

General Check

| | | |
|-----------------------|------|----|
| S/H | 18 | OK |
| Deflection Girder | 27.0 | OK |
| Wheel Base(4 Wheel) | 4000 | NO |
| b / T4 | 41.8 | OK |

| | | |
|----------------------|-------------|----|
| S/B | 36.48648649 | OK |
| Stress Girder | 120.6 | OK |
| Rail Size Traversing | A55 | OK |
| Stress EC 8Wheel | 83.6 | OK |

| | | |
|---------------------|----------|----|
| H/B | 2.027027 | OK |
| Stress EC 4Wheel | 148.9 | NO |
| Rail Size Traveling | A75 | NO |
| Wheel Base 8 Wheel | 5600 | OK |

| | | |
|-------------------|------------|----|
| TOTAL WEIGHT 8W | 55320 | KG |
| TOTAL WEIGHT 4W | 53495 | KG |
| WEIGHT 2 X GIRDER | 42109 | KG |
| WEIGHT Legs | 8418.61488 | KG |
| WEIGHT BRIDGES | 48309 | KG |

| | | | | |
|-----------|-------|------|---|----|
| H1 / T2 | 30.0 | ---- | Dimension Check | OK |
| b / T1 | 10.0 | ---- | Dimension Check | OK |
| b / T3 | 10.0 | ---- | Dimension Check | OK |
| SLOPE | 87.7 | deg | Column cross section slope control | OK |
| S-SUT | 121.6 | Mpa | allowable stress (slenderness) | OK |
| S-BS | 159.0 | Mpa | Allowable bending stress | OK |
| f/F | 0.2 | ---- | Column stability and resistance criterion | OK |
| Stress-S2 | 15.8 | Mpa | bending stress in the larger Area | OK |
| Stress-S1 | 46.2 | Mpa | bending stress in a smalle Area | OK |

| | | | | |
|----------|------|------|------------------------------------|----|
| M 1 | 0.3 | ---- | Resistance criterion control | OK |
| M 2 | 0.3 | ---- | Control of sustainability criteria | OK |
| Fvo - S1 | 94.5 | Mpa | Shear stress in smaller section | OK |
| Fvo - S2 | 1.5 | Mpa | Shear stress in larger section | OK |
| t-1 | 25.3 | ---- | The required thickness for T1 | NO |
| t-2 | 25.3 | ---- | The required thickness for T2 | NO |
| LC | 5000 | mm | Suitable Value | OK |

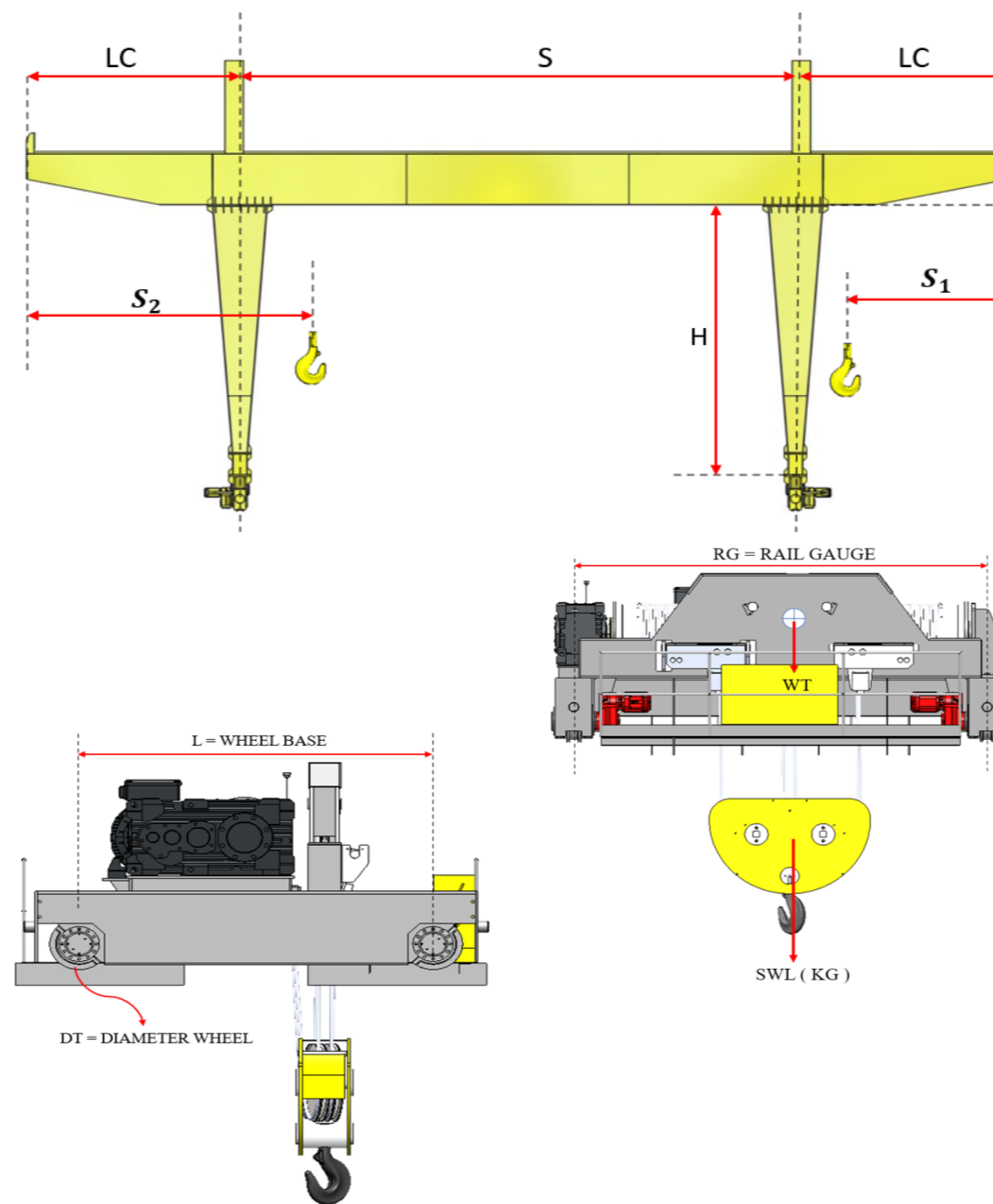
| | |
|--------------|-------------|
| COMPANY | KETAN |
| PROJECT NAME | PATEL |
| TAG NAME | KETAN PATEL |
| REVISION .DC | A |

GENERAL HOIST DATA

| | | | |
|----------|--------|-------------------------|-----|
| Q | 60 | Load | T |
| S | 27 | Span | M |
| DF | 1.15 | Dynamic factor | --- |
| WG | M5 | Working group | ISO |
| H.O.L | 16000 | Height Lift | MM |
| S1 | 1500 | Approach Side Max | MM |
| S2 | 1500 | Approach Side min | MM |
| DFG | L/1000 | Deflection Girder limit | --- |
| Material | SS400 | Material Girder | --- |

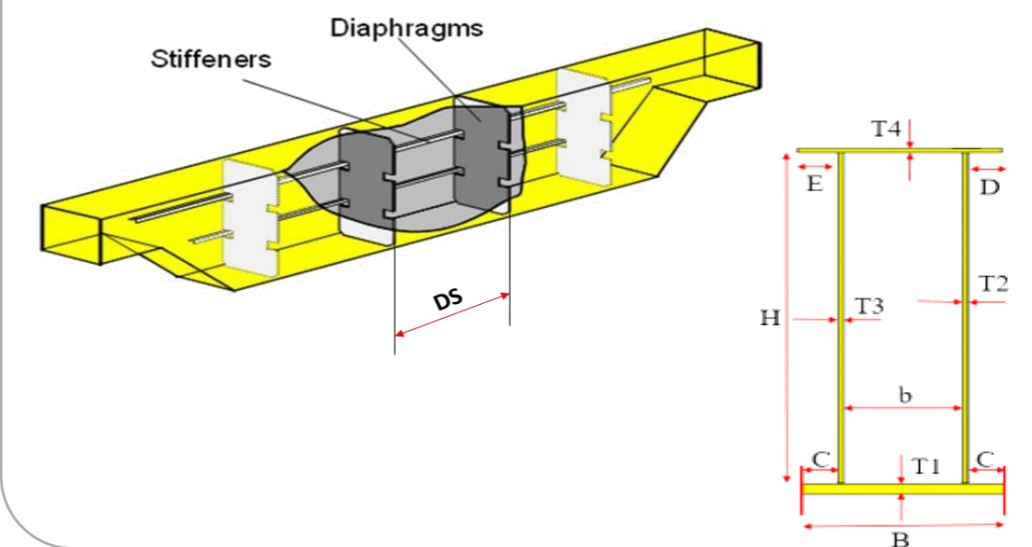
| | | | |
|---------|------|--------------------------|-------|
| NTw | 6 | No. Wheel | ---- |
| L | 2000 | Wheel base Trolley | MM |
| DT | 315 | Diameter Wheel Trolley | MM |
| TS | 20 | Trolley Speed | M/MIN |
| Wt | 4250 | Weight Trolley | KG |
| HS | 5 | Hoist speed | M/MIN |
| RTS | A55 | Rail Traversing | MM |
| MRTS | 52 | Material Rail Traversing | ST |
| RG | 3000 | Rail Gauge | MM |
| Drum | 405 | Diameter Drum Hoist | MM |
| Reeving | 8/2 | Reeving Hoist | --- |

| | | | |
|-------|------|--------------------|----|
| PS | 1500 | Power Supply | KG |
| CE | 2000 | Cubicle Electrical | KG |
| SP | 2500 | Service Platform | KG |
| CABIN | 0 | Cabin | KG |



INPUT MAIN GIRDER

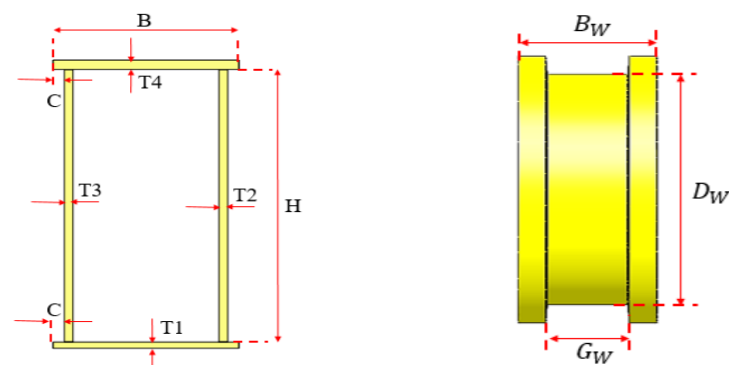
| | | | |
|-------|--------|---------------------------|----|
| H | 1500 | Height Web | mm |
| B | 740 | Width Top & Bottom Flange | mm |
| T1 | 20 | Thickness Bottom Flange | mm |
| T2 | 20 | Thickness Web 1 | mm |
| T3 | 20 | Thickness Web 2 | mm |
| T4 | 15 | Thickness Top Flange | mm |
| C | 50 | Space Flange | mm |
| D | 50 | Space Flange | mm |
| E | 50 | Space Flange | mm |
| RN | 3 | Row Number | mm |
| SF | 70X 70 | Size Stiffener | mm |
| DS | 1800 | Diaphragm Distance | mm |
| DF-TH | 8 | Diaphragm thickness | mm |
| Weld | 5 | Thickness Weld Girder | mm |



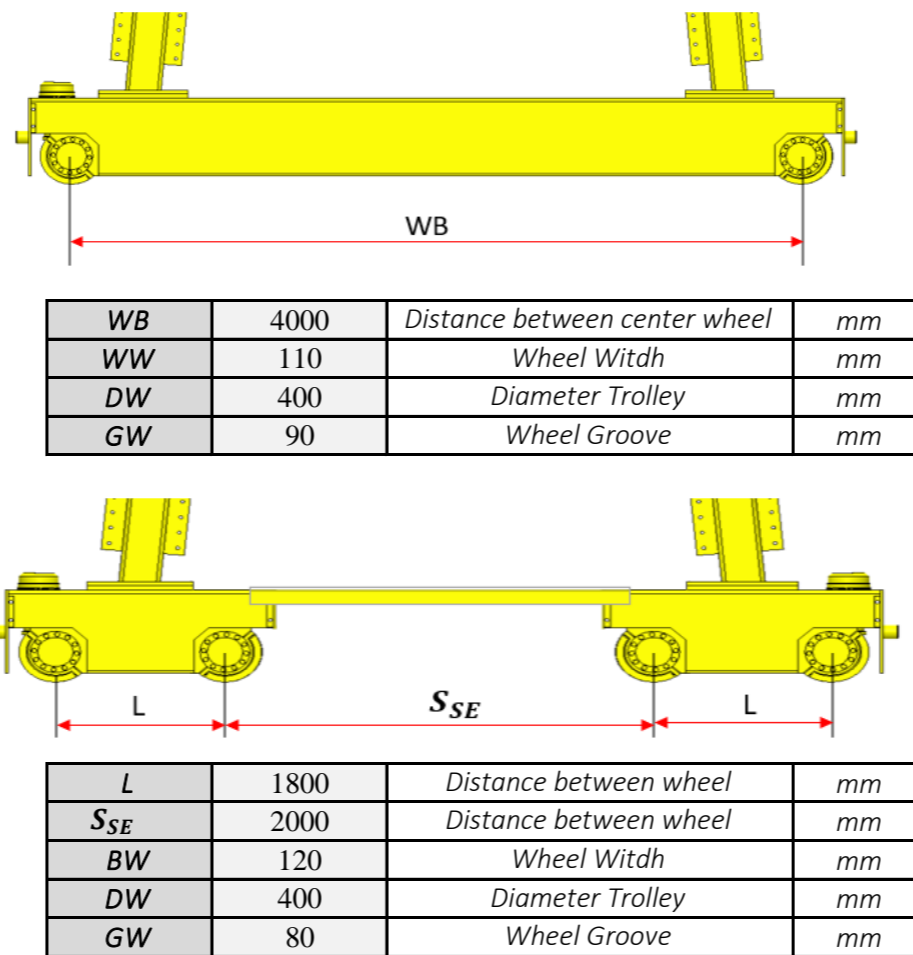
INPUT END CARRIAGE

| | | | |
|----|-----|---------------------------|----|
| H | 500 | Height Web | mm |
| B | 200 | Width Top & Bottom Flange | mm |
| T1 | 15 | Thickness Bottom Flange | mm |
| T2 | 10 | Thickness Web 1 | mm |
| T3 | 10 | Thickness Web 2 | mm |
| T4 | 15 | Thickness Top Flange | mm |
| C | 15 | Space Flange | mm |

| | | | |
|----|----|------------------------|-------|
| XC | 4 | WELD THICKNESS | mm |
| GD | A5 | Amplifying coefficient | FEM |
| BS | 63 | Bridge Speed | m/min |



| | | | |
|-----|-------|-----------------|-----|
| MR | 52 | Material (Rail) | mm |
| SKF | 22220 | Bearing | --- |
| RT | A75 | Rail Type | mm |



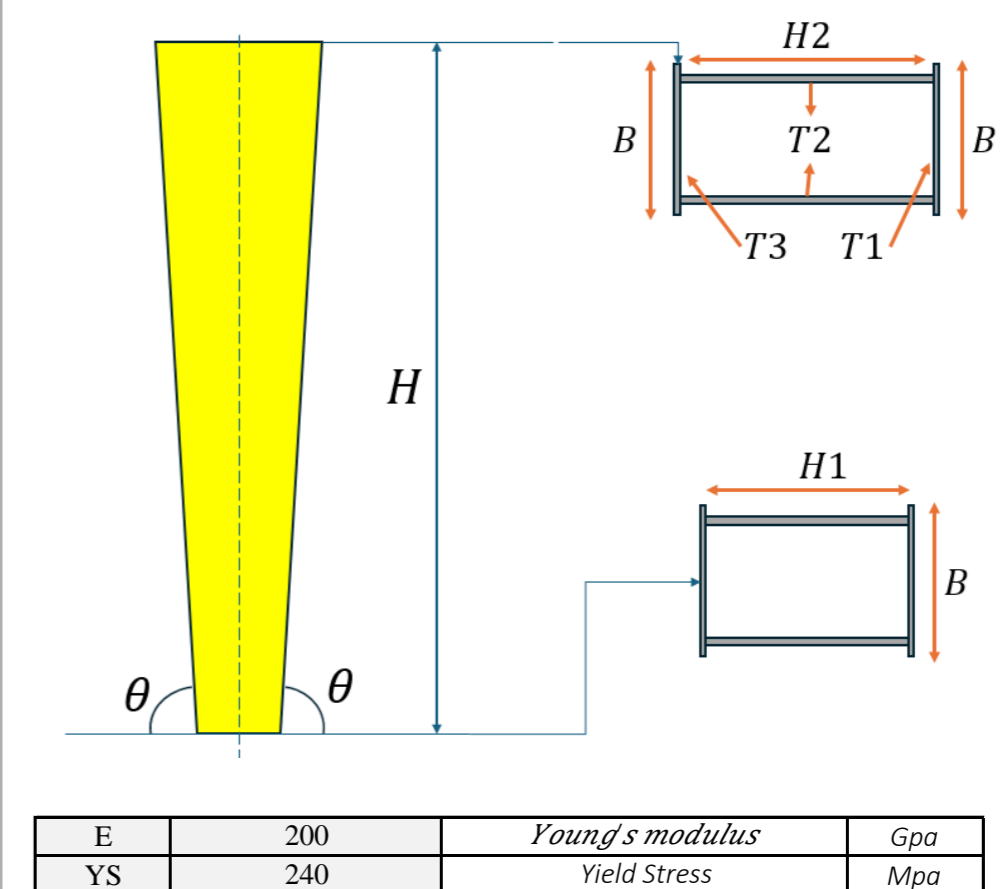
| | | | |
|----|------|-------------------------------|----|
| WB | 4000 | Distance between center wheel | mm |
| WW | 110 | Wheel Width | mm |
| DW | 400 | Diameter Trolley | mm |
| GW | 90 | Wheel Groove | mm |

| | | | |
|-----|------|------------------------|----|
| L | 1800 | Distance between wheel | mm |
| Sse | 2000 | Distance between wheel | mm |
| BW | 120 | Wheel Width | mm |
| DW | 400 | Diameter Trolley | mm |
| GW | 80 | Wheel Groove | mm |

INPUT Leg Data

| | | | |
|----|-----|-------------------------------|----|
| H1 | 300 | Height Web (Smaller) | mm |
| B | 400 | Width Flange | mm |
| T1 | 20 | Thickness Bottom Flange | mm |
| T2 | 10 | Thickness Web | mm |
| T3 | 20 | Thickness Top Flange | mm |
| H2 | 700 | Height Web = H1 or (Bigger) | mm |

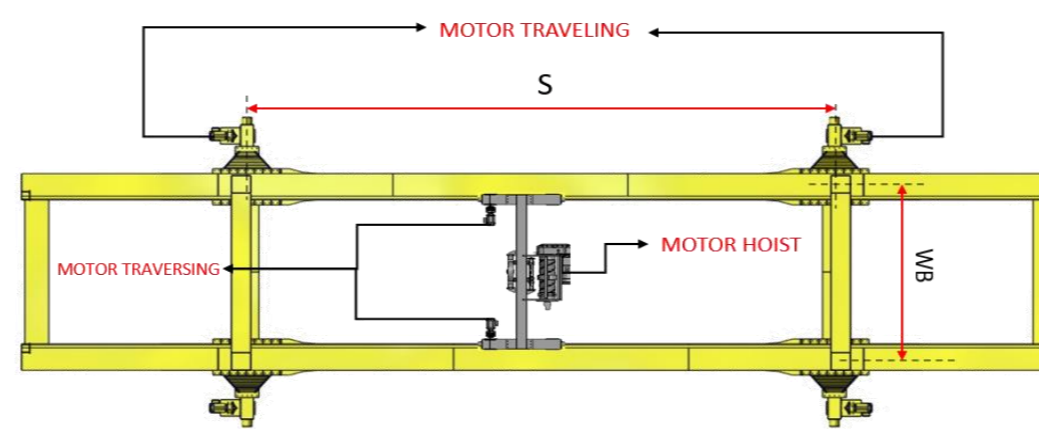
| | | | |
|----|------|-----------------|--------|
| H | 5000 | Column Height | mm |
| MC | 7800 | Material Column | kg/m^3 |



| | | | |
|----|-----|-----------------|-----|
| E | 200 | Young's modulus | Gpa |
| YS | 240 | Yield Stress | Mpa |

INPUT MOTOR DATA

| | | | |
|----|-------------|--|------|
| S3 | 0.6 | Operating mode Traveling | --- |
| S3 | 0.6 | Operating mode For Traversing | --- |
| S3 | 0.6 | Operating mode For Hoist | % |
| T | 60 | Ambient temperature | C° |
| H | 2500 | Installation altitude above sea level | m |
| f | Top Running | Rolling Friction of Drive | ---- |
| E | Sleeve | Mechanical efficiency Of Drive machinery | ---- |
| TM | AC Inverter | Type Of Motor | ---- |
| TC | Inverter | Type of control | ---- |
| RS | 3000 | Speed Range | ---- |



Dimension Check

General Check of Dimensions :

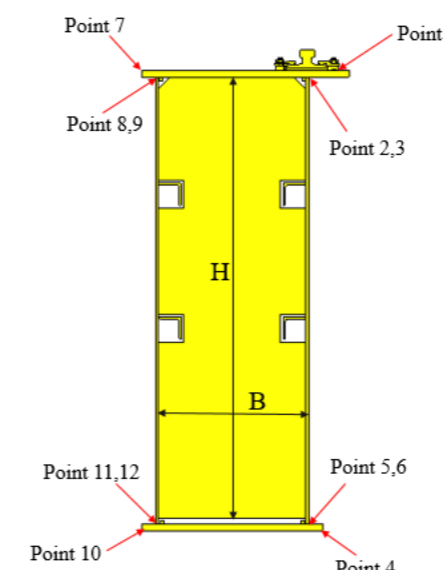
| | | | |
|-----------------|---------|----|------|
| S/H < 25 | 18090.5 | OK | CMAA |
| S/B < 65 | 21054.5 | OK | CMAA |
| 1.6 < H/B < 2.7 | 42108.9 | OK | CMAA |
| b / T4 < 39 | 40.0 | OK | CMAA |

Girder Section Properties :

| | | |
|----|---------------|------|
| Ix | 26074552136.4 | mm^4 |
| Iy | 6949903333.3 | mm^4 |

Elastic section modulus :

| Point | Sx | Sy |
|-------|----------|----------|
| 1 | 32672470 | 18783523 |
| 2 | 33298333 | 21718448 |
| 3 | 33298333 | 21718448 |
| 4 | 35382133 | 18783523 |
| 5 | 36369164 | 21718448 |
| 6 | 36369164 | 21718448 |
| 7 | 32672470 | 18783523 |
| 8 | 33298333 | 21718448 |
| 9 | 33298333 | 21718448 |
| 10 | 35382133 | 18783523 |
| 11 | 36369164 | 21718448 |
| 12 | 36369164 | 21718448 |



Live Load Deflection :

| | | |
|-----|------|----|
| LLD | 23.6 | mm |
|-----|------|----|

Dead Load Deflection :

| | | |
|-----|------|----|
| DLD | 10.8 | mm |
|-----|------|----|

Camber :

| | | |
|--------|------|----|
| CAMBER | 22.6 | mm |
|--------|------|----|

Deflection Max :

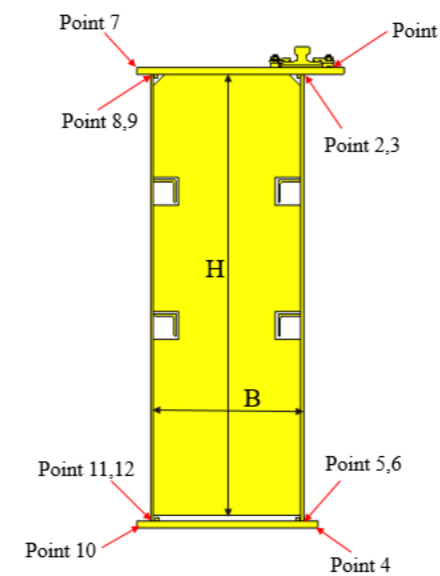
| | | |
|-----|------|----|
| DFL | 27.0 | mm |
|-----|------|----|

Check Dimension :

| | | |
|------|------|----|
| CMAA | 27.0 | OK |
|------|------|----|

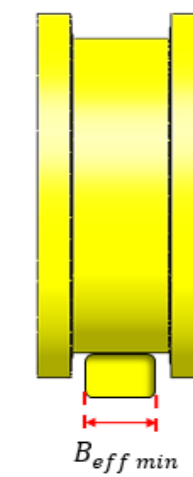
Stress & Fatigue Main Girder

| Point | σx1 | σx2 | σx3 | σx (total) | txy1 | txy2 | txy (wh) | txy (total) | σz | σeq |
|-------|------|-----|-----|------------|------|------|----------|-------------|-----|-----|
| 1 | -106 | -14 | 0 | -119 | 0 | 0 | 0 | 0 | 0 | 119 |
| 2 | -104 | -12 | 0 | -116 | 4 | 2 | 6 | 12 | -32 | 105 |
| 3 | -104 | -12 | 0 | -116 | 4 | 2 | 6 | 12 | -32 | 105 |
| 4 | 98 | 14 | 0 | 111 | 0 | 0 | 0 | 0 | 0 | 111 |
| 5 | 95 | 12 | 0 | 107 | 4 | 2 | 0 | 6 | 0 | 107 |
| 6 | 95 | 12 | 0 | 107 | 16 | 8 | 0 | 23 | 0 | 114 |
| 7 | -106 | -14 | 0 | -119 | 0 | 0 | 0 | 0 | 0 | 119 |
| 8 | -104 | -12 | 0 | -116 | 4 | 2 | 0 | 6 | 0 | 116 |
| 9 | -104 | -12 | 0 | -116 | 14 | 6 | 0 | 20 | 0 | 121 |
| 10 | 98 | 14 | 0 | 111 | 0 | 0 | 0 | 0 | 0 | 111 |
| 11 | 95 | 0 | 0 | 107 | 4 | 2 | 0 | 6 | 0 | 107 |
| 12 | 95 | 0 | 0 | 107 | 16 | 7 | 0 | 23 | 0 | 114 |



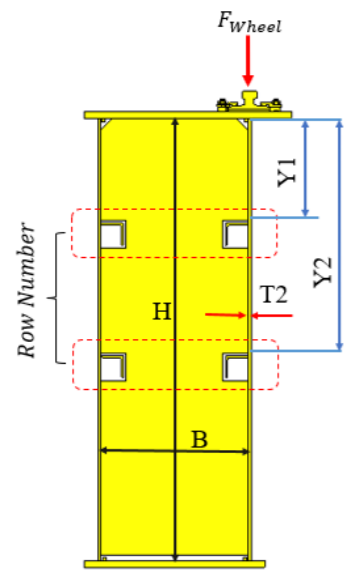
Selection Rail Size Trolley

| | | |
|--------------------------|-----------|----|
| P_{Mean} | 107083.33 | N |
| $B_{eff\ min}$ | 45.81 | mm |
| B_{eff} | 48.33 | mm |
| $B_{eff} > B_{eff\ min}$ | | OK |



| | | |
|----------------------|-----|----|
| Rail Size Traversing | A55 | OK |
|----------------------|-----|----|

Selection Stiffener Main Girder



| | |
|----------------|--------|
| Size Stiffener | 70X 70 |
| Row Number | 3 |

| Buckling Stiffener | | |
|-------------------------------|----|-------------------------------------|
| $H / T2 \text{ or } T3 < 160$ | 75 | Don't Need first buckling stiffener |
| $H / T2 \text{ or } T3 < 320$ | 75 | Don't Need first buckling stiffener |

| | | |
|--------------|---|---------------------|
| F_{Wheel} | 0 | KN |
| τ_{act} | 0 | Mpa |
| | | Acting Shear Stress |

| Row Number | Y1 | Y2 | Y3 |
|------------|-----|-----|-----|
| 1 | 300 | | |
| 2 | 210 | 495 | |
| 3 | 165 | 360 | 630 |

Buckling Box Diaphragm

| τ_{BUC} | Safety factors |
|--------------|----------------|
| 103.84 | 16.86451888 |
| | Mpa |

| τ_{BUC} | Safety factors |
|--------------|----------------|
| 286.455 | 46.5228107 |
| | Mpa |

| τ_{BUC} | Safety factors |
|--------------|----------------|
| 139.9 | 22.72102859 |
| | Mpa |

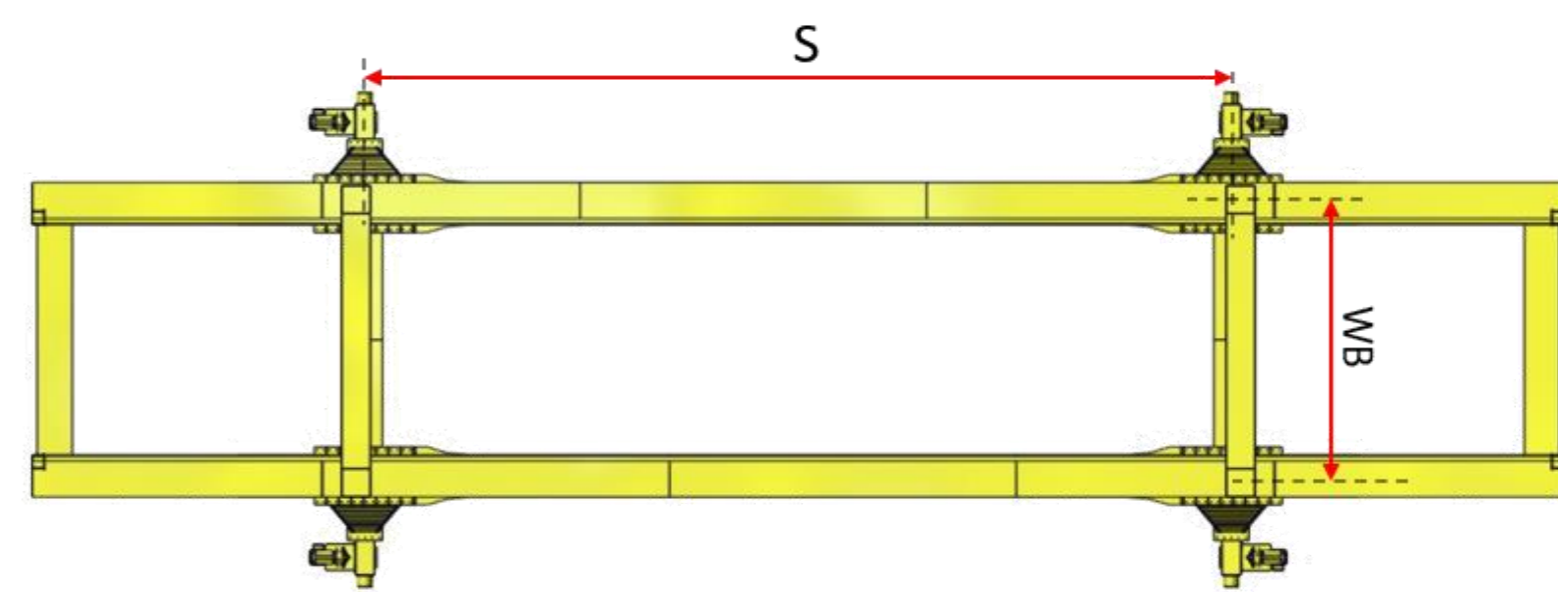
Diaphragm Welded
(lowest 15% non-welded)

Diaphragm Welded to both webs down to the bottom, (lowest 15%
With Double Fillet Weld)

Diaphragm Welded
also to bottom flange or to a bottom stiffener of the diaphragm

Calculate End Carriage

| Parameter | 8 Wheel | 4 Wheel | Description | Unit |
|---------------|---------|----------|---|---------|
| RPM_{Wheel} | 50.2 | 50.2 | ANGULAR VELOCITY OF WHEEL | Rev/min |
| P_{Max} | 221.8 | 428.6 | MAX STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE | KN |
| P_{Min} | 83.1 | 148.5 | MIN STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE | KN |
| P_{dyn} | 175.5 | 410.9 | MAX DYNAMIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE | KN |
| RL | 87.8 | 205.5 | RADIAL LOAD IN BEARING | KN |
| AL | 21.9 | 51.4 | AXIAL LOAD IN BEARING | KN |
| P_B | 151.0 | 353.4 | THE FORCE ACTING ON THE BEARING | KN |
| L 10H | 69646 | 04089 | BASIC RATING LIFE (AT 90% RELIABILITY) OPERATING HOURS | hr |
| F_{Max} | 257.8 | 475.8 | MAX WHEEL LOAD | KN |
| F_{Min} | 161.5 | 164.8 | MIN WHEEL LOAD | KN |
| M_{Max} | 104.4 | 2.4E+01 | MAX MOMENT ACTING ON END CARRIAGE | KN.M |
| M_{Min} | 65.4 | 8.2E+00 | MIN MOMENT ACTING ON END CARRIAGE | KN.M |
| S /WB | 3613.5 | 6.8 | SPAN TO WHEEL BASE RATIO < 7 NOT EXCEED 7 | --- |
| F_y | 25.2 | 69.3 | HORIZONTAL FORCE ACTING ON END CARRIAGE | KN |
| M_y | 25.2 | 3.47E+00 | THE MOMENT DUE TO HORIZONTAL FORCE ACTING ON END CARRIAGE | KN.M |



Calculate End Carriage

| Parameter | 8 Wheel | 4 Wheel | Description | Unit |
|----------------|---------|---------|--------------------------|------|
| τ_{Weld} | 20.53 | 19.12 | SHEAR STRESS OF THE WELD | Mpa |
| Y_{Max} | 0.24 | 0.0055 | Max Deflection | mm |
| V | 257.84 | 475.78 | MAX SHEAR FORCE | N |
| σ_{equ} | 83.56 | 148.94 | TOTAL COMBINED STRESS | Mpa |

| | | |
|----------------------|-------|----|
| Total Stress 4 wheel | 148.9 | NO |
| Total Stress 8 wheel | 83.6 | OK |

Selection Rail Traveling

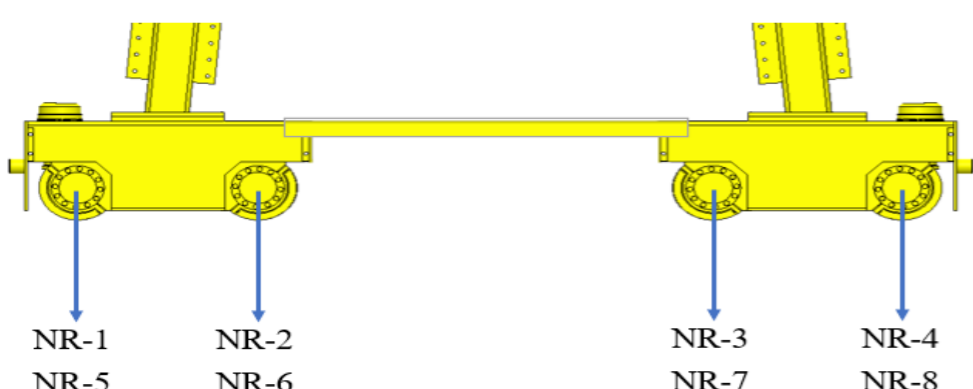
| Parameter | Value | Description |
|----------------|----------|--------------------|
| RAIL | A75 | RAIL SIZE SELECT |
| $B_{eff\ min}$ | 62.83986 | MIN WIDTH FOR RAIL |
| B_{eff} | 64.33 | WIDTH RAIL |

UNIT : mm

8 W

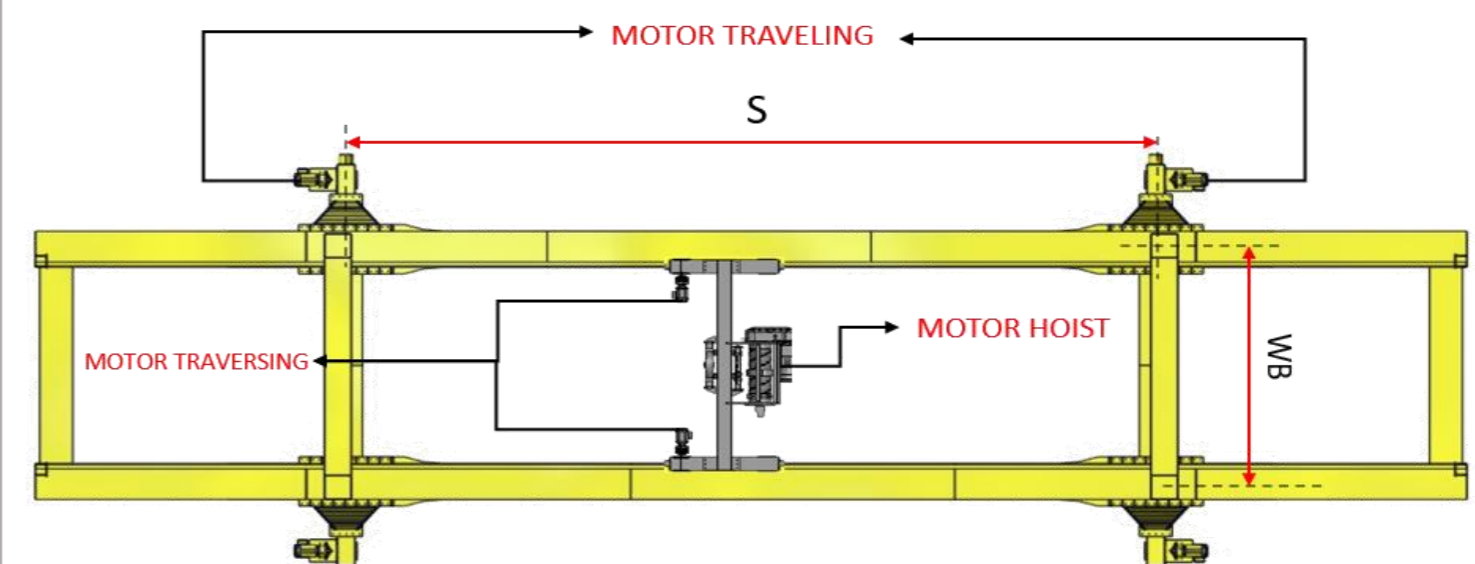
$B_{eff} > B_{eff\ min}$ OK

Wheel Load



| Wheel | $R_{max\ Stc}$ | $R_{min\ Stc}$ | $R_{min\ Dyn}$ | $R_{max\ Dyn}$ | Unit |
|-------|----------------|----------------|----------------|----------------|------|
| NR1 | 221.8 | -- | -- | 257.8 | KN |
| NR2 | 221.8 | -- | -- | 257.8 | KN |
| NR3 | 221.8 | -- | -- | 257.8 | KN |
| NR4 | 221.8 | -- | -- | 257.8 | KN |
| NR5 | -- | 83.1 | 175.5 | -- | KN |
| NR6 | -- | 83.1 | 175.5 | -- | KN |
| NR7 | -- | 83.1 | 175.5 | -- | KN |
| NR8 | -- | 83.1 | 175.5 | -- | KN |

Selection Motors



| Parameter | Value | Description |
|-----------------|---------|---------------------------|
| S3 - Traveling | 1.10 | Cyclic duration factor |
| S3 - Traversing | 1.10 | Cyclic duration factor |
| S3 - Hoist | 1.10 | Cyclic duration factor |
| f-T | 0.75 | Temperature factor |
| F-H | 0.91 | Sea level factor |
| f | 15.00 | Rolling Friction factor |
| a | 0.25 | acc rate traversing |
| a | 0.40 | acc rate traveling |
| Cr- Traversing | 1.08 | Rotational inertia factor |
| Cr- Traveling | 1.10 | Rotational inertia factor |
| kt | 1.50 | acc Torque Factor |
| ks | 1.00 | acc Torque Factor |
| E | 0.93 | Mechanical efficiency |
| nf | 3000.00 | Free Running |
| nr | 2950.00 | Full Load Speed |

Selection Motors For Crane 8 wheel EC

| Parameter | Description | Power (KW) | Round (RPM) |
|-----------|------------------|------------|-------------|
| DHM | Hoist Motor | 68.75 | 5.94 |
| DTLM | Traveling Motor | 33.82 | 50.16 |
| DTSM | Traversing Motor | 7.22 | 20.22 |

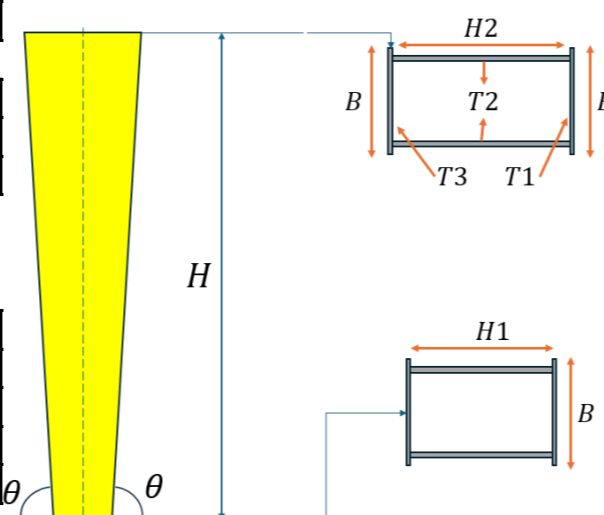
Dimension check leg Gantry

| Parameter | Value | Description | Unit |
|-----------|-----------|--|-----------------|
| A - S1 | 22000 | Area Section 1 | mm ² |
| Ix - S1 | 530010606 | Vertical - Moment of Inertia x-x Section 1 | mm ⁴ |
| Iy - S1 | 339533333 | Horizontal - Moment of Inertia y-y Section 1 | mm ⁴ |
| rx-S1 | 155 | Radius of Gyration x-x | mm |
| ry-S1 | 124 | Radius of Gyration y-y | mm |

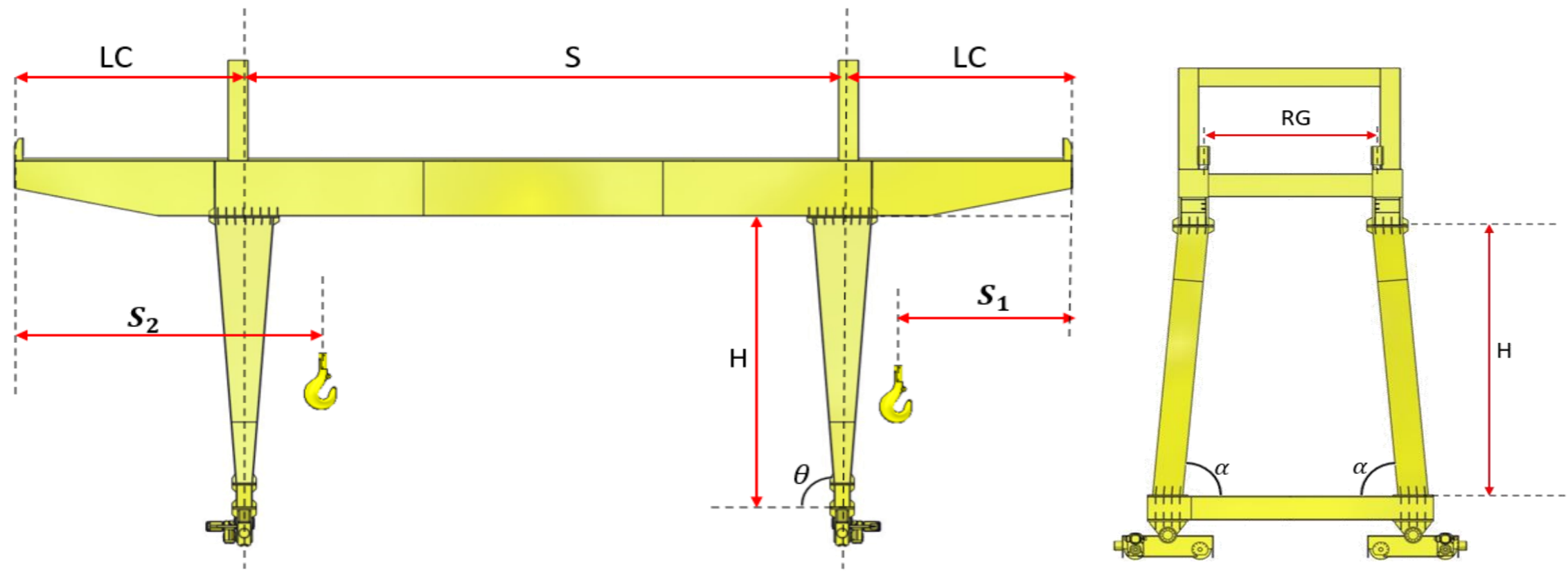
| | | | |
|--------|-----------|---|-----------------|
| ATO-S1 | 8500 | Pressure Area of the column | mm ² |
| ITO-S1 | 106670833 | Moment of inertia compressive - XX | mm ⁴ |
| rTO | 112 | Radius of gyration of compressive section | mm |

| Parameter | Value | Description | Unit |
|-----------|------------|--|-----------------|
| A - S2 | 30000 | Area Section 2 | mm ² |
| Ix - S2 | 3380496667 | Vertical - Moment of Inertia x-x Section 2 | mm ⁴ |
| Iy - S2 | 507800000 | Horizontal - Moment of Inertia y-y Section 2 | mm ⁴ |
| rx-S2 | 336 | Radius of Gyration x-x | mm |
| ry-S2 | 130 | Radius of Gyration y-y | mm |

| | | | |
|-----|---------|---------------------|-----------------|
| SLX | 9136477 | Section modulus X-X | mm ³ |
| SLY | 2539000 | Section modulus Y-Y | mm ³ |



Design leg Gantry

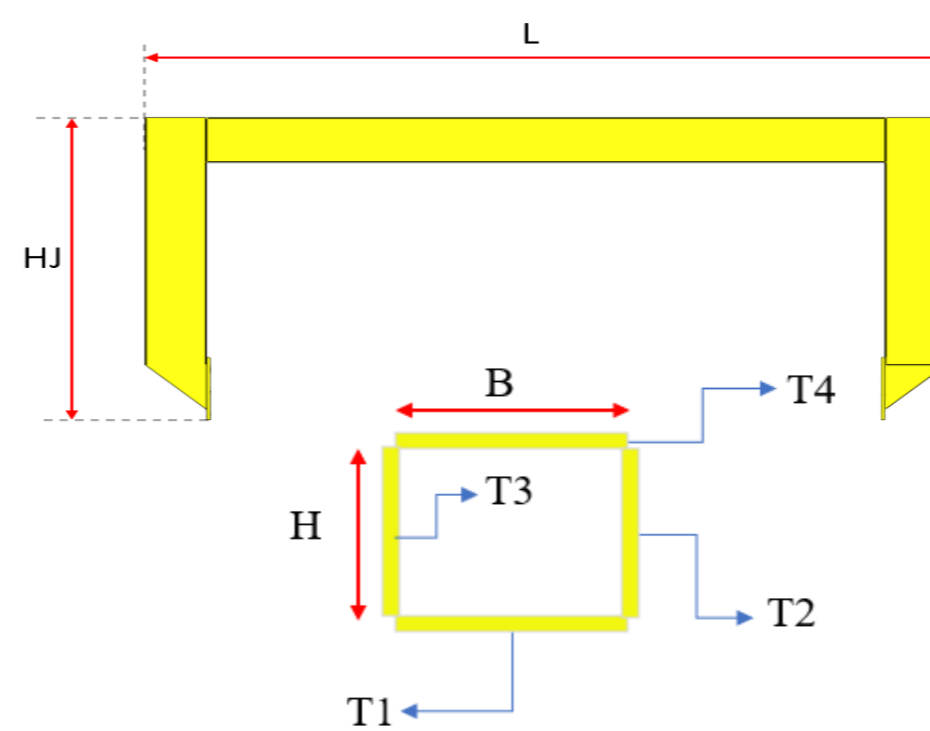
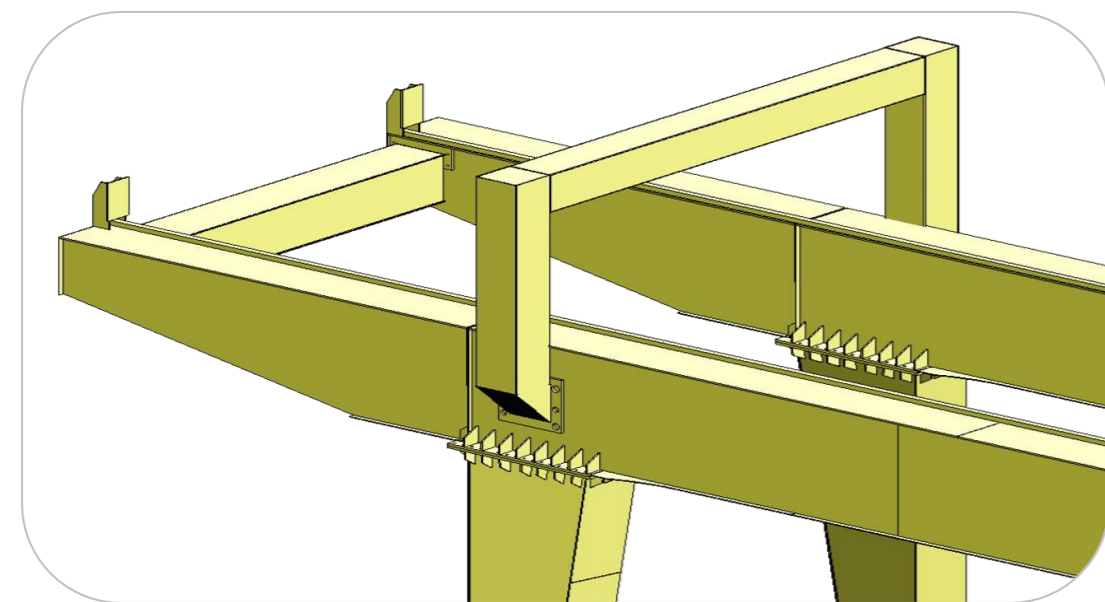


| | | | |
|----------|-------|------------------------------------|-----|
| θ | 87.7 | Column cross section slope control | Deg |
| α | 1.7 | Column cross section slope control | Deg |
| RG | 3000 | Rail Gauge | mm |
| H | 17000 | Column Height | mm |

| | | | | |
|----------|-------|--|-----|----|
| Fay | 122 | allowable compressive stress (slenderness) | Mpa | OK |
| Fby | 159 | Allowable bending stress | Mpa | OK |
| f/F | 0.17 | Column stability and resistance criterion | --- | OK |
| Fvo - S1 | 94.54 | Shear stress in smaller section | Mpa | OK |

| | | | | |
|-----------|-------|-----------------------------------|-----|----|
| Stress-S2 | 15.76 | bending stress in the larger area | Mpa | OK |
| Stress-S1 | 46.20 | bending stress in a smaller | Mpa | OK |
| M | 0.25 | The resistance criterion | --- | OK |
| Fvo - S2 | 1.48 | Shear stress in larger section | Mpa | OK |

Design Joint Girders



| | | | |
|----|-----|---------------------------|----|
| H | 900 | Height Web | mm |
| B | 444 | Width Top & Bottom Flange | mm |
| T1 | 10 | Thickness Bottom Flange | mm |
| T2 | 10 | Thickness Web 1 | mm |
| T3 | 10 | Thickness Web 2 | mm |
| T4 | 7.5 | Thickness Top Flange | mm |

| | | | |
|----|------|----------------------|----|
| L | 6140 | Thickness Web 2 | mm |
| HJ | 2550 | Thickness Top Flange | mm |

| | | | |
|-----|------------|----------------------|----|
| W | 2259.30744 | Weight Joint Girder | KG |
| WJG | 4518.61488 | Weight Joint Girders | KG |