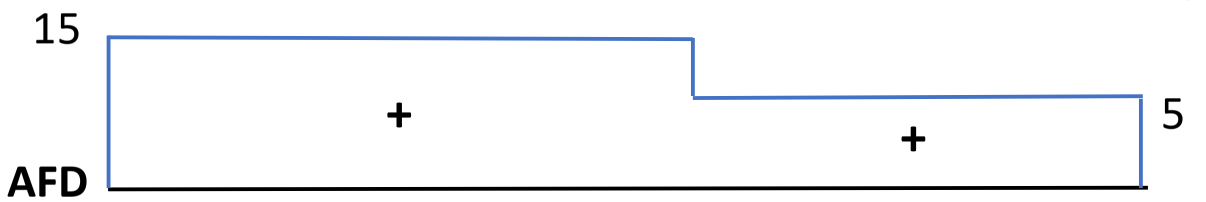
$$\sum F_y = 0 \ (\uparrow +ve)$$

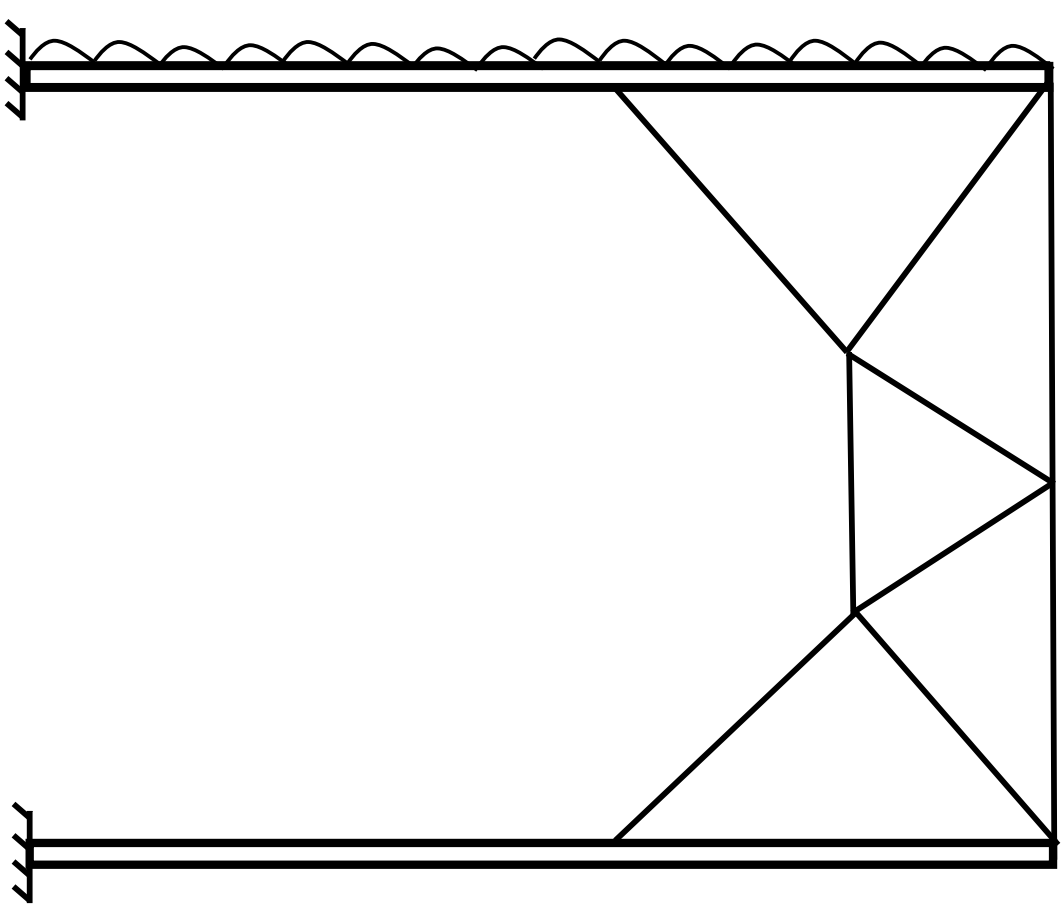
$$- F_{ML} \times \cos 45^0 - F_{LN} \times \cos 45^0 = 0$$

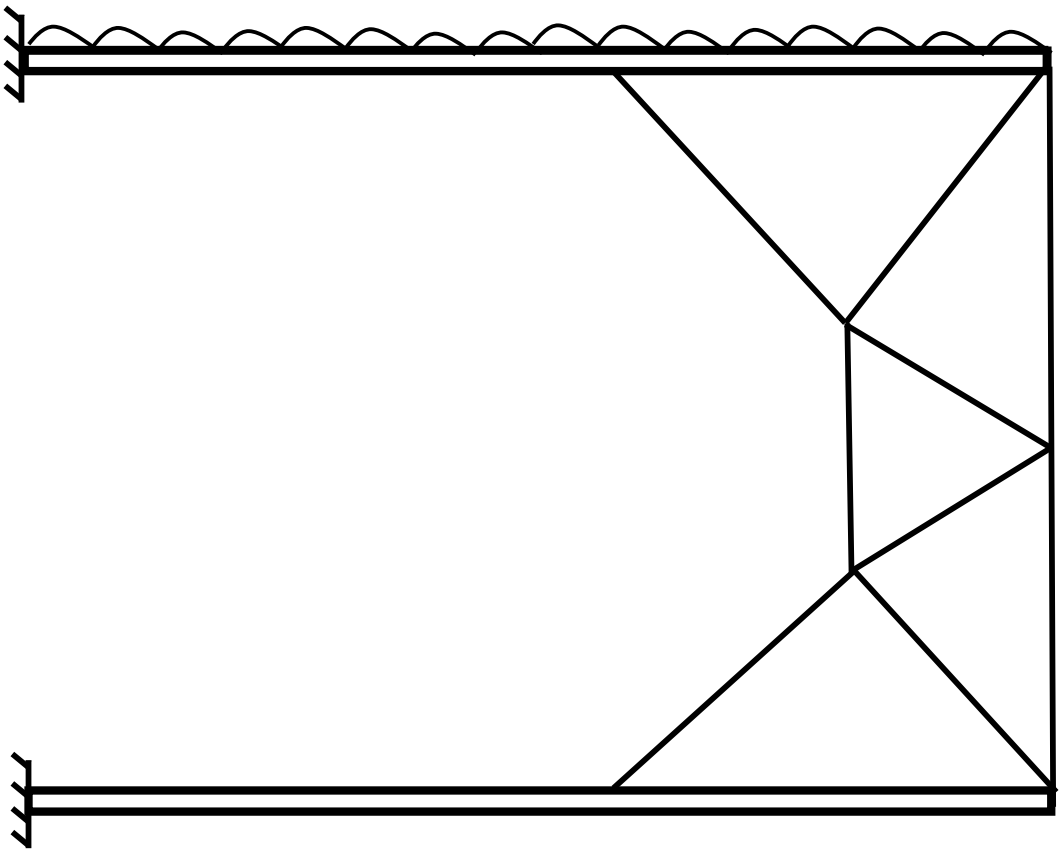
$$F_{LN=} \ - 21.21 \text{ kN (C)}$$

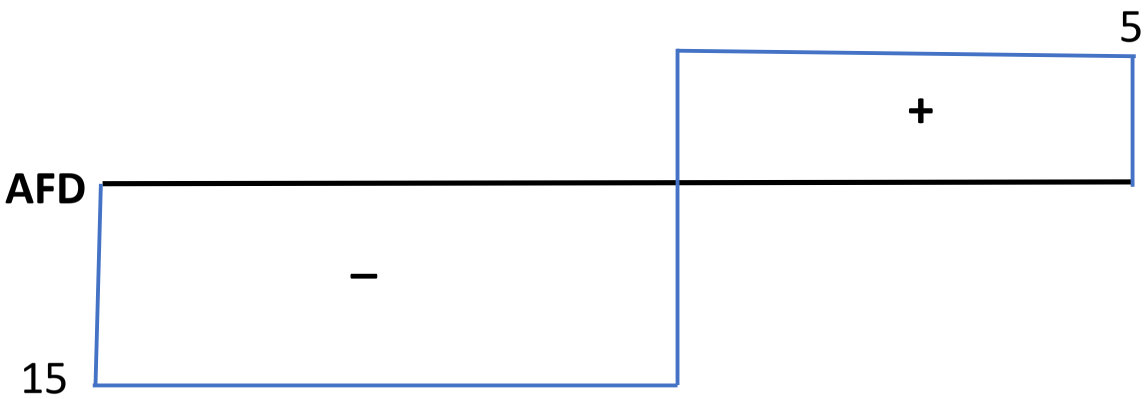

18.75
+
BMD
-
31.25

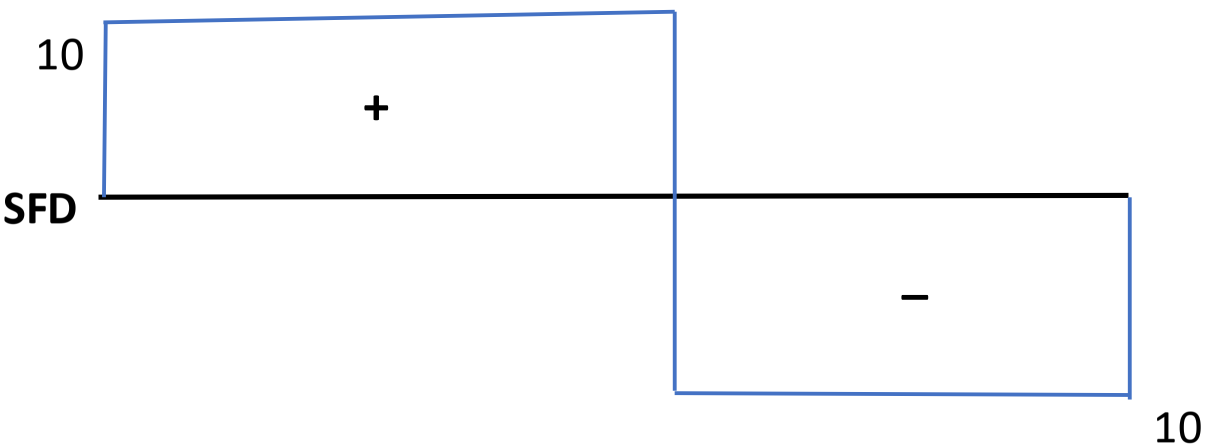

15
5
+
SFD
-
5
10

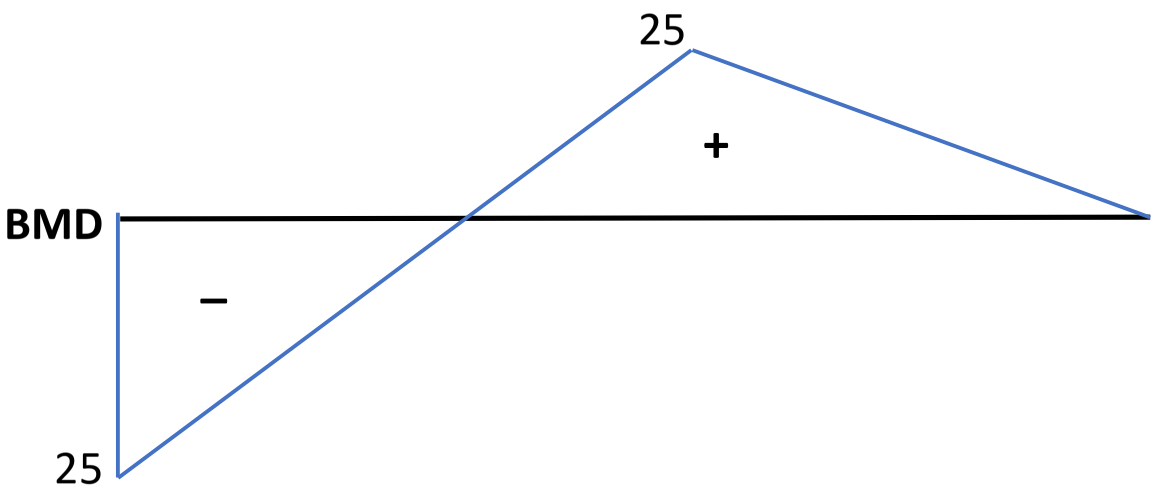

15
+
+
5
AFD






5
+
AFD
–
15


10
+
SFD
–
10


25
+
BMD
–
25