GANTRY GIRDER NOTES

∴ Prefer my youtube video with these notes.

→ Gantry girders are the laterally unsupported beams.

→ It is a component of crane system used in factories, workshops, steel works, etc.

⇒ Components to be considered in design:

- Gantry girder
- Crane girder
- Trolley
- Crane rails.

⇒ Design steps:

① Max. wheel load:

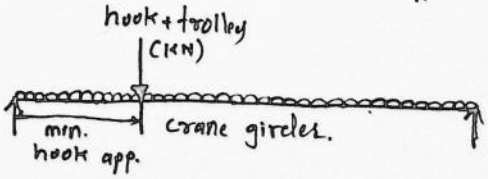
→ U.D.L. on crane girder = $\frac{\text{total wgt. of c.g.}}{\text{Span of c.g.}}$

Concentrated load = weight lifted by hook + wgt. of trolley

- This concentrated load will be placed at the min. hook approch.

→ Load on each wheel

$= \frac{\text{Max. reaction}}{2}$



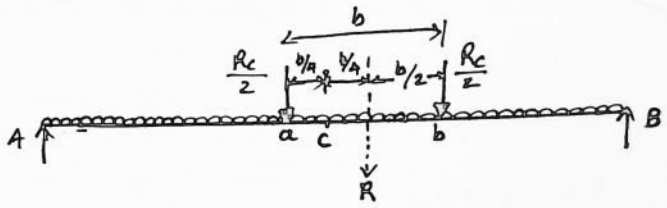
→ This wheel load is increased by 25% for impact.

(2) Max. B.M. in Gantry Girder :

→ U.d.l. on G.G. = Self wgt. of G.G. + wgt. of rail section.

→ Position of max. B.M. :

– Max. B.M. will occure at 'a'.



(3) Max. S.F. :-

→ S.F. due to wheel load is max. when one of the wheel is at support.

⇒ Braking force : 5% of static wheel load i.e. load on each wheel.

⇒ Surge load : 10% of C wgt. lifted on hook + wgt. of crab)

(4) Section selection :

→ Economic depth = $\frac{L}{12}$

→ Width of flange = $\frac{L}{40}$ to $\frac{L}{30}$

$\therefore Z_p$ req. = $K \times \frac{M_u}{f_y}$ ($\because K = 1.4$ to 1.5)

(5) Calculate I_{zz}, I_{yy} & Z_p of trial section.

(6) Check for momen capacity (IS 800:2007, P. 53, Cl. 8.2.1.2)

(7) Check for ~~moment~~ shear capacity (P.g-59, Cl. 8.4.1)

(8) Check for Buckling Resistance :

- IS 800:2007, Pg.-54, cl. 8.2.2.

(9) Check for Local Buckling :

→ Buckling resistance = $(b_1 + n_1)\, t_w \cdot f_{cd}$. (Cl. 8.7.3.1, Pg-67)

∴ Buckling resistance > Max. wheel load.

(10) Design of Weld :-

$$q_w = \frac{V \times A \times \bar{y}}{I_z}$$

∵ V = max. shear

A = Area of channel.

(11) Check for deflection :-

$$\delta_c = wL^3\left[\left(\frac{3a}{4L}\right) - \left(\frac{a^3}{L^3}\right)\right] \qquad \because a = \frac{(L-c)}{2}$$

→ Permisible deflection = $\frac{L}{750}$ [IS 800:2007, P.31, T.-6]

∴ δ_c < Permisible deflection O.K.