Arch 314
Structures I

Fall 2025 Recitation 004

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TAUBMAN COLLEGE

GSI Info :)

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Office Hours: By Appointment
Studio Location: Reassembled (Comerci)

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Recitation 004

Welcome to session 2!

- Quick Recap of this week's lectures
- Homework #3 Review (Moment of a Force)
- Lab: Moment of a Force

Feel free to ask questions anytime

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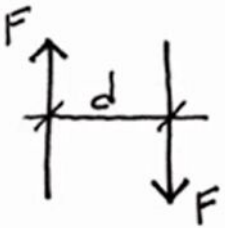
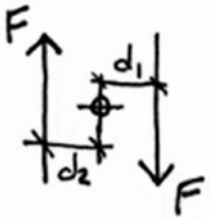
Lecture: Moment of a Force (09/08)

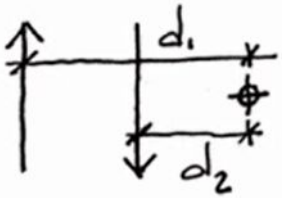
Force Couple



$M = F \times d$



$M = F \times d1 + F \times d2$
$= F \times (d1 + d2)$
$= F \times d$



$M = F \times d1 - F \times d2$
$= F \times (d1 - d2)$
$= F \times d$

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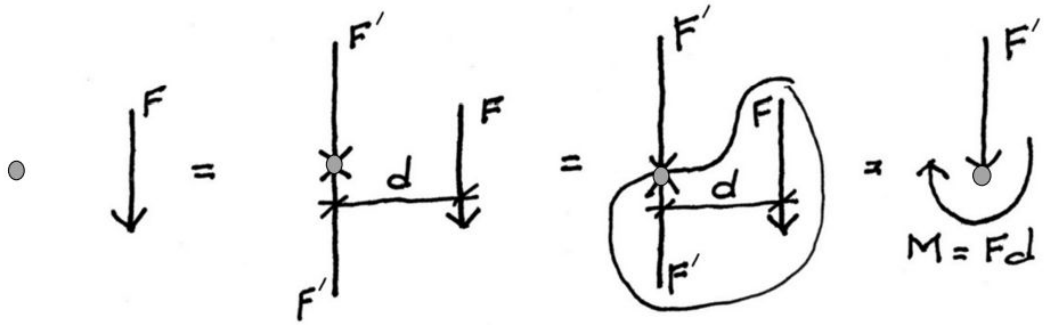
Lecture: Moment of a Force (09/08)

Replacement of a force by a force + a couple



A force can be replaced (represented) by an equal force shifted some distance plus the moment of the original force times the shifted distance.

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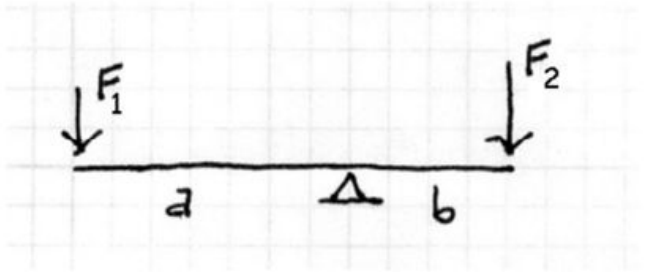
Lecture: Static Equilibrium (09/10)

Archimedes Lever

Two forces will balance at distances reciprocally proportional to their magnitudes.

$$\mathbf{F}_1 \times a = \mathbf{F}_2 \times b$$

$$\mathbf{F}_1 = \mathbf{F}_2 \frac{b}{a}$$



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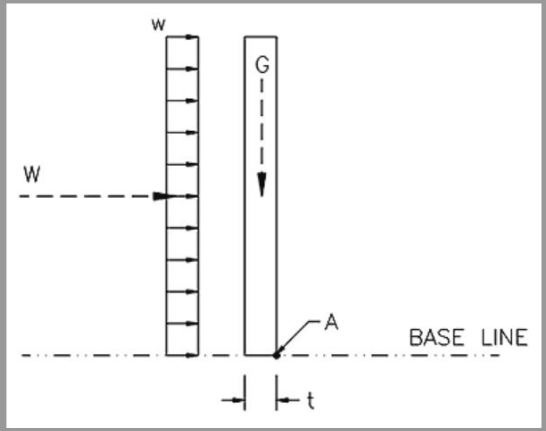
HW #3: Moment of a Force

3. Moment of a Force

Find the total wind force (W) in LBS normal to the wall that would cause an overturning moment equal to the resisting moment from gravity (G).

DATASET: 3 -1- -2-

Wall thickness	20 IN
Density of wall	160 PCF
Height of wall	15 FT



#	Question	Your Response	Correct Answer	Score
1	Total weight of 1 linear foot length of wall (G)	4000 PLF	4000 PLF	5
2	Moment arm length for resisting gravity moment	10 INCH	10 INCH	5
3	Resisting moment of 1 linear foot length of wall about point A (absolute value)	3333 FT-LBS	3333.33 FT-LBS	5
4	Moment arm length for overturning wind moment	7.5 FT	7.5 FT	5
5	Overturning wind force W acting on a 1 linear foot length of wall area	444.44 LBS	444.444 LBS	5
6	Wind pressure on wall	29.63 PSF	29.6296 PSF	5

Current Score: 30 / 30

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HW #3: Moment of a Force

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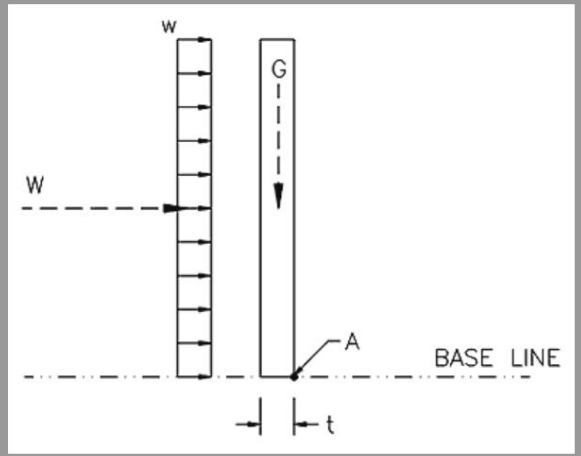

1. Total weight of 1 linear ft length of wall (G)

$\rho = \frac{M}{V} \rightarrow M = \rho \cdot V$

$W_{wall} = 160\ PCF \times \left(\frac{20"}{12"} \times 15'\right)$

(thickness; height; density; unit conversion)

$= 4{,}000\ PLF$

2. Moment arm length for resisting gravity moment

thickness → $\frac{t}{2} = \frac{20"}{2} = 10"$

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HW #3: Moment of a Force

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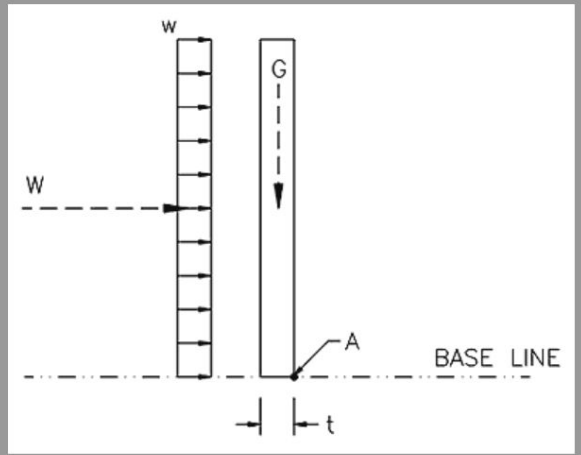

3. Resisting Moment of 1 linear ft length of wall about point A (absolute value)

$M_A = W \times E$ ← Moment Arm from #2

W ← Total weight from #1

$= 4{,}000\,PLF \times \frac{10''}{12''}$ ← convert inches to feet

$= 3{,}333.33\ ft\text{-}lbs$

4. Moment arm length for overturning wind moment

W → $\frac{h}{2} = \frac{15'}{2} = 7.5'$

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HW #3: Moment of a Force

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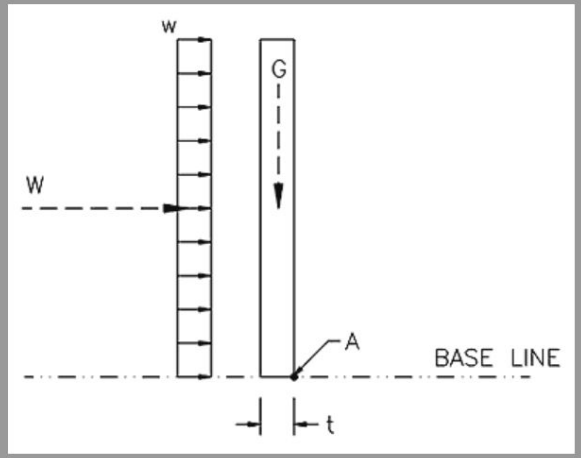

5. Overturning wind force W acting on a 1 linear ft length of wall area →

$M_R = W \times \frac{h}{2} \rightarrow W = \frac{2M_R}{h}$

Resisting moment from #3

$W = \frac{2(3,333.33 \text{ ft/lbs})}{15'} = \boxed{444.44 \text{ lbs}}$

6. Wind pressure on wall

Wind pressure = $\frac{W}{h}$ ← wind force / ← wall surface

$= \frac{444.44}{15'}$ ← wind force from #5

$= \boxed{29.63 \text{ PSF}}$ ☺

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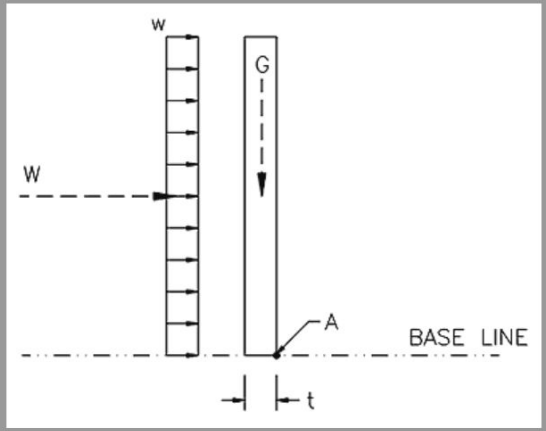

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LAB!

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