

BeamsDesign stepsGiven values

Assume max. permissible

bending -  $165 \text{ N/mm}^2$ Load -  $\text{UDL}$   
effective spanStep-I

Assumed self weight of the beam -

$$\frac{\text{Given load} \times L}{800}$$

Total Load - Given load + self weight of the beam.

Step-II

Determine max. Bending moment -

$$B.M = \frac{wL^2}{8} \text{ N-m} \quad [w = \text{Total Load}]$$

Step-III

Calculate section modulus from basic of bending moment

$$Z_{xx} = \frac{M}{f_b} \text{ mm}^3 \text{ or cm}^3.$$

Step-IV

Corresponding to section modulus, select a beam section and determine the values from steel table such as -

ISLB 300 @  $485.6 \text{ N/m}$ .

$$Z_{xx} = 488.9 \text{ cm}^3. \quad \text{D or B} = 300 \text{ mm}, \quad t_w = 6.7 \text{ mm}$$

$$I_{xx} = 7332.9 \text{ cm}^4$$

E always -  $2 \times 10^5$

Step - II

Shear force -

$$S.F = \frac{wL}{2}$$

where  $w$  is the

Total load + [load from steel table,  
i.e. - 485.6 N/m]

Step - III

Check for shear.

$$\text{shear stress} = \frac{S.F}{d \cdot t_w}$$

which should be less than  $\tau_{av}$ ,  
so section is safe in shear

Step - IV

Check for deflection

$$\delta = \frac{5}{384} \cdot \frac{wL^4}{EI}$$

Condition

$$\delta \leq \frac{L}{325} \text{ (mm)}$$

→  $L$  is effective spanConvert this  
into mm

So, section is safe in deflection.

⇒ check for safety or crippling -

$$\frac{S.F}{(b + k_2 \sqrt{3})t}$$

which is less than  $0.75 f_y$  (i.e.  $187.5 \text{ N/mm}^2$  for steel  
with  $f_y = 250 \text{ N/mm}^2$ )