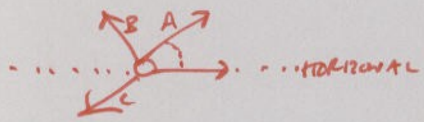
SOH CAH TOA

$\sin \measuredangle = \frac{O}{H}$ $\cos \measuredangle = \frac{A}{H}$ $\tan \measuredangle = \frac{O}{A}$

- TO FIND MAG. & DIRECTION OF RESULTANT FORCE



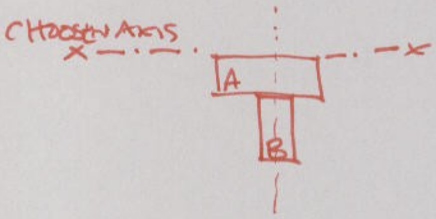
$\Sigma_H = 0$ $\Sigma_V = 0$

FORCE	H	V
A	+	+
B	−	−
C	+	+
	=	=

=

FIND USING TRIG

- TO FIND CENTROID OF COMPLEX SHAPE



ZONE	AREA	$\bar{y}$	STAT MOMENT $= A \cdot \bar{y}$
A	#		
B	#		
	=		=

TOTAL ÷ TOTAL = DISTANCE FROM CHOOSEN AXIS

$\bar{y}$ = DISTANCE FROM OBJECTS (ZONES) CENTER TO AXIS

- MOMENT OF INERTIA

$\frac{bd^3}{12}$ FOR RECTANGULAR SHAPES ABOUT CENTROID $\frac{bd^3}{3}$ FOR RECTANGLES ABOUT BASE

FOR COMPLEX SHAPES (FIND CENTROID OF ENTIRE SECTION FIRST)

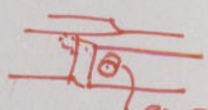
$\Sigma_{\text{OF EA. ZONE}} \Rightarrow I_O + Ay^2$ OF EACH ZONE ADDED UP

WHERE: I_O = MOMENT OF INERTIA FOR EACH ZONE

A = AREA OF EACH ZONE

y = DIFFENCE BETWEEN CENTROID OF SECTION & CENTROID OF EA ZONE.

- FIND UNIT STRESS (BE IT TENSION  COMPRESSION  OR SHEAR



$f = \frac{P}{A}$ WHERE f = UNIT STRESS

P = FORCE BEING APPLIED

A = AREA OF CROSS SECTION

- FIND THE DEFORMATION OF A MEMBER, SHAPE, BAR, ET.

$$\Delta = \frac{P \cdot L}{A \cdot E}$$

WHERE:
- Δ IS THE DEFORMATION
- P IS FORCE APPLIED
- L IS LEGTH OF ORIGINAL SHAPE OR BAR
- A IS AREA OF CROSS SECTION
- E IS MODULAS OF ELASTICITY. STEEL IS 29,000000

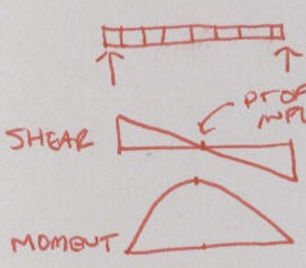
- FIND (DEFORMATION) CHANGE IN LENGTH DUE TO TEMPERATURE

$$\Delta = \varepsilon \cdot L \cdot \Delta_t$$

WHERE:
- Δ IS CHANGE IN LENGTH
- ε IS COEFFICENT OF THERM. EXP.
- L IS ORIGINAL LENGTH
- Δ_t IS TEMPERATURE CHANGE

- FIND QUICK MAX MOMENT:

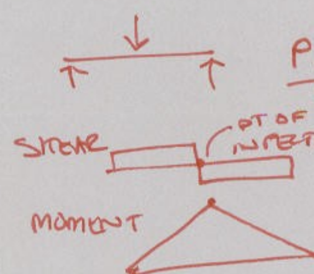
UNIFORM LOADED BEAM



$$\frac{wl^2}{8} = M_{MAX}$$

$$\text{DEFLECTION} = \frac{5wl^4}{384EI}$$

POINT LOAD BEAM



$$\frac{Pl}{4} = M_{MAX}$$

DEFLECTION: $\frac{Pl^3}{48EI}$

*DEVIDE SHEAR BY W TO FIND INFLECTION PT.

- FIND BENDING STRESS:

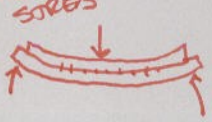
$$f_b = \frac{M}{S} \quad \text{OR} \quad f_b = \frac{M \cdot c}{I}$$

WHERE
- M = MAX MOMENT (BENDING)
- S = SECTION MOD. $\left(\frac{I}{c}\right)$
- C = DISTANCE FROM FIBER IN QUESTION TO NEUTRAL AXIS
- I = MOMENT OF INERTIA (FOR RECT. $I = \frac{bd^3}{12}$

* SECTION MODULAS CAN ALSO BE $S = \frac{bd^2}{6}$

- FIND HORIZONTAL SHEAR STRESS:

HORIZONTAL SHEAR STRESS → $f_v = \frac{3V}{2bd}$ ← MAX SHEAR

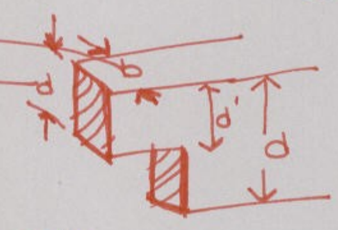


- CHECK ALL WOOD BEAM NOTCHES FOR HORIZONTAL SHEAR

$$f_v = \frac{3V}{2 b \cdot d} \times \frac{d}{d_1}$$

WHERE d = TOTAL DEPTH OF BEAM
d' = ACTUAL DEPTH OF BEAM AT NOTCH

* TRICKY.



- TO FIND BEARING AREA ON A POST OR JACK STUD.

TAKE THE END REACTION IN SHEAR = V
DEVIDE BY $F_{c\perp}$ (ALLOWABLE STRESS PERP. TO GRAIN) =
AREA REQUIRED SO THE HORIZONTAL FIBERS OF THE BEAM DON'T CRUSH.

- CHECK STEEL BEAM FOR VERTICAL & HORIZONTAL SHEAR

$$f_v = \frac{V}{d \cdot t}$$

f_v → UNIT STRESS

WHERE V = VERTICAL SHEAR (MAX)
d = depth OF BEAM
t = THICKNESS OF WEB

- FIND SLENDERNESS RATIO OF STEEL COLUMN.

$$\frac{K \ell}{r}$$

WHERE K = ~~UNBRACED~~ EFFECTIVE LENGTH FACTOR
ℓ = UNBRACED LENGTH
r = RADIUS OF GYRATION FROM TABLES.
*USE SMALLER ONE WHEN UNBRACED LENGTH THE SAME IN BOTH DIRECTIONS

THIS CAN BE USED TO FIND ALLOWABLE STRESS IN A COMPRESSION MEMBER FROM TABLES

- GENERAL "REINFORCED" CONCRETE FORMULA.

$$M_u = \phi \cdot A_s \cdot f_y \cdot J_u \cdot d$$

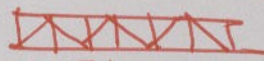
(J_u) — ALWAYS .9

WHERE M_u = ULTIMATE MOMENT CAPACITY
ϕ = .9 FOR BENDING .85 FOR SHEAR. STRENGTH REDUCTION FACTOR OF SAFETY.
A_s = CROSS SECTIONAL AREA OF RE-BAR
f_y = REBAR GRADE: YIELD STRENGTH TYP. 60,000 PSI
d = DEPTH BTW CENTER OF R-BAR TO TOP OF BEAM.

TRUSS TYPES:

PRATT  (THE REVERSE "A")

HOWE  &  WITH ADDITIONAL ANGLE BRACE.

WARREN  & 
WITH VERTICALS

~~CONCRETE~~ TYPES OF PORTLAND CEMENT:

I NORMAL

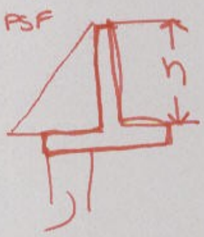
II LESS HEAT THAN I.
USED IN WARM DRY CLIMATES

III HIGH, EARLY
FAST CURE, HIGH HEAT

IV VERY LOW HEAT
GOOD FOR LARGE MONOLITHIC POURS.
SLOW CURE

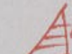
V SULFATE PROOF.

FIND LOADS ON A CANTILEVERED RETAINING WALL



FIND SOIL PRESSURE AT BASE: W · h

FIND TOTAL EARTH PRESSURE ON STEM = 1/2 W · h


AREA OF THE DIAGRAM. TOTAL AT BASE

1.5 THE MOMENT. TO RESIST OVERTURNING.

FIND BENDING MOMENT ON STEM: TOTAL EARTH LOAD × (1/3 · h) = MOMENT.