Announcements

- TAM210 last lecture: Friday, Nov. 3rd
- TAM210 Final: 2 hour exam
  - Location: CBTF
  - Thursday, Nov. 9th through Sunday, Nov. 12th

❑ Upcoming deadlines:

- Tuesday (10/24)
  - PL HW16
- Thursday (10/26)
  - ME HW17

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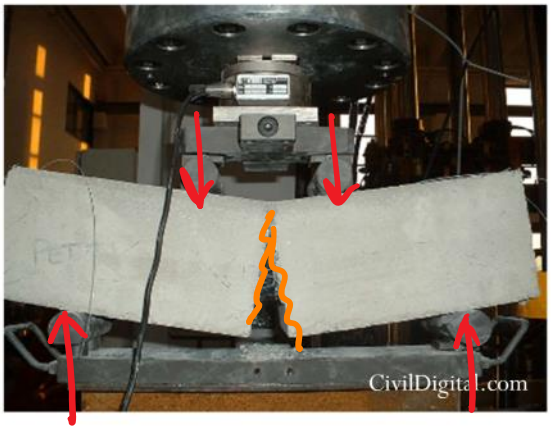
1

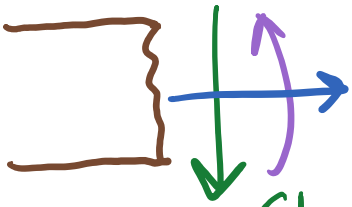
Recap: Internal Forces and Moment



2D.

- 3 components.

Bending moment (M) (+ smiley)



Normal force (N)

Shear force (V)

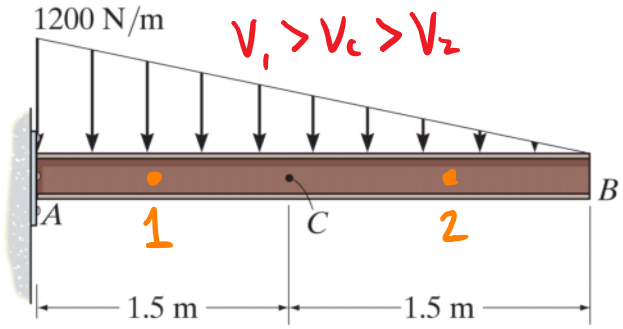
(+ points away from the cut)

(+ clockwise rotation)

2

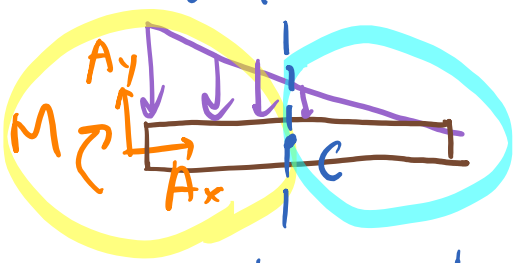
$N_1 = N_C = N_2$ $M_1 > M_C > M_2$

$V_1 > V_C > V_2$



Determine the normal force, shear force, and bending moment at C of the beam.

1.) FBD of the whole system & find all external loadings.

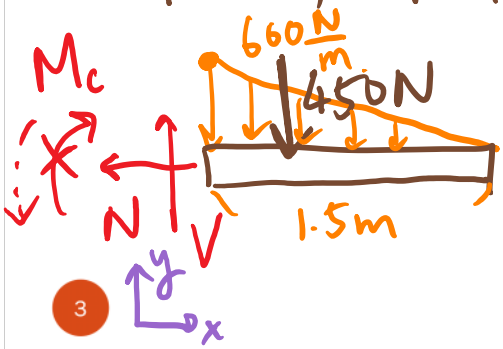


2.) Make a cut at the pt. of interest.

3.) Pick the side w/ least # of loadings.

- Pick right side

FBD of right piece



EoE

$\sum F_x = \boxed{N = 0}$

$\sum F_y = V - F_R = 0$

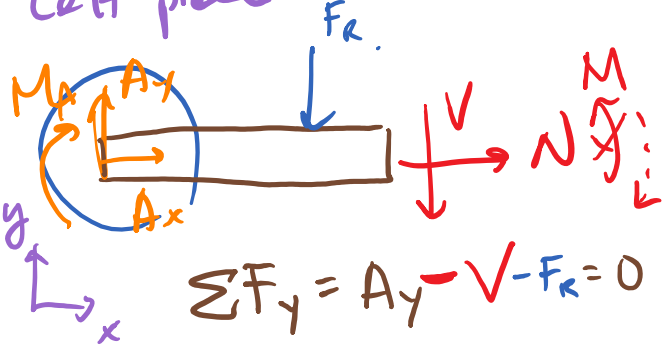
$\boxed{V = F_R}$

$\sum M_C = -M_C - F_R\left(\frac{1}{3}\right)(1.5\,m) = 0$

$\boxed{M_C = \Theta F_R\,(0.5m)}$

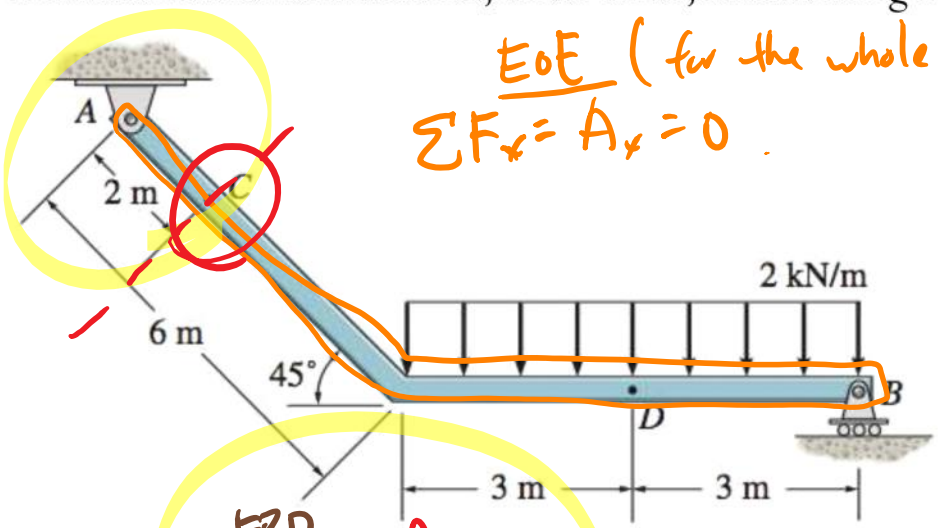
4.) Use FBD & EoE of the chose piece to solve for V, N, M.

Left piece



$\sum F_y = A_y - V - F_R = 0$

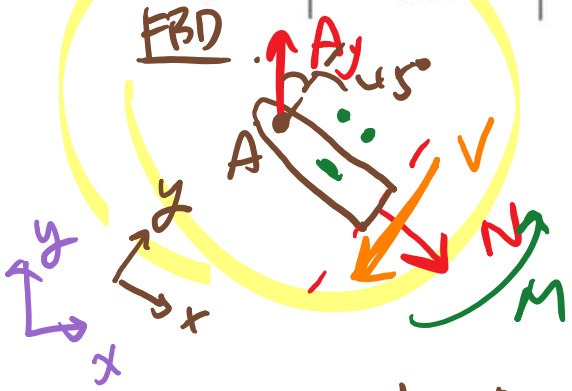
Determine the normal force, shear force, and bending moment at C.



EoE (for the whole beam)

$\Sigma F_x = A_x = 0$.

FBD



EoE changes according to chosen coord. sys. in FBD.

$\Sigma F_x = N - A_y \sin 45° = 0$

$\Sigma F_y = -V + A_y \cos 45° = 0$.

$\Sigma F_x = 0 = N \cos 45° - V \sin 45° = 0$

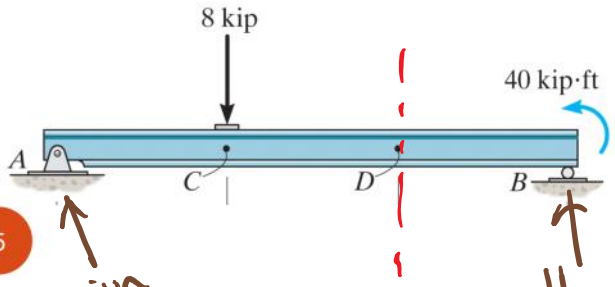
$\Sigma F_y = A_y - N \sin 45° - V \cos 45° = 0$.

Friday, October 20, 2017 11:14 AM

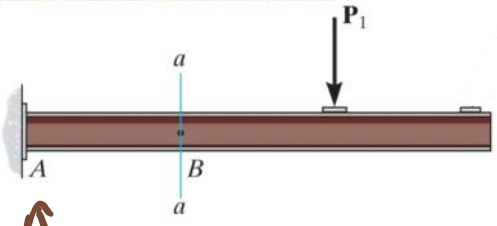
Shear and Moment Diagram

Beams: structural members designed to support loadings applied perpendicular to their axes.

Simply supported beam



Cantilever beam

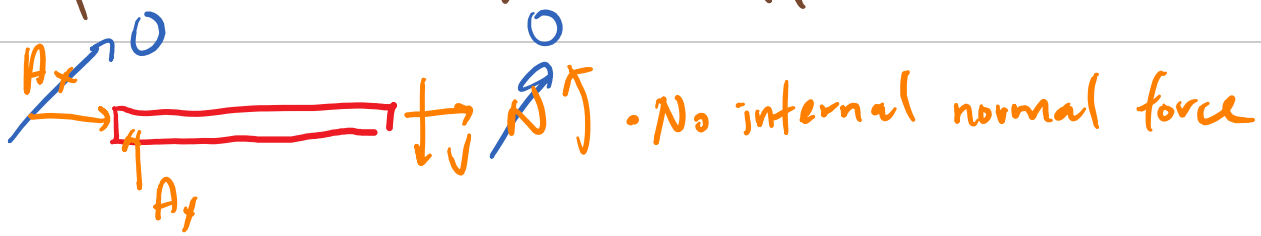


5

pin

roll.

fixed.

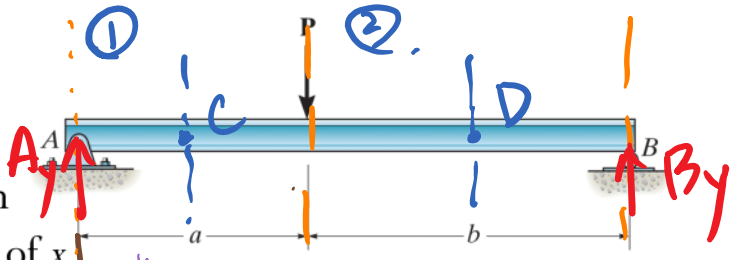


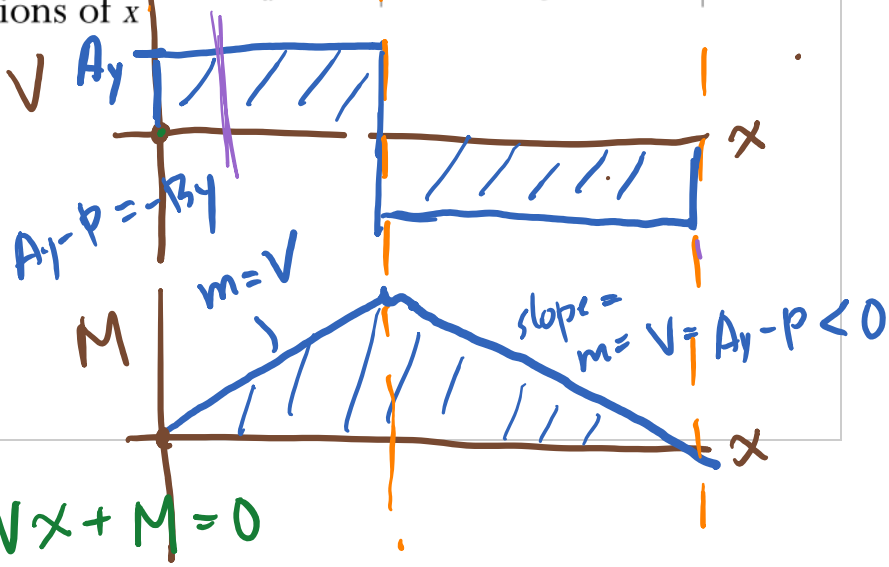
Shear and Moment Diagram

Goal: provide detailed knowledge of the variations of internal loadings (V and M) throughout the beam

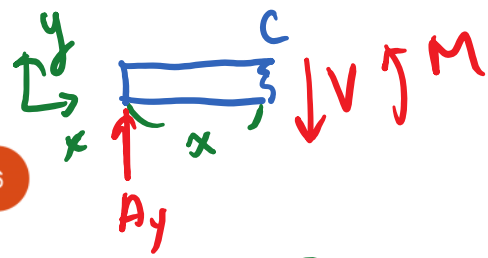
Procedure

1. Find support reactions (free-body diagram of entire structure)
2. Specify coordinates x
3. Divide the beam into regions
4. Draw FBD of a segment
5. Apply equations of equilibrium to derive V and M as functions of x





FBD ①

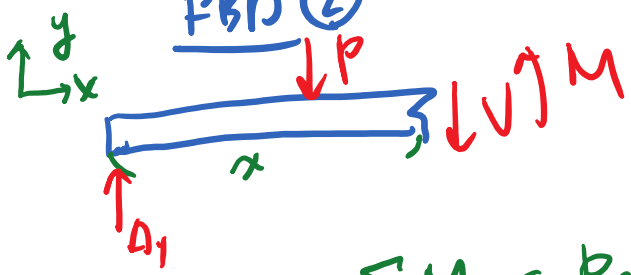


EoE ①

$\Sigma F_y = A_y - V = 0$ $\quad \Sigma M_A = -Vx + M = 0$

$\boxed{V = A_y}$ $\quad \boxed{M = Vx}$

FBD ②



EoE ②

$\Sigma F_y = A_y - P - V = 0$

$\boxed{V = A_y - P}$

$\Sigma M_A = -Pa - Vx + M = 0 \Rightarrow \boxed{M = Pa + Vx}$