

# SUMMARY PLASTIC ANALYSIS & DESIGN

## PLASTIC MOMENT

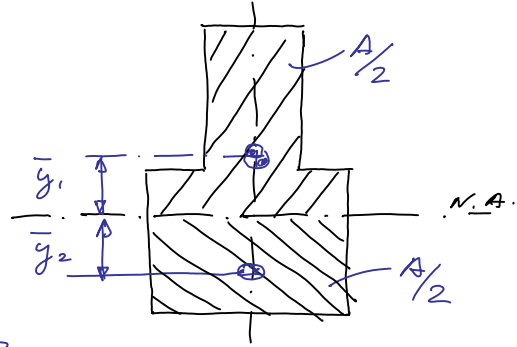
$$M_p = \frac{1}{2} A (\bar{y}_1 + \bar{y}_2) \cdot F_y$$

## PLASTIC SECTION MODULUS

$$Z = \frac{1}{2} A (\bar{y}_1 + \bar{y}_2)$$

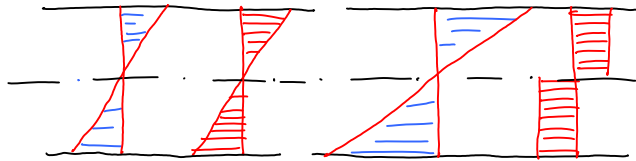
## SHAPE FACTOR

$$m = \frac{M_p}{M_y} = \frac{Z}{S}$$



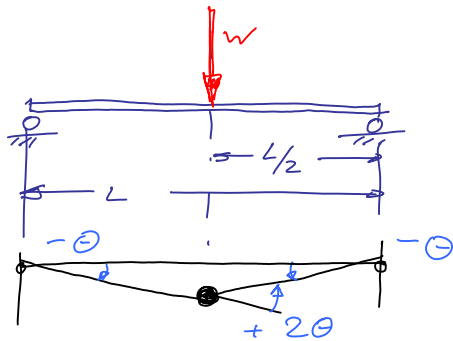
WITH  $M_y$ : YIELD MOMENT

$S$ : EL. SECTION MOD.



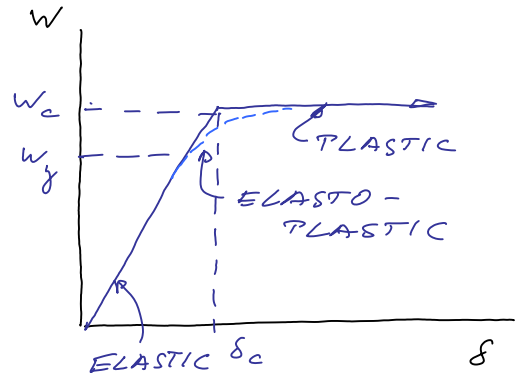
$E < E_y$   $F < F_y$   
ELASTIC

$E > E_y$   $F = F_y$   
PLASTIC (HINGE)



STATIC SYSTEM:  
S.S. BEAM

CHANGES OF GEOMETRY DURING COLLAPSE



LOAD-DEFLECTION FOR SIMPLY SUPP. BEAM

STATIC SYSTEM: EXAMPLE  
PORTAL FRAME

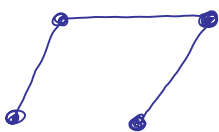
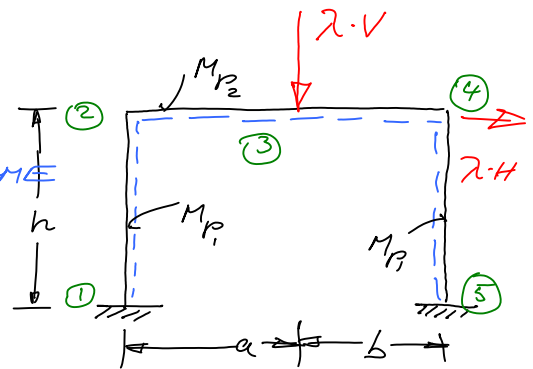
## EXTERNAL ENERGY

$$\lambda \sum (V_i \delta_i + H_j \delta_j)$$

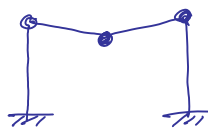
$$= \text{INTERNAL ENERGY}$$

$$= \sum M_{p_i} \theta_i$$

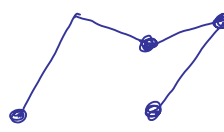
SOLVE  $\rightarrow \lambda_c$ : COLLAPSE LOAD FACTOR



SWAY



BEAM



COMBINED

COLLAPSE MECHANISMS