



CALCULATION GANTRY CRANE DOUBLE GIRDER ((4W))

V.01

S/H	13.5	---	Span / Height Web	OK
S/B	27.0	---	Span / Width Flange TF, BF	OK
H/B	2.0	---	Height Web / Width Flange TF, BF	OK
b/T4	41.3	---	Width diaphragm / thickness top Flange	OK
DG	20.0	mm	Deflection Girder	OK
SG	110.2	Mpa	Stress Girder	OK
RTS	70 X 40	mm	Rail Traversing	OK

SEC - 4W	15.1	Mpa	Stress EC 4 Wheel	OK
WB - 4W	5200.0	mm	Wheel Base 4 Wheel	OK
RTL - 4W	70 X 40	mm	Rail Traversing	NO

B/T1	60.0	----	Dimension Check	OK
B/T3	60.0	----	Dimension Check	OK
H1/T2	40.0	----	Dimension Check	OK
SLOPE	88.6	deg	Column cross section slope control	OK
S- SUT	127.2	Mpa	allowable stress (slenderness)	OK
S- BS	156.0	Mpa	Allowable bending stress	OK
f/F	0.0	----	Column stability and resistance criterion	OK
Stress-S2	38.8	Mpa	bending stress in the larger Area	OK
Stress-S1	21.4	Mpa	bending stress in a small Area	OK

Pcr	1.0E+08	N	Column buckling (Critical Load)	OK
FoS	30.9	----	slenderness ratio of columns	OK
H/B	10.0	----	Dimension Check	OK
M_4W	1.2E+07	N.m	Stability condition of 4-wheel crane	OK

TOTAL WEIGHT 4W	45629	KG
WEIGHT 2 X GIRDER	18260	KG
WEIGHT Legs	5054.4	KG
WEIGHT BRIDGES	24460	KG



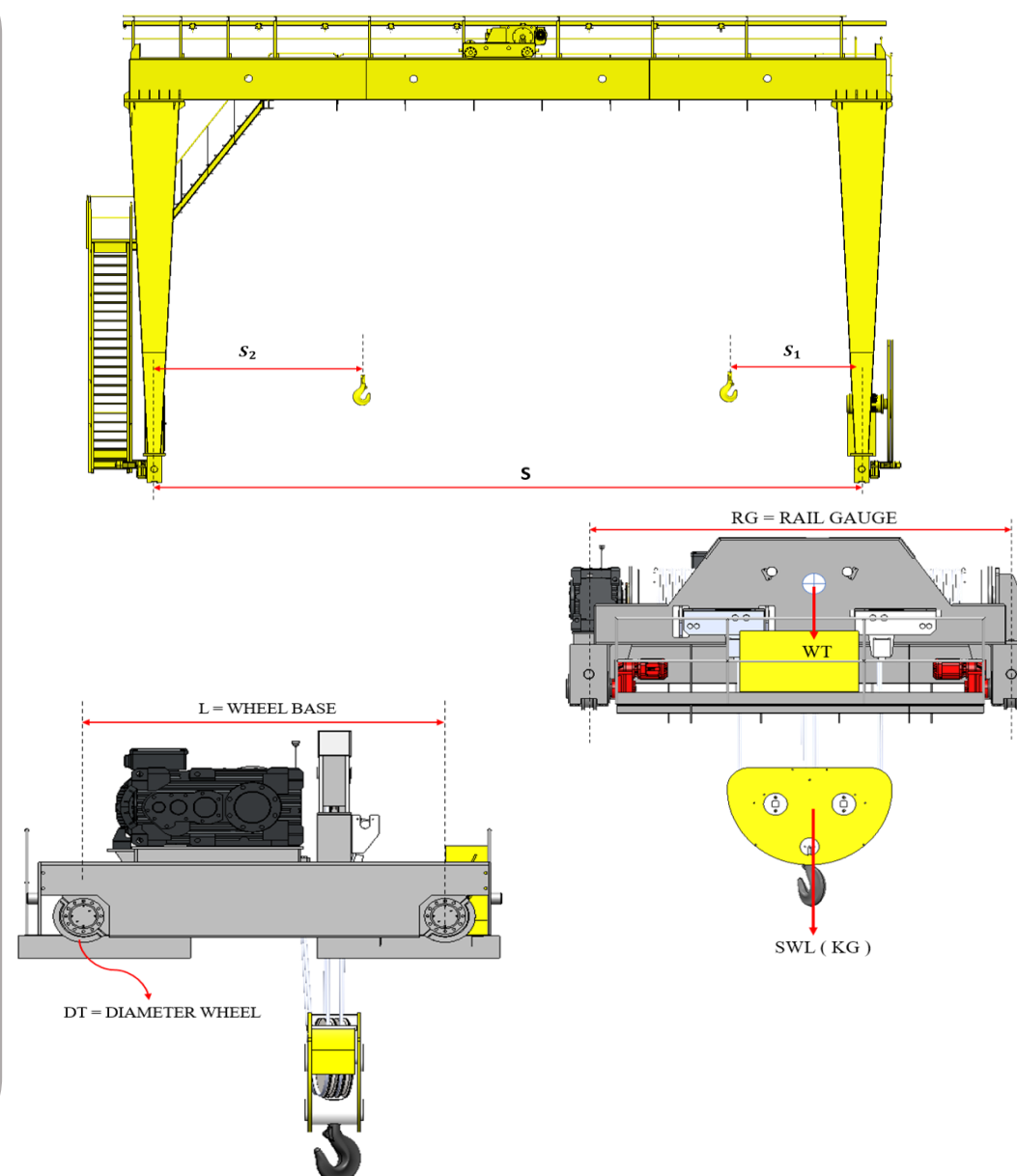
COMPANY	KAMARKHANI
PROJECT NAME	CRANE
TAG NAME	GANTRY
REVISION .DC	A

GENERAL HOIST DATA

Q	50	Load	T
S	20	Span	M
DF	1.15	Dynamic factor	---
WG	M5	Working group	ISO
H.O.L	20000	Height Lift	MM
S1	1500	Approach Side Max	MM
S2	1500	Approach Side min	MM
DFG	L/1000	Deflection Girder limit	---
Material	1	Material Girder	---

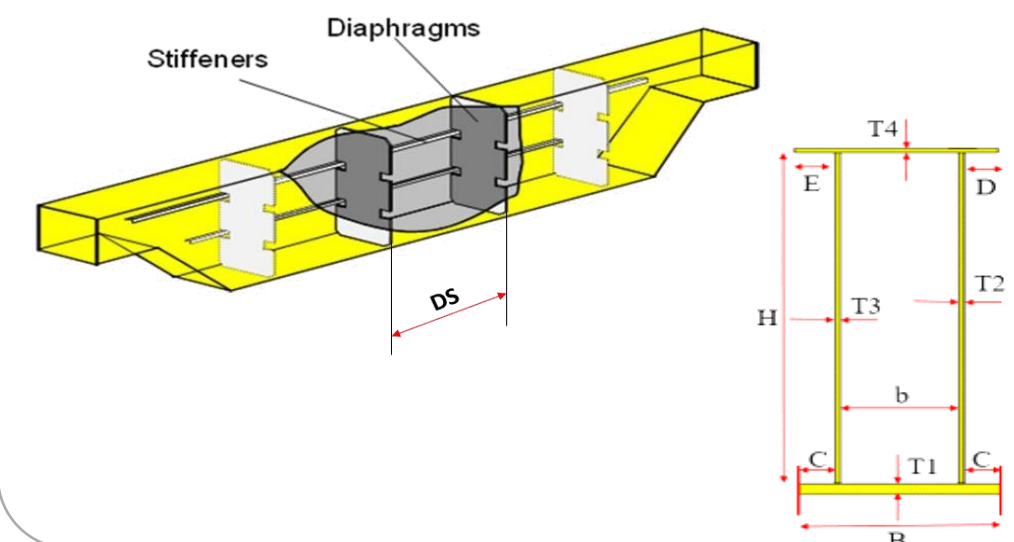
NTw	4	No. Wheel	----
L	5000	Wheel base Trolley	MM
DT	315	Diameter Wheel Trolley	MM
TS	12.5	Trolley Speed	M/MIN
Wt	15000	Weight Trolley	KG
HS	3	Hoist speed	M/MIN
RTS	70 X 40	Rail Traversing	MM
MRTS	52	Material Rail Traversing	ST
RG	5000	Rail Gauge	MM
Drum	450	Diameter Drum Hoist	MM
Reeving	16/2	Reeving Hoist	---

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



INPUT MAIN GIRDER

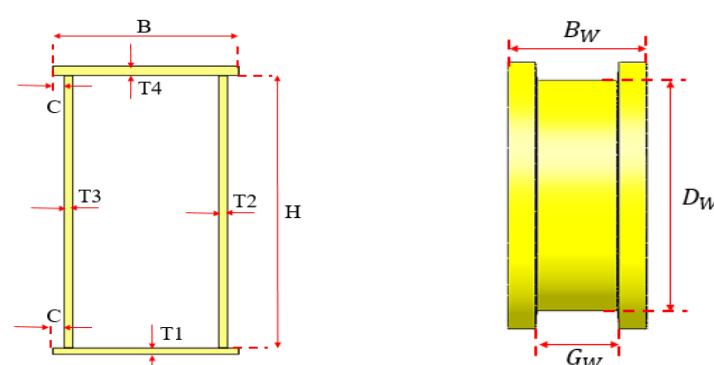
H	1480	Height Web	mm
B	740	Width Top & Bottom Flange	mm
T1	10	Thickness Bottom Flange	mm
T2	10	Thickness Web 1	mm
T3	10	Thickness Web 2	mm
T4	15	Thickness Top Flange	mm
C	50	Space Flange	mm
D	50	Space Flange	mm
E	50	Space Flange	mm
RN	1	Row Number	mm
SF	70 X 70 X 7	Size Stiffener	mm
DS	1800	Diaphragm Distance	mm
DF-TH	8	Diaphragm thickness	mm
Weld	10	Thickness Weld Girder	mm



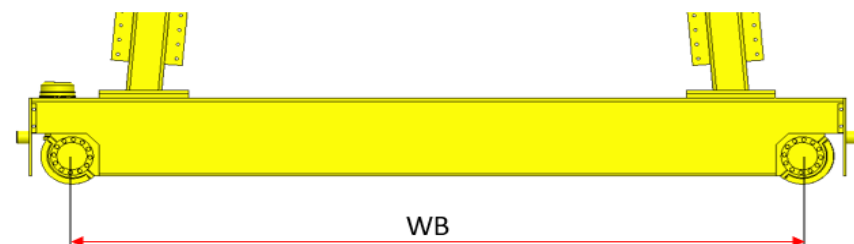
INPUT END CARRIAGE

H	600	Height Web	mm
B	300	Width Top & Bottom Flange	mm
T1	10	Thickness Bottom Flange	mm
T2	10	Thickness Web 1	mm
T3	10	Thickness Web 2	mm
T4	10	Thickness Top Flange	mm
C	15	Space Flange	mm

XC	6	WELD THICKNESS	mm
GD	A5	Amplifying coefficient	FEM
BS	20	Bridge Speed	m/min



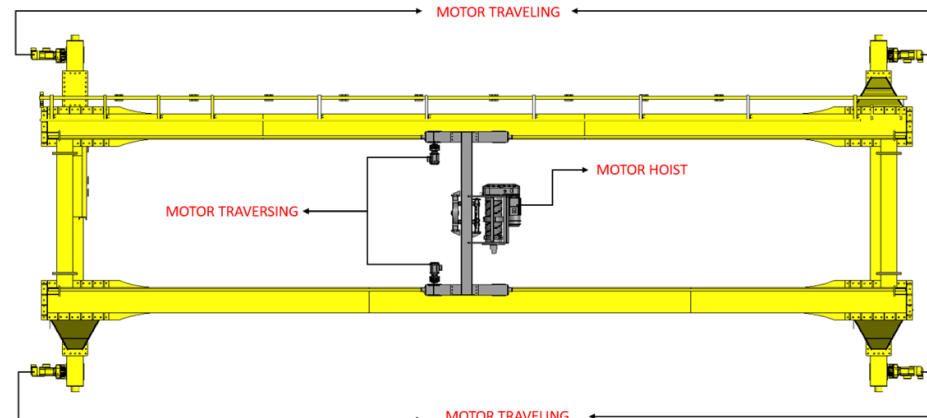
MR	52	Material (Rail)	mm
SKF	22220	Bearing	---
RT	70 X 40	Rail Type	mm



WB	5200	Distance between center wheel	mm
WW	110	Wheel Width	mm
DW	315	Diameter Trolley	mm
GW	90	Wheel Groove	mm

INPUT MOTOR DATA

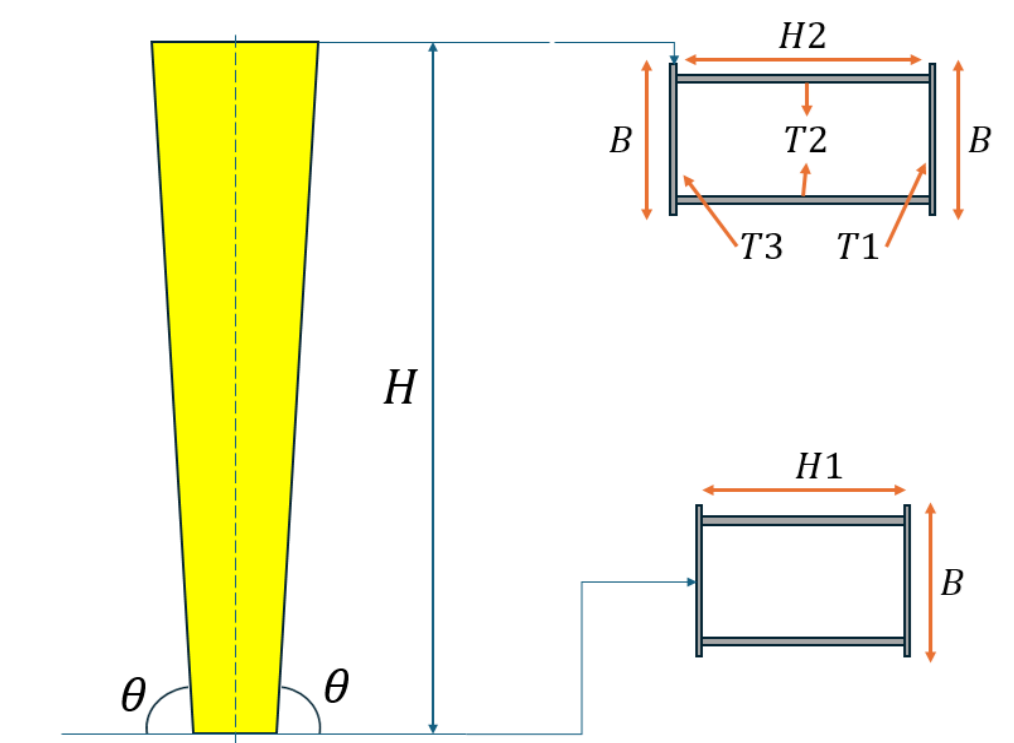
S3	0.6	Operating mode Traveling	---
S3	0.6	Operating mode For Traversing	---
S3	0.6	Operating mode For Hoist	%
T	30	Ambient temperature	C°
H	2500	Installation altitude above sea level	m
f	Top Running	Rolling Friction of Drive	----
E	Sleeve	Mechanical efficiency Of Drive machinery	----
TM	AC Inverter	Type Of Motor	----
IC	Inverter	Type of control	----
RS	3000	Speed Range	----



INPUT Leg Data

H1	400	Height Web (Smaller)	mm
B	600	Width Flange	mm
T1	10	Thickness Bottom Flange	mm
T2	10	Thickness Web	mm
T3	10	Thickness Top Flange	mm
H2	700	Height Web = H1 or (Bigger)	mm

H	6000	Column Height	mm
MC	7850	Material Column	kg/m^3



E	210	Young's modulus	Gpa
YS	235	Yield Stress	Mpa

Dimension Check

General Check of Dimensions :

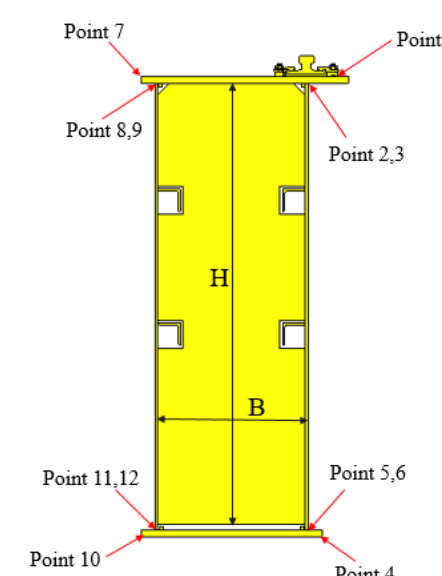
S/H < 25	7503.6	OK	CMAA
S/B < 65	9130.1	OK	CMAA
1.6 < H/B < 2.7	18260.2	OK	CMAA
b/T4 < 39	41.3	OK	CMAA

Girder Section Properties :

Ix	15551470592.9	mm^4
Iy	3781523333.3	mm^4

Elastic section modulus :

Point	Sx	Sy
1	22308316	10220333
2	22798886	11817260
3	22798886	11817260
4	19249618	10220333
5	19490877	11817260
6	19490877	11817260
7	22308316	10220333
8	22798886	11817260
9	22798886	11817260
10	19249618	10220333
11	19490877	11817260
12	19490877	11817260



Live Load Deflection :

LLD	16.3	mm
-----	------	----

Dead Load Deflection :

DLD	3.6	mm
-----	-----	----

Camber :

CAMBER	11.7	mm
--------	------	----

Deflection Max :

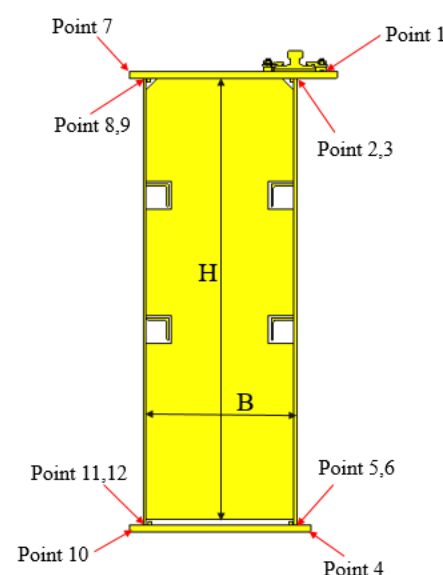
DFL	20.0	mm
-----	------	----

Check Dimension :

CMAA	20.0	0
------	------	---

Stress & Fatigue Main Girder

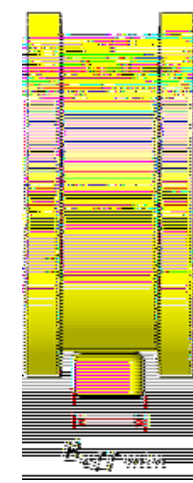
Point	σx1	σx2	σx3	σx (total)	txy1	txy2	txy (wh)	txy (total)	σz	σeq
1	-85	-12	0	-97	0	0	0	0	0	97
2	-83	-10	0	-93	8	5	16	30	-82	102
3	-83	-10	0	-93	8	5	16	30	-82	102
4	98	12	0	110	0	0	0	0	0	110
5	97	10	0	107	8	4	0	12	0	109
6	97	10	0	107	8	4	0	12	0	109
7	-85	-12	0	-97	0	0	0	0	0	97
8	-83	-10	0	-93	8	5	0	13	0	96
9	-83	-10	0	-93	7	5	0	12	0	95
10	98	12	0	110	0	0	0	0	0	110
11	97	0	0	107	8	4	0	12	0	109
12	97	0	0	107	8	5	0	13	0	110



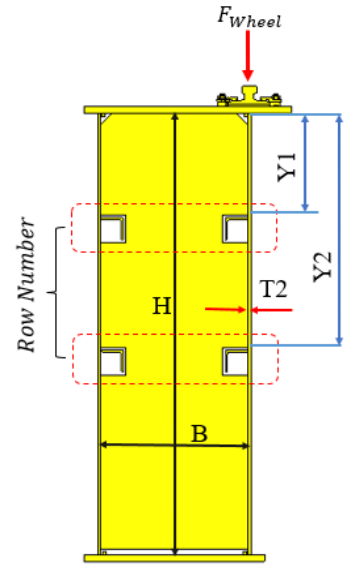
Selection Rail Size Trolley

P_{Mean}	162500.00	N
$B_{eff\ min}$	66.39	mm
B_{eff}	70.00	mm
$B_{eff} > B_{eff\ min}$		OK

Rail Size Traversing	60	OK
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Selection Stiffener Main Girder



Size Stiffener	70 X 70 X 7
Row Number	1

Buckling Stiffener		
$H / T2 \text{ or } T3 < 160$	148	Don't Need first buckling stiffener
$H / T2 \text{ or } T3 < 320$	148	Don't Need first buckling stiffener

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

Row Number	Y1	Y2	Y3
1	296		
2	207.2	488.4	
3	162.8	355.2	621.6

Buckling Box Diaphragm

τ_{Buc}	Safety factors
25.8026	2.043496781
Mpa	

Diaphragm Welded
(lowest 15% non-welded)

τ_{Buc}	Safety factors
71.1796	5.637232499
Mpa	

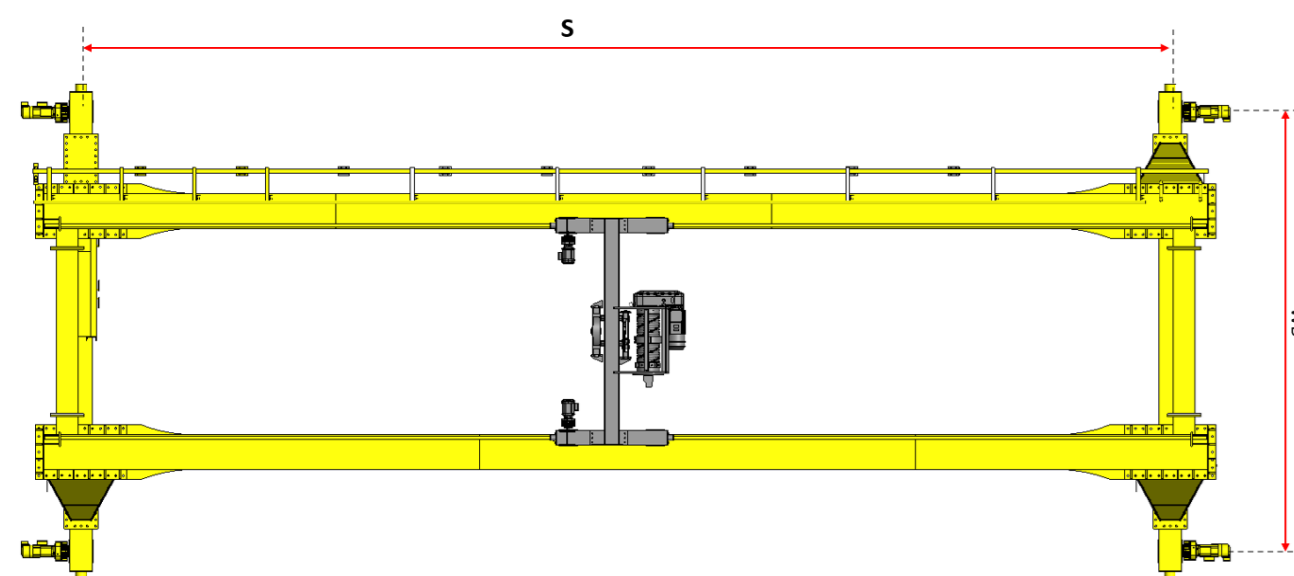
Diaphragm Welded to both webs down to the bottom, (lowest 15% With Double Fillet Weld)

τ_{Buc}	Safety factors
39.8953	3.159603579
Mpa	

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}	20.2	20.2	ANGULAR VELLOCIITY OF WHEEL	Rev/min
P_{Max}	193.4	345.6	MAX STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE	KN
P_{Min}	58.8	74.6	MIN STATIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE	KN
P_{dyn}	148.5	343.5	MAX DYNAMIC WHEEL LOAD WHEN TROLLEY IS SDE OF BRIDGE	KN
RL	74.3	171.7	RADIAL LOAD IN BEARING	KN
AL	18.6	42.9	AXIAL LOAD IN BEARING	KN
P_B	127.7	295.4	THE FORCE ACTING ON THE BEARING	KN
L_{10H}	486143	29744	BASIC RATING LIFE (AT 90% RELIABILITY) OPERATING HOURS	hr
F_{Max}	226.7	383.7	MAX WHEEL LOAD	KN
F_{Min}	117.0	82.8	MIN WHEEL LOAD	KN
M_{Max}	91.8	3.8E+00	MAX MOMENT ACTING ON END CARRIAGE	KN.M
M_{Min}	47.4	8.3E-01	MIN MOMENT ACTING ON END CARRIAGE	KN.M
S / WB	3604.8	3.8	SPAN TO WHEEL BASE RATIO < 7 NOT EXCEED 7	---
F_y	11.8	33.0	HORIZONTAL FORCE ACTING ON END CARRIAGE	KN
M_y	11.8	3.30E-01	THE MOMENT DUE TO HORIZONTAL FORCE ACTING ON END CARRIAGE	KN.M



Calculate End Carriage

Parameter	8 Wheel	4 Wheel	Description	Unit
τ_{Weld}	9.41	1.05	SHEAR STRESS OF THE WELD	Mpa
Y_{Max}	0.14	0.0011	Max Deflection	mm
V	226.70	383.66	MAX SHEAR FORCE	N
σ_{equ}	41.47	15.06	TOTAL COMBINED STRESS	Mpa

Total Stress 4 wheel	15.1	OK
Total Stress 8 wheel	41.5	OK

Selection Rail Traveling

Parameter	Value	Description
RAIL	70 X 40	RAIL SIZE SELECT
$B_{eff\ min}$	103.2736	MIN WIDTH FOR RAIL
B_{eff}	70.00	WIDTH RAIL
UNIT : mm		

4 W

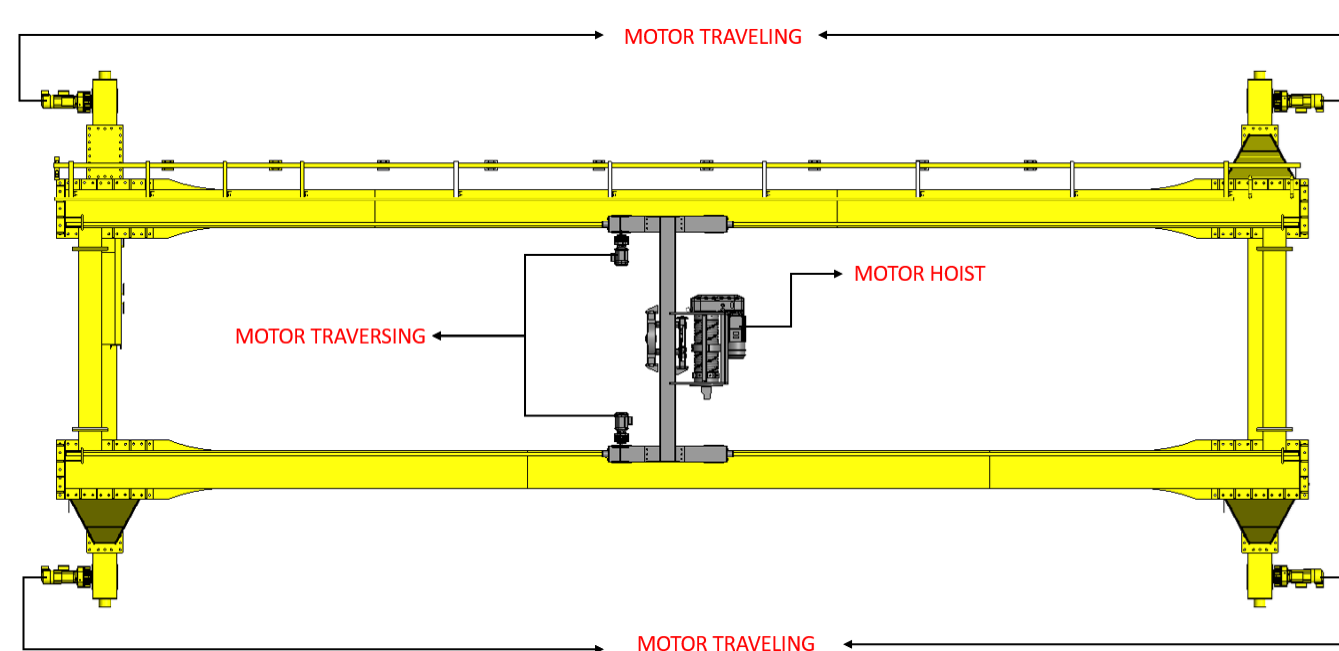
$B_{eff} > B_{eff\ min}$ NO

Wheel Load

Wheel	Rmax Stc	Rmin Stc	Rmin Dyn	Rmax Dyn	Unit
NR1	345.6	--	343.5	--	KN
NR2	345.6	--	343.5	--	KN
NR3	--	74.6	--	383.7	KN
NR4	--	74.6	--	383.7	KN



Selection Motors



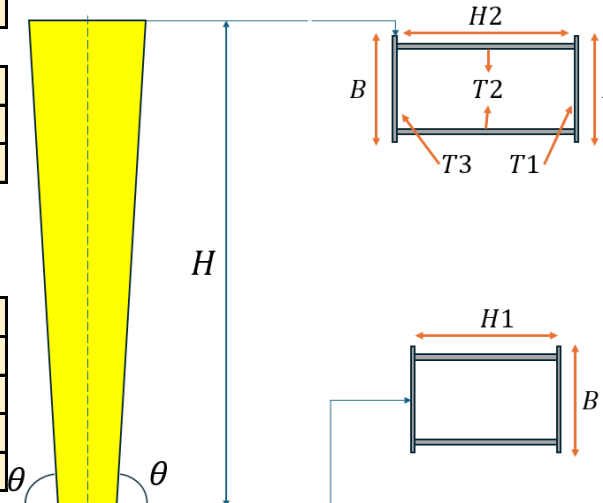
Dimension check leg Gantry

A - S1	20000	Area Section 1	mm^2
Ix - S1	752186667	Vertical - Moment of Inertia x-x Section 1	mm^4
Iy - S1	840266667	Horizontal - Moment of Inertia y-y Section 1	mm^4
rx-S1	194	Radius of Gyration x-x	mm
ry-S1	205	Radius of Gyration y-y	mm

ATO-S1	6667	Pressure Area of the column	mm^2
ITO-S1	180005556	Moment of inertia compressive - XX	mm^4
rTO	164	Radius of gyration of compressive section	mm

A - S2	26000	Area Section 2	mm^2
Ix - S2	2747020513	Vertical - Moment of Inertia x-x Section 2	mm^4
Iy - S2	1200466667	Horizontal - Moment of Inertia y-y Section 2	mm^4
rx-S2	325	Radius of Gyration x-x	mm
ry-S2	215	Radius of Gyration y-y	mm

SLX	7630613	Section modulus X-X	mm^3
SLY	4001556	Section modulus Y-Y	mm^3

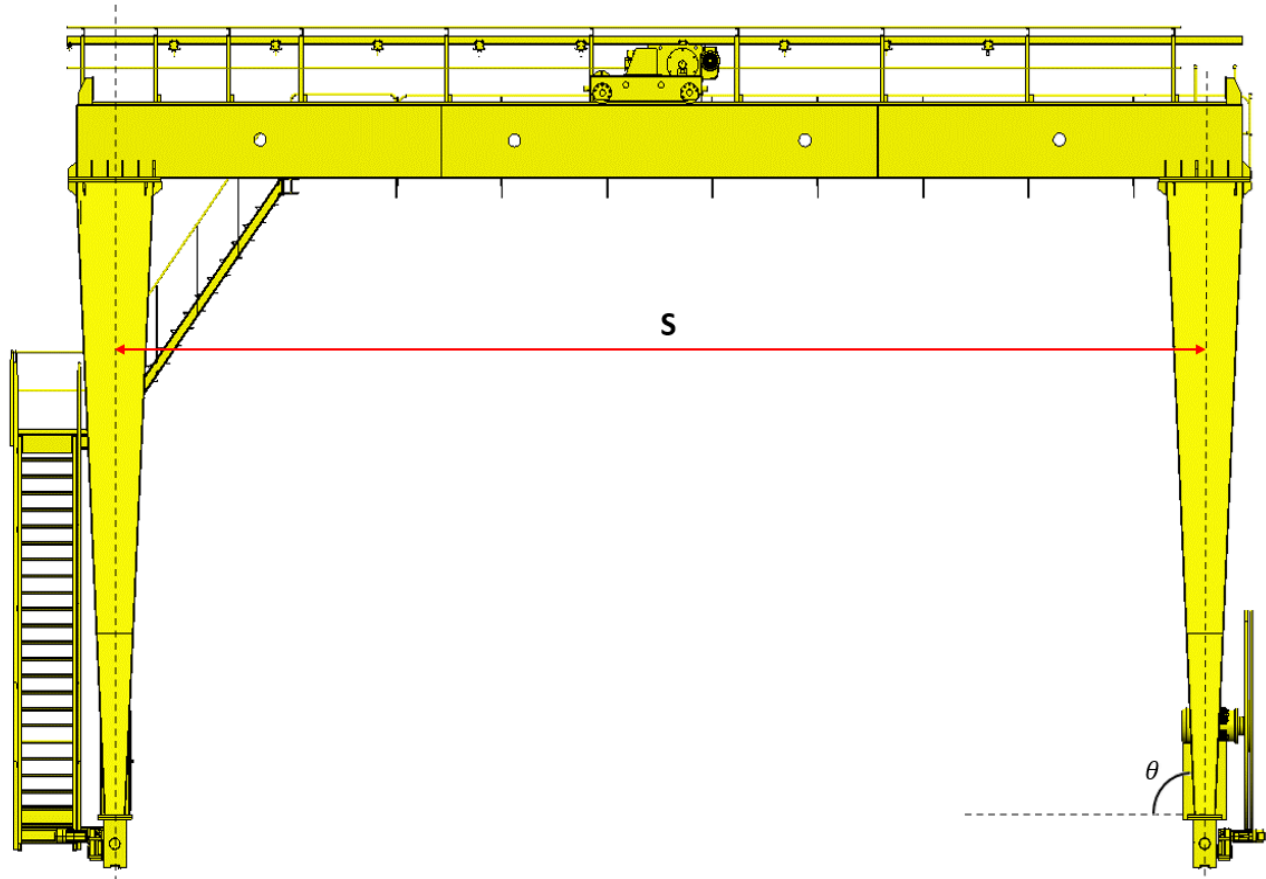


Parameter	Value	Description
S3 - Traveling	1.10	Cyclic duration factor
S3 - Traversing	1.10	Cyclic duration factor
S3 - Hoist	1.10	Cyclic duration factor
f-T	1.00	Temperature factor
F-H	0.91	Sea level factor
f	15.00	Rolling Friction factor
a	0.25	acc rate traversing
a	0.25	acc rate traveling
Cr- Traversing	1.08	Rotational inertia factor
Cr- Traveling	1.08	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

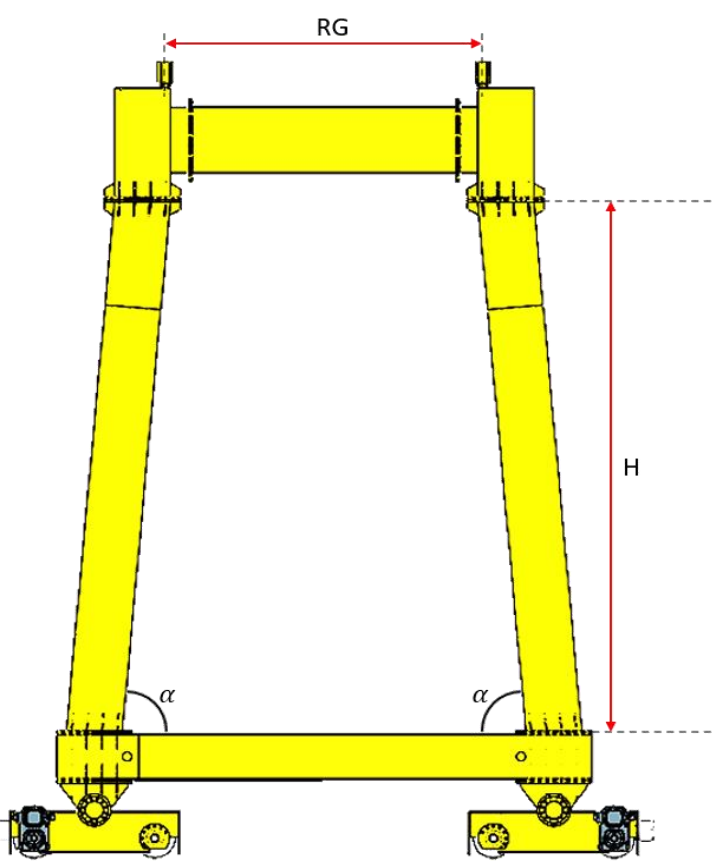
Selection Motors For Crane 4 wheel EC

Parameter	Description	Power (KW)	Round (RPM)
DHM	Hoist Motor	25.78	2.83
DTLM	Traveling Motor	5.48	20.22
DTSM	Traversing Motor	3.42	12.64

Design leg Gantry



Fay	127	allowable compressive stress (slenderness)	Mpa	OK
Fby	156	Allowable bending stress	Mpa	OK
f/F	0.17	Column stability and resistance criterion	----	OK
Fvo - S1	59.50	Shear stress in smaller section	Mpa	OK



θ	88.6	Column cross section slope control	Deg
α	1.7	Column cross section slope control	Deg
RG	3000	Rail Gauge	mm
H	6000	Column Height	mm

Stress-S2	41.81	bending stress in the larger area	Mpa	OK
Stress-S1	152.70	bending stress in a smaller	Mpa	OK
M	0.45	The resistance criterion	---	OK
Fvo - S2	4.91	Shear stress in larger section	Mpa	OK



CALCULATION GANTRY CRANE DOUBLE GIRDER

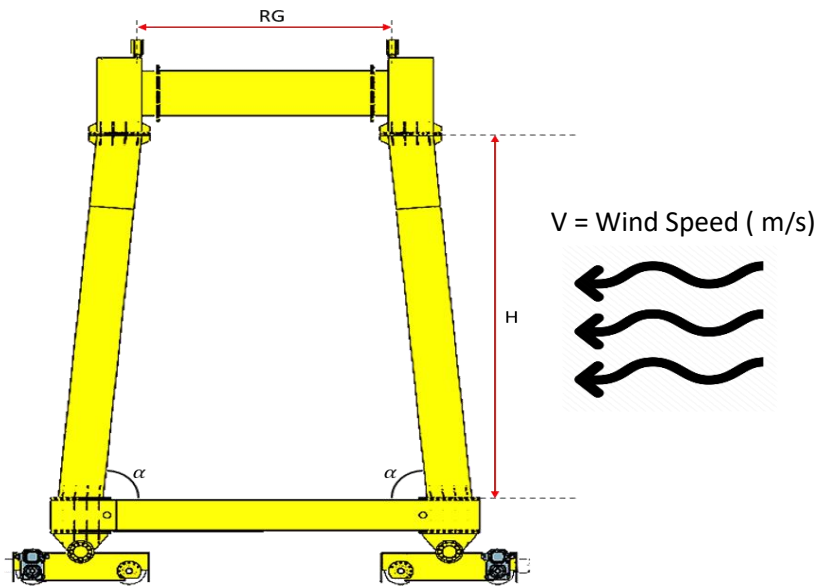
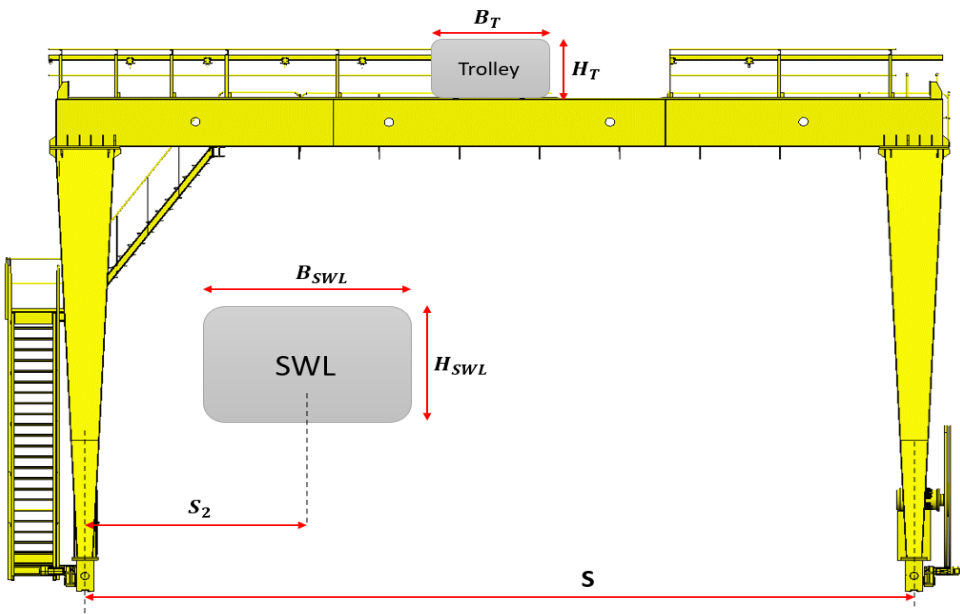
Document : Wind Load

4 Wheel



GENERAL CRANE DATA

Q	50	Load	T	B_SWL	2000	Dimension Load	mm
S	20	Span	M	H_SWL	2000	Dimension Load	mm
DF	1.15	Dynamic factor	---	B_T	2000	Dimension Trolley	mm
WG	M5	Working group	ISO	H_T	2000	Dimension Trolley	mm
H.O.L	20000	Height Lift	MM	V	20	Wind Speed	m/s
S1	1500	Approach Side Max	MM	RG	5000	Rail Gauge	mm
S2	1500	Approach Side min	MM	H	6000	Height Leg	mm



F_G	120.941604	Wind force acting on the Girder	N
F_T	16.34346	Wind force acting on the Trolley	N
F_L	16.34346	Wind force acting on the Load	N
F_Leg	13.4833545	Wind force acting on the Leg	N

F_G	29600000	Girder Area affected by wind	mm^2
F_T	4000000	Trolley Area affected by wind	mm^2
F_L	4000000	Load Area affected by wind	mm^2
F_Leg	3300000	Leg Area affected by wind	mm^2

M_Over	1020	Crane overturning moment	N.M
M_Sta	12312877	Crane stability torque	N.M

M_Over * SF < M_Sta	Crane stability condition	OK
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