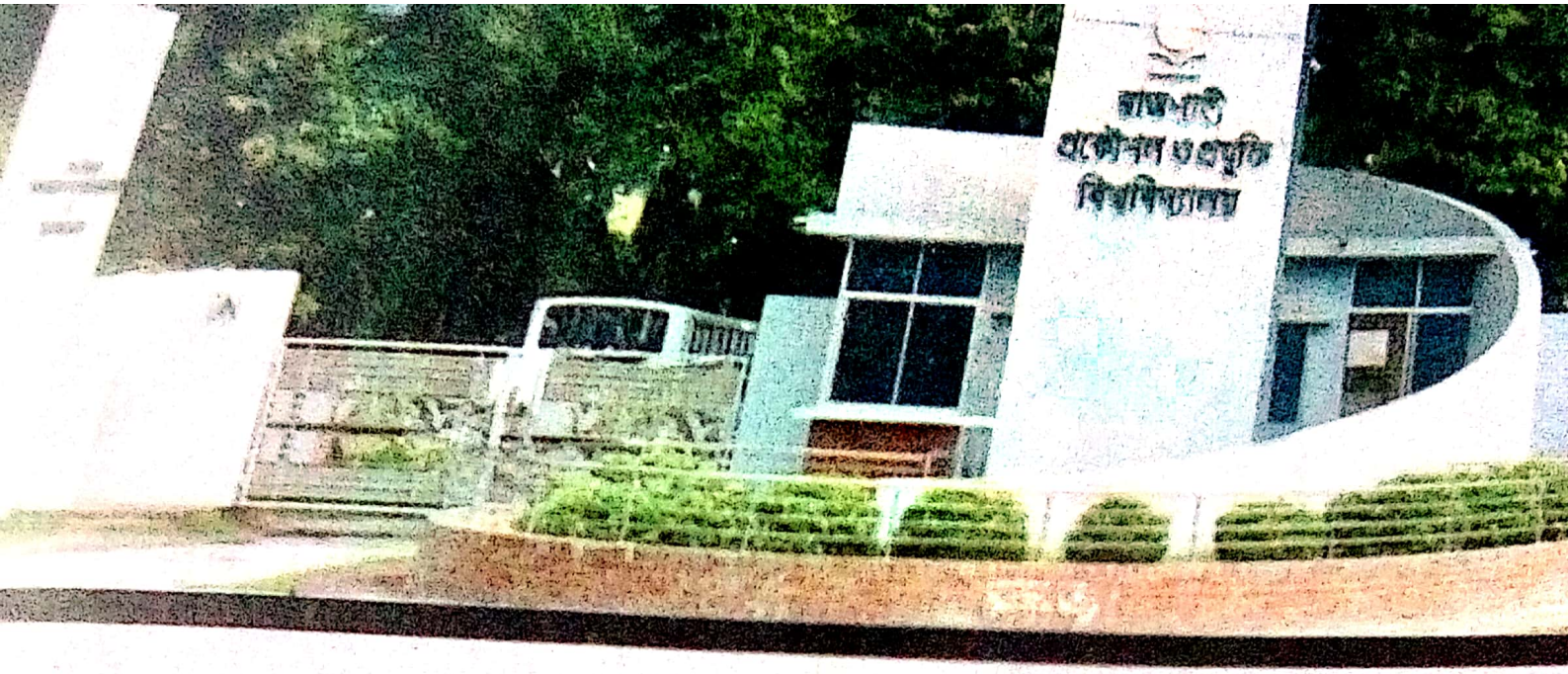


Name:....Noushin...Tabassum...Tasnim.....

Roll:.....1800130.....

25/01/2020

Fluid Mechanics

↳ behaviour of fluid or movement of fluid.

Fluid:

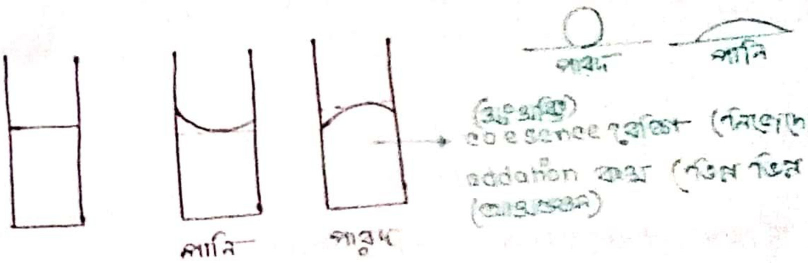
Fluid is a substance which is capable of flowing.

Ideal Fluid: flow হওয়ার সময় কোন বাধা পায় না। Viscosity = 0. } Surface tension = 0 }

Real Fluid:

Viscosity বেশি হলে fluid কম flow করবে।

→ fluid friction (একটি স্তর আরেকটি স্তরের যে বাধার সৃষ্টি করে)



(সংসক্তি) cohesence বেশি (নিজেদের মধ্যে আকর্ষণ)
adhesion কম (ভিন্ন ভিন্ন বস্তুর আকর্ষণ)
(আসঞ্জন)

Surface tension থাকলে flow কমে যায়।

Substitution:

* gas → compresive
liquid → incompresive (slightly compresive) negligible

1. Hydro statics (স্থির অবস্থায় থাকে)
2. Dynamas Kinematics (move করবে) (অন্য property consider হবে) Hydrolics → water
3. Dynamics (move করবে → force, velocity, acceleration consider করা হবে)

01/02/2020

Dimension and unit:

→ measurable quality যেকে well-acceptable কিছু কিছু পরিমাণ। (m, ft, kg, ...)

→ measurable quality of a substance.

Dimension is the measurable quality of a substance.

unit weight : Unit আয়তনের ওজন।

পানির unit weight = 1000 kg/m³. → Unit weight of water

= 1000 kg/m³

= 62.4 lb/ft³

= 1 gm/cc

Specific gravity: কোন পদার্থ 4°C পানির তুলনায় কতটুকু ভারী।

Compresibility:

পানি খুবই কম compresive → negligible.

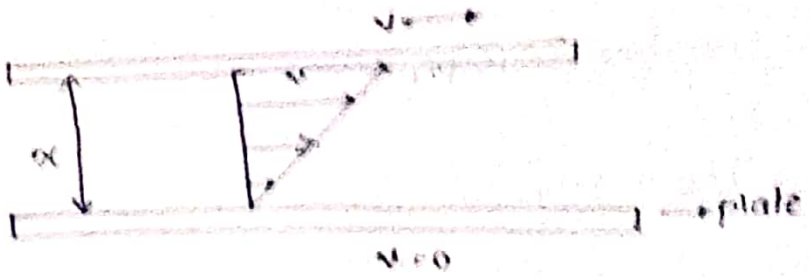
যেকোন পদার্থের চাপ দিলে তাতো compress হবে কথা সেই প্র

Co-efficient of compresibility: → কতটুকু compress হলো / original volume

$$\text{Bulk} = \frac{1}{\text{compresibility}}$$

modulas of elasticity

Viscosity:



Newton's law of viscosity:

Absolute viscosity

$\mu = \frac{\tau x}{v}$ → co-efficient of viscosity (dinamic)

$\tau = \frac{\mu v}{x}$

shearing stress (τ) (কর্তন)

$\nu = \frac{\mu}{\rho}$ → static viscosity

Force, $P = \tau A$

Rajul

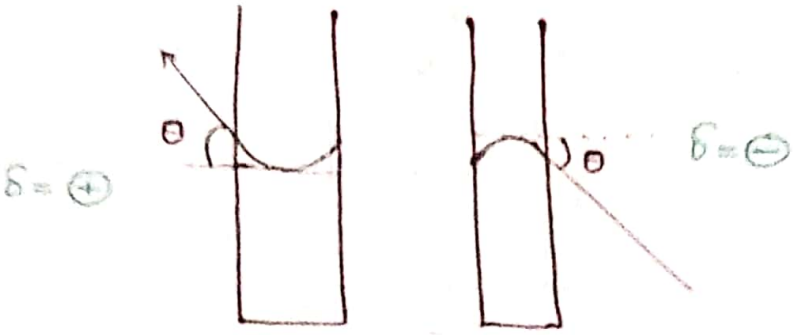
Effect of temperature on vescosity and pressure on viscosity:

temp ⟶ liquid ⟶ viscosity কমে
gas ⟶ " বাড়ে (momentum বেড়ে যায়)

pressure ⟶ তেমন effect নেই।

Surface tension

Capilarity



$$h = \frac{4\sigma\cos\theta}{\omega d}$$

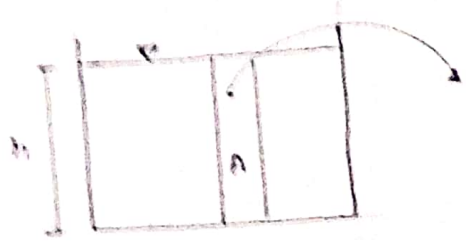
δ = surface tension per unit length

(prove করতে হবে)

6mm এর কম usable না

Fluid statics

unit pressure
pressure head



সম্পূর্ণভাবে pressure দেয়া
(water যদি সিলিন্ডারাকৃতি থাকে)

$V = Ah$

Drama
Drama

weight, $w = \gamma(Ah)$
$= \gamma V$

Total force, $P = \gamma Ah$

$P = \frac{\gamma Ah}{A}$

$= \gamma h$

$\Rightarrow \boxed{h = \frac{P}{\gamma}} \rightarrow \frac{P}{62.4} \rightarrow \frac{P}{13.6 \times 62.4}$

(water) (Heavy)

$h = ?$ ft p water

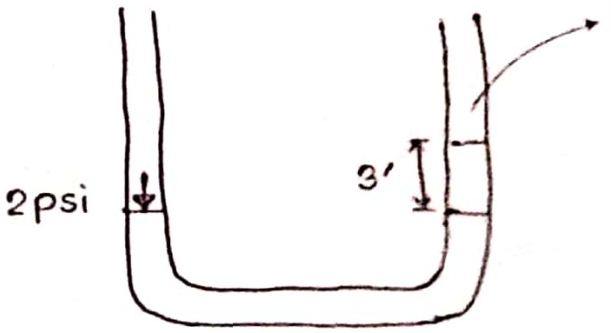
$\begin{cases} lb/ft^2 \\ kg/m^2 \end{cases}$

Pascal's Law:

Atmospheric pressure:

15/02/2020

Pressure head:



H = 3' of water (Ans)

P বেশি → H বেশি

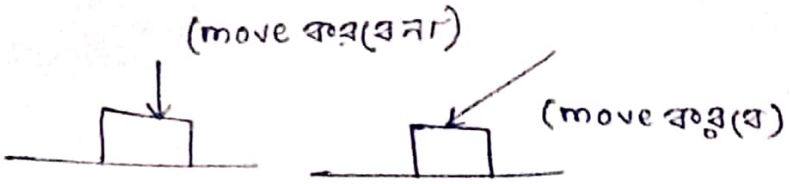
$P = \gamma H$, $P \propto H$

পারদের specific gravity বেশি, পানির তুলনায় একই pressure এ কম height উঠবে,

sp. grn. = 13·6

$\gamma \propto \frac{1}{H}$

Pascal's law: Static অবস্থায় pressure সবদিকে সমভাবে ক্রিয়া করে।



rest-এ থাকলে সব সমভাবে থাকতে হবে।

17/02/2020

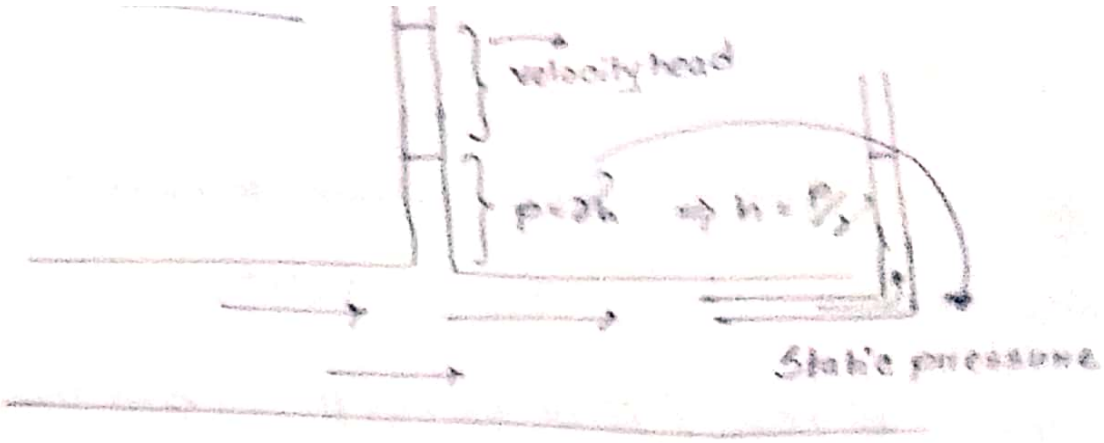
Atmospheric Pressure:

1 sq in. এর একটা column বায়ুমণ্ডলের শেষস্তর পর্যন্ত পৌঁছালে ঐ বায়ুর আয়তন যে স্তরের জন্য চাপ প্রয়োগ করবে।

At. pressure = 14.7 psi / 76 cm hg / 34 ft (theoritically)

error = 8 ft [কিছু energy loss হবে]
↳ friction
pipe এর dia change
dust in pipe

practicaly → 26'

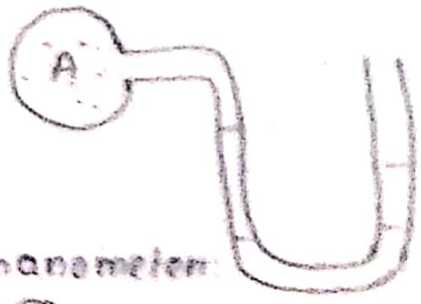


Pressure measurement: /Gage:

✓ Boordon pressure gadge: (প্রেসার মিটার)

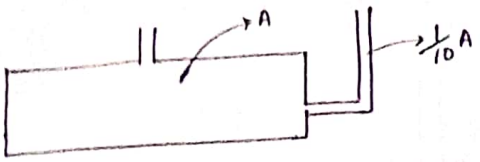
* Manometer: height of liquid measure করা হয়

* piezometer:



* Differential manometer:

* Single column:

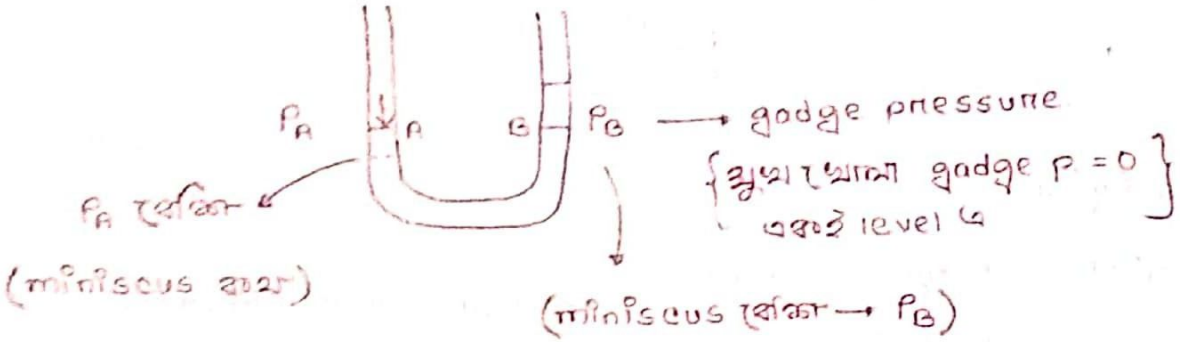


Manometer liquid:

P বেশি ⟶ hg use করব
P কম ⟶ water " "
} measure করার সুবিধার জন্য

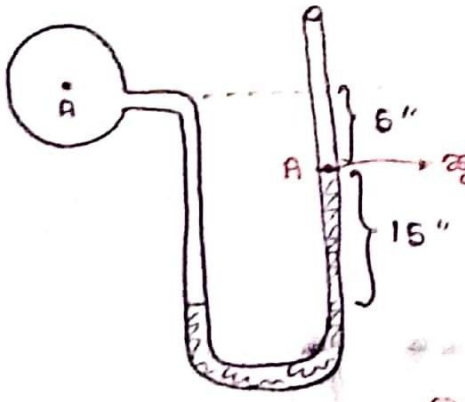
22/02/2020

* pressure ⟶ gadge pressure
* absolute pressure ⟶ almospheric pressure (14.7 ± gadge pressure)



Prob: 2.46

{ tube এর একমুখ খোলা ⟶ যেকোন জায়গা থেকে (specially খোলা মুখ) শুরু করুক।
. . . বন্ধ ⟶ যেকোন জায়গা থেকে



F.P.S ⟶ $\gamma = 62.4 \text{ lb/ft}^3$

$P = \gamma h$

(i) liquid এর tube এর মধ্যে চলবে
(ii) liquid change level এ আসবে
(iii) tube এর উপরে/নীচে নামতে পারবে
Pressure কোথা ⟶ ⊕ (নীচে)

pressure, $p = 0 + (13.6 \times 62.4) \times \frac{15}{12} - 62.4 \times \frac{(6+8)}{12} = P_A$

[illegible] [illegible]

(A point is gauge p = 0)

$\therefore P_A = 957 \text{ lb/ft}^2$ (Ans)

psi ⟶ $\frac{957 \text{ lb}}{12^2 \text{ in}^2}$

Prob: 2.50

24/02/2020

Prob: 2.35

Temp 70°F এ পেয়েছি তাই এর pressure ও countable হবে (unit weight considerable)

$\gamma = w = 0.075$ lb/ft

Temp 0°F হলে, $\gamma = 0$

তাহলে কম pressure দেয়া হলেও air এর weight consider করা লাগবে।

water → 9.79 (m
→ 62.4 (FP

$$\rightarrow \quad 0 + (9.79 \times 13.6)\, y - 9.79 \times (1+2) - (0.82 \times 9.79) \times (5-2)$$

$$= 30$$

$\Rightarrow y = ?$

Prob: 2.23

aneroid barometer ⟶ atmospheric pressure এপর্যন্ত
⟶ gauge ও যাইবে

$P_A = 12$ psi

$P_B = 20$ psi

We know,

$$p = \gamma h$$

$$\rightarrow h = p/\gamma$$

here,

$\gamma = \gamma_{Hg}$ [আপেক্ষিক pressure নেওয়া হয়েছে]

$\gamma_{Hg} = 13.6$

(13.6×62.4)

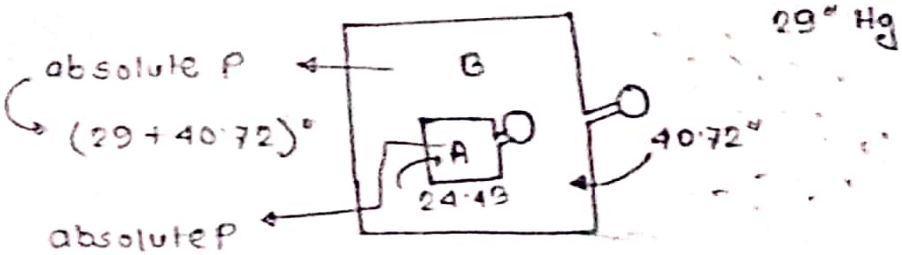
$\therefore P_A = \gamma_{Hg} h_A$

$\Rightarrow P_A = 24.43$ inch of mercury

$P_B = 40.72$ inch of Hg

$h_A = 24.43$ inch
$h_B = 40.72$ inch

বাইরে
29" Hg



Absolute Pressure at A = 29 + 40.72 + 24.43 psi

Prob: 2.28

specific weight থাকলে γ নিয়ে চাপ নিতে সুবিধা।

specific weight = unit weight.

$$15 \times 12 + 0.075 \times 2 + \gamma_{oil} \times 1 = P_B$$

$$P_B + 1 \times \gamma_{oil} + 62.4 \times 2 = P_C$$

here,

$$P_C = P_B - 1.25$$

Prob: 2.30

$$0 + (0.83 \times 9.79) \times H - (0.83 \times 9.79) \times (2-0) = 35$$

$$\Rightarrow H = ?$$

19/02/2020

■ Hg-র স্পেসিফিক গ্র্যাভিটি 13.6 হলে এর আপেক্ষিক ওজন কত?

→ 62.4×13.6 পাউন্ড/ফুট³ (FPS)

9.79×13.6 → (MKS)

Prob: 2.33

| $P_C = 18.82$
| $P_B = 13.80$

① → $P_A + 0 + 9.79 \times \frac{50}{1000} = P_C$

$\Rightarrow P_A = ?$

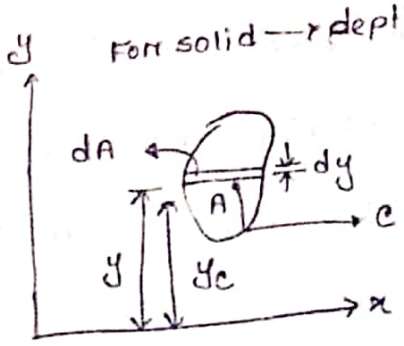
② → $P_A + 0 + 9.79 \times \frac{(50-h)}{1000} + 0.8 \times 9.79 \times \frac{h}{1000} = P_B$

$\Rightarrow h = ?$

Force on Submerged Surface.

$p = \gamma h$

load = $P \times A$



depth → water → উপর থেকে নিচে

Horizontal:

$y = y_c \quad [h = h_c]$

$F = PA$

$= \gamma h A$ [এই γ ↓ ω]

$\boxed{F = \gamma h_c A}$

$y \to h$ এই

Vertical:

$F = \omega \int y dA$

$\Rightarrow \boxed{F = \gamma \int h dA}$

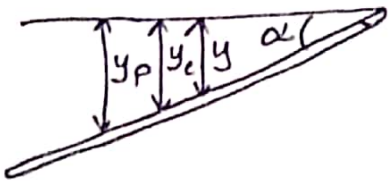
$\boxed{F = \gamma h_c A}$

$\bar{y} = y_c = \dfrac{\int y dA}{A}$

$\Rightarrow \int y dA = A\bar{y}$

$= y_c A$

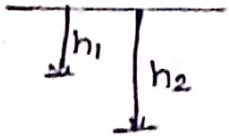
Inclined:



$\boxed{F = P_{cg} A}$

$y_p \to$ center of pressure.

$F = \gamma h_{cg} A \Rightarrow F = P_{cg} A$

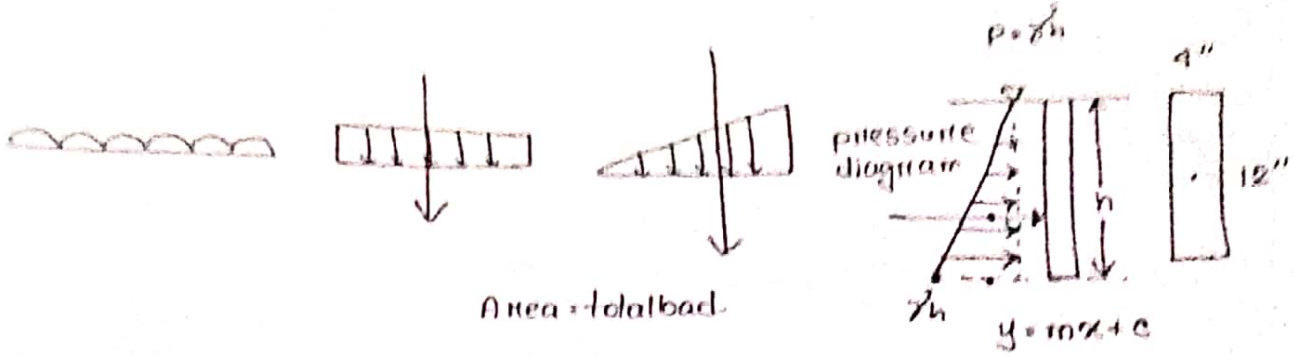


$P = \gamma h_1$

$P = \gamma h_2$

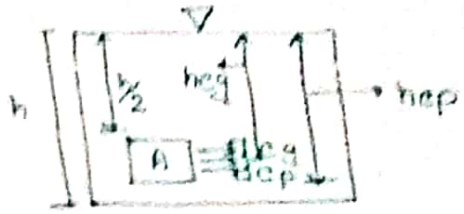
$P = \gamma h_c$

→ Force সবসময় same থাকে।



central pressure formula:

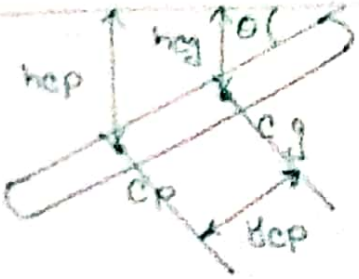
$$h_{cp} = h_{cg} + \frac{I_{cg}}{I_{cg} A}$$



cp & cg एक साथ नहीं

$$y_{cp} = \ominus \frac{I_{xx} \sin\theta}{h_{cg} A}$$

$$F = \gamma h_{cg} A$$



θ = 90° → vertical

$(y_{cg} - y_{cp})$