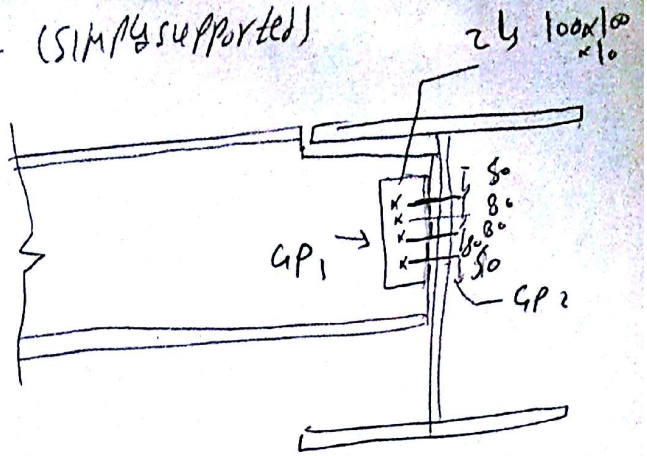
Q3

→ Connection between stringer and X-girder (simply supported)



$Q_y = 36.71$ t

using M22 (friction type)
grade 10.9

$P_s = 4.77$ t

$n = \frac{36.71}{4.77 \times 2} = 3.84$

(GP1) use 4 bolts M22 (10.9)

For GP2

$n = \frac{36.71}{4.77} = 7.7 \rightsquigarrow$ use 8 bolts

use 4 bolts M22 (10.9) per side

→ connection between X.girder and M.G (simply supported)
(Friction type)

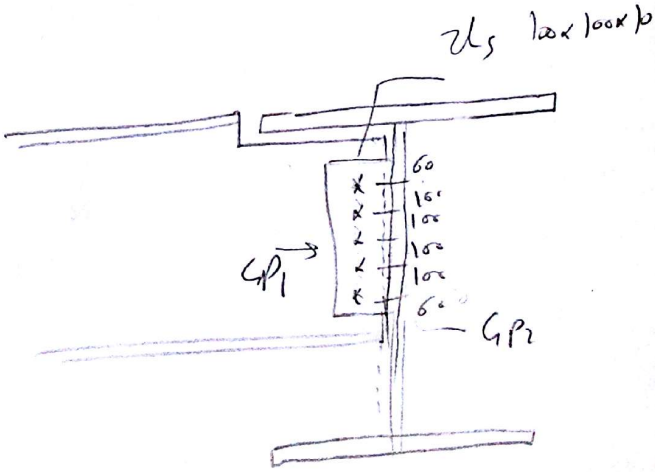
$Q_y = 71.86$ t

using M27 (10.9)

$P_s = 7.72$

$n = \frac{71.86}{7.72 \times 2} = 4.97$

(GP1) use 5 M27 (10.9)



for GP2

$n = \frac{71.86}{7.72} = 9.95$

use 10 bolts

use 5 M27 (10.9) per side

↳ connection bet. Stringer and x-Girder (simply supported)

bearing type

$Q_y = 36.71\ t$

for GP1 try M24 (10.9)

$R_{sh} = 3.53 \times 0.2 \times 10 \times 2 = 14.12\ t$

$R_b = 0.8 \times 3.6 \times 2.4 \times 1.11 = 7.67\ t$ } $\rightarrow R_{bearb} = 7.67\ t$

(e=2d)

$\therefore n = \frac{36.71}{7.67} = 4.8$

use 5 bolts M24 (10.9)

for GP2

$R_{sh} = 3.53 \times 0.2 \times 10 = 7.06\ t$

$R_b = 0.8 \times 3.6 \times 2.4 \times 1 = 6.91\ t$ (e=2d) } $\rightarrow R_{bearb} = 6.91\ t$

$\therefore n = \frac{36.71}{6.91} = 5.3 \rightarrow 6$ bolts

$\therefore$ use 10 bolts M24 (10.9) for symm. (5 bolts per leg)

→ connection between X-Girder and M.C (simply supported)

Bearing type

$Q_y = 71.86\ t$

using M27 (10.9)

for GP1

$R_{sh} = 4.59 \times 0.2 \times 10 \times 2 = 18.36\ t$

$R_b = 0.8 \times 3.6 \times 2.7 \times 1.6 = 12.44\ t$ } $\rightarrow R_{bearb} = 12.44\ t$

$n = \frac{71.86}{12.44} = 5.7$ → $t_w = 16mm < 2t_c = 20mm$

use 6 M27 (10.9)

for GP2

$R_{sh} = 4.59 \times 0.2 \times 10 = 9.18\ t$

$R_b = 0.8 \times 3.6 \times 2.7 \times 1 = 7.77\ t$

$\therefore n = \frac{71.86}{7.77} = 9.25 \rightarrow 10$ bolts

use 12 M27 (10.9) for symm. (6 bolts per leg)

Case of Cant. Stringer:-

GP3

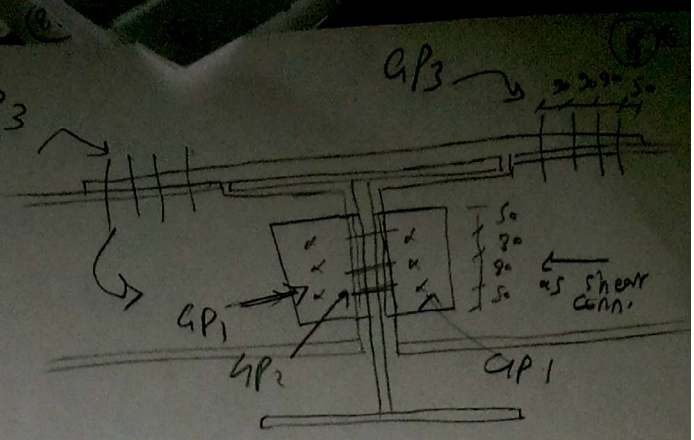
$M = 0.75 \times 22.67 = 17$ mt

$T = C = \frac{17 \times 100}{0.8 \times (55 - 1.72)} = 39.9$ t

For M 24 (10.9) $\rightarrow P_s = 5.55$ t

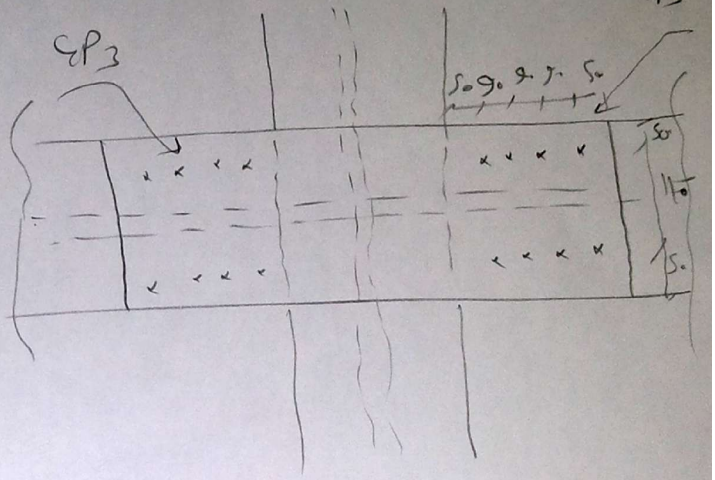
$n = \frac{39.9}{5.55} = 7.18$

use 8 bolts



(GP1, GP2 as before)

→ 4 rows 2 bolts / row



Design of Plate:-

$1.4 \times 21 \times t_p = 39.9$ t

$t_p = 1.357$ cm

Let $t_p = 1.4$ cm

Hint: Use $b_p = (21 - 2 \times 2.6)$ (d+2 mm) in case of using beams type ~~A~~ A-I