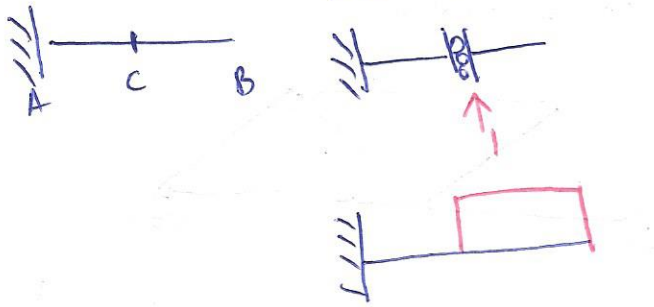
8/12/2015

Previously, we stop at Meuller-Bresslau method, where we apply a vertical roller to construct Influence line.

Influence line at C



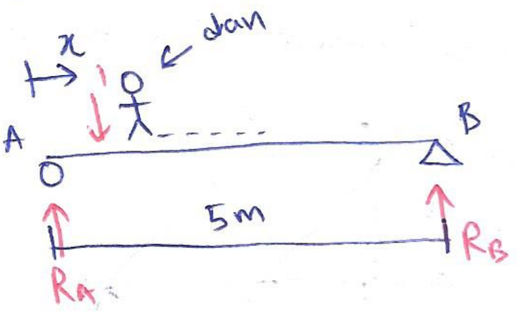
Why only 1 unit load?

Here, the application of (I.L) can determine

1) reaction force
2) shear force
3) bending moment

} using I.L, we can determine all this at the specific point

How about a load of 590 N of (dan) along the span?



$\sum F_y = 0$

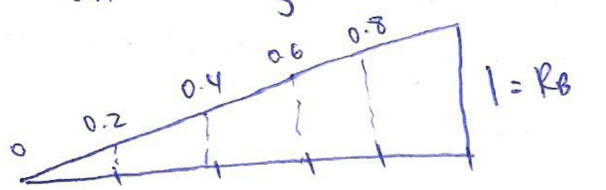
$R_A + R_B = 1$

$\sum M_A = 0$

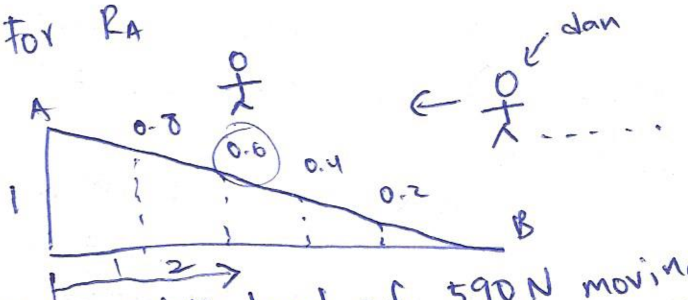
$1 \cdot x - R_B \cdot 5 = 0$

$R_B = \frac{x}{5}$

$R_A = 1 - \frac{x}{5}$



for R_A

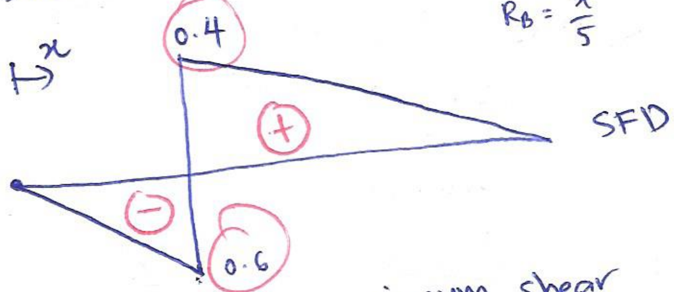


if a moving load of 590 N moving from $B \rightarrow A$, specifically at point 0.6, so the influence line should be?

Shear Force

$R_A = 1 - \frac{x}{5}$

$R_B = \frac{x}{5}$

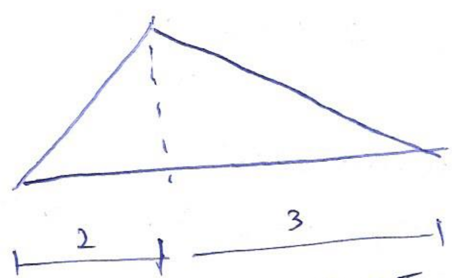


when $x = 2$, the maximum shear force $590 \times 0.4 = 236\text{ N}$

also, at $x = 2$, there is the minimum shear force

$590 \times (-0.6) = -\cancel{350}\ 354\text{ N}$ *

Then, the maximum bending moment



$0 \leq x \leq 2$

$M_x = \cancel{\frac{3x}{5}}$

$M_x = -2 + 2x - \frac{x^2}{5}$

when $x = 2$

$M_x = -2 + 4 - \frac{4}{5}$

$= 1.2\text{ kNm}$

$2 \leq x \leq 5$

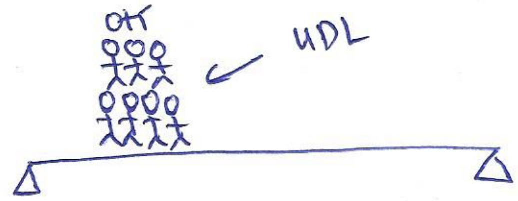
$M_x = 6 - \frac{6}{15}x$

$M_x = x - \frac{x^2}{5}$

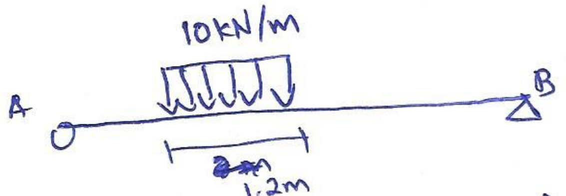
So, the maximum bending moment when (dan) is at 2 m from A should be

$$590 \times 1.2 = 708 \text{ Nm}$$ ※

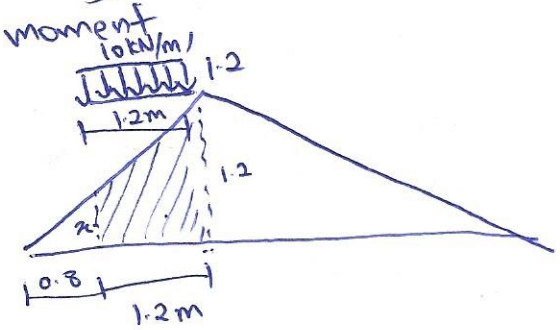
Aaaa... that's for ~~an unif~~ a point load



※. The really concern is the bending moment!



Using the I.L for bending moment



$$\frac{0.8}{x} = \frac{2}{1.2} \Rightarrow x = \frac{0.8}{2} \times 1.2$$
$$= 0.48$$

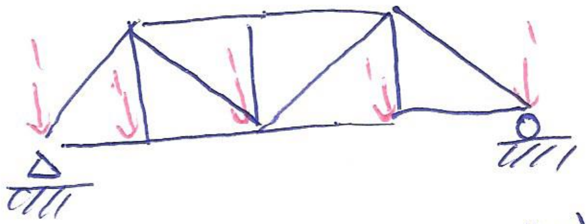
So, the trapezium area is

$$M_x = \frac{1}{2}(1.2 + 0.48) \times 1.2 \times 10$$
$$= \underline{\underline{10.08 \text{ kNm}}}$$

※. The total moment influence line when all guys (10kN/m) is at 2 m from A.

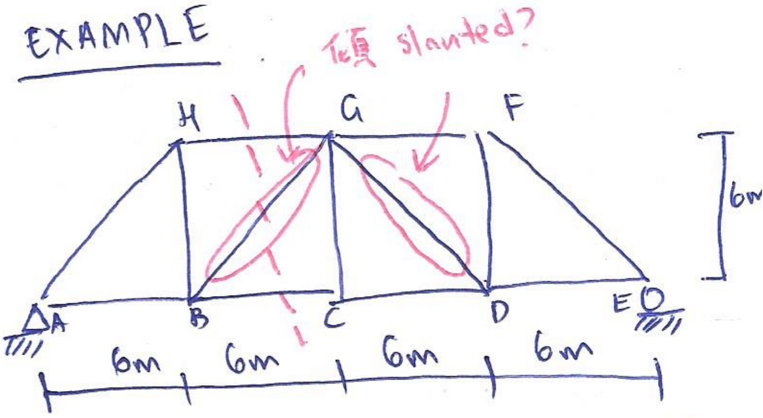
Influence line for truss

When determining the I.L for truss, normally we use method of section.

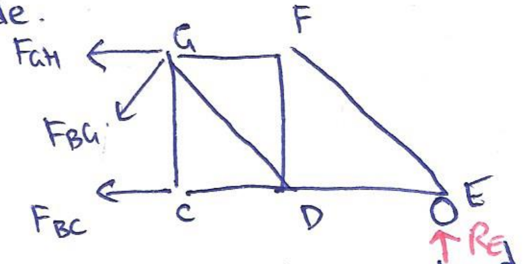


☆ the 1 unit load is applied at the joint or the support.

EXAMPLE



Let say we consider from the right side.



Firstly, don't apply any load & achieve the equilibrium condition

$\sum F_x = 0$ $\qquad$ $\sum F_y = 0$

$F_{GH} = 0$ $\qquad$ $R_E - F_{BG} \sin 45° = 0$

$F_{BC} = 0$ $\qquad$ $\boxed{R_E = F_{BG} \sin 45°}$

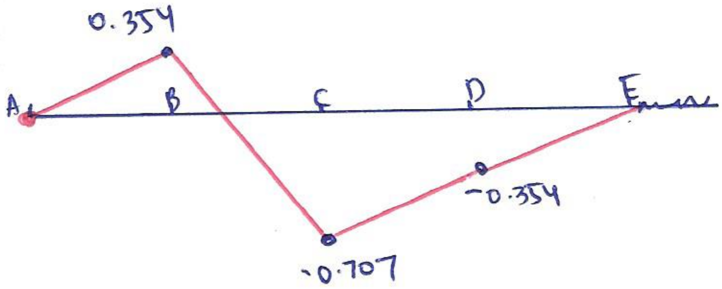
Then, ~~for~~ for truss case, apply a beam to construct the influence line.

At B, when $x = 6$

$$R_E = F_{BG} \sin 45^\circ$$

$$F_{BG} = \frac{R_E}{\sin 45^\circ} = \frac{0.25}{\sin 45^\circ} = 0.354$$

Now, construct the influence line!

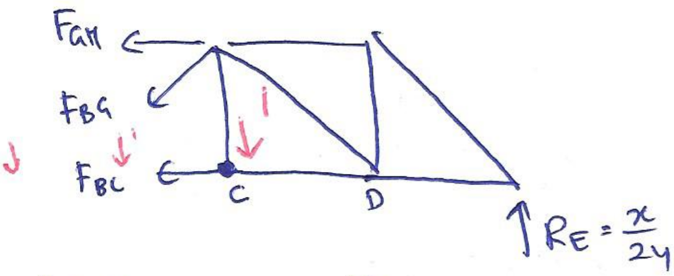


At C, when $x = 12$

$$\cancel{R_E = F_{BG} \sin 45^\circ}$$

$$\cancel{F_{BG} = \frac{R_E}{\sin 45^\circ} = \frac{0.5}{\sin 45^\circ}} = 0.71$$

But why?



At C, when $x = 12$

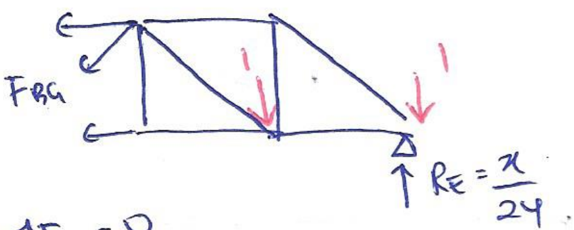
$$\Sigma F_y = 0$$

$$F_{BG} \sin 45^\circ + 1 = R_E$$

-0.707

$$F_{BG} = \frac{R_E - 1}{\sin 45^\circ} = \frac{0.5 - 1}{\sin 45^\circ} = \cancel{0.7}$$

At D, when $x = 18$



$$\Sigma F_y = 0$$

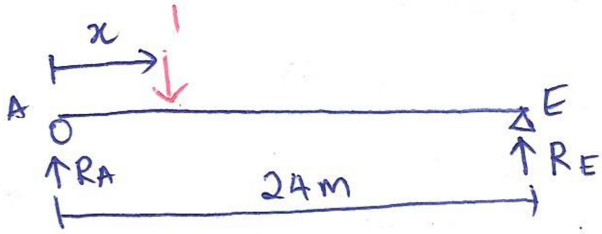
$$F_{BG} \sin 45^\circ + 1 = R_E$$

$$F_{BG} = \frac{R_E - 1}{\sin 45^\circ} = \frac{0.75 - 1}{\sin 45^\circ} = -0.354$$

At E when $x = 24$

$$F_{BG} \sin 45^\circ + 1 = R_E$$

$$F_{BG} = \frac{R_E - 1}{\sin 45^\circ} = \frac{1 - 1}{\sin 45^\circ} = 0$$



$\sum F_y = 0$

$R_A + R_E = 1$

$\sum M_A = 0$

$\cancel{1 \cdot x - R_E . 24 = 0}$

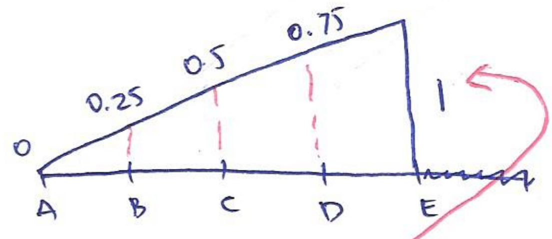
$1 \cdot x - R_E \cdot 24 = 0$

$$\boxed{R_E = \frac{x}{24}}$$

$$R_A = 1 - R_E = 1 - \frac{x}{24}$$

Then, plot it!

Joint	Distance	$R_E = \frac{x}{24}$
A	0	0
B	6	0.25
C	12	0.5
D	18	0.75
E	24	1



So, using the value of the influence line for beam, plot it for the truss.

At A, when $x = 0$

$R_E = F_{BG} \sin 45^\circ$

We want to determine the F_{BG}

$$F_{BG} = \frac{R_E}{\sin 45^\circ} = \frac{0}{\sin 45^\circ} = 0\text{ N}$$