INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**DESIGN PARAMETERS FOR EOT CRANES**	**IPSS: 2-02-001-18 (Revised)**
	Corresponding Indian Standard not available	Formerly: IPSS: 2-02-001-81

0. FOREWORD

0.1 Interplant standardization in steel industry has been initiated under the aegis of the Indian Standards Institution (ISI) and the Steel Authority of India Limited (SAIL). This Interplant Standards is prepared by the Standard Committee on E O T Cranes, IPSS 2:2 with the active participation of the representatives of all the steel plants and leading consultants and was adopted in December, 1981. Thereafter, standard was revised by the Standard Committee in March, 2018.

0.2 Interplant Standards on design Parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in design activities.

0.3 This standard attempts at prescribing uniform overall dimensions and other parameters for design of EOT cranes so that complementary equipment, such as motors, control gears and trolleys could be designed in harmony. Board guidance for specifying technical characteristics of the crane has also been given in this standard. However, for the details of design and manufacturing practices for other crane components, good designing / manufacturing practice and / or the relevant Indian Standards are applicable.

0.4 This standards is essentially futuristic in nature and as such the developments in technology have been incorporated to the extent possible. Hence for new steel plants and in the expansion programs of the existing steel plants, deviation from the stipulations of this standard is not desirable. However, if the existing situation in steel plants so demands, the designer may deviate from the stipulations of this standard with respect to the nomenclature, service data, speeds and acceleration, clearance dimensions, etc.

0.5 Corresponding IS : 4137-2015 “Code of practice for heavy duty electric overhead traveling cranes including special service machines for use in steel works” shall be referred for other specifications which are not covered in this IPSS.

1. **Scope** – This Interplant Standard covers the design parameters and related aspects of general purpose, ladle, stripper, soaker and mould handling EOT cranes. This standard also covers the design

parameters and related aspects of cranes not covered by Annex 'A' (Clause #1.1) of IS 4137: 2015 i.e. Steel plant process cranes, steel handling cranes, maintenance cranes and general purpose cranes etc.

1.1 This standard does not cover single girder cranes.

2. **Lifting Capacities** – The main, auxiliary & other capacities of different type of EOT cranes shall be as per process/ technical requirement. Nomenclature based on lifting capacity is given in **Table-1**.

3. **Typical Service Data** – The typical service data of different mechanisms of an EOT crane depending upon the extent and frequency of utilization is given in **Table 2** for guidance in selection and manufacture.

4. **Speeds** – Speeds for long travel, cross travel and hoist mechanism of cranes shall be as per process/ technical requirement. However, preferred speeds for long travel, cross travel and hoist mechanism for different duties and capacities of different types of EOT cranes shall be are given in **Table – 3 to 6.**

5. **Acceleration** - The acceleration for long travel and cross travel for EOT cranes of various applications shall be as given in **Table – 7**.

6. **Trolley Gauge** – The trolley gauges for general purpose EOT cranes shall be as per process/ technical requirement.

7. **Clearance Dimensions** – The limiting dimensions within which the cranes are to be designed shall be agreed to between the customer and the supplier. However, for the guidance of both, the proforma given in the following appendices may be used. It shall be read with figures against each for the respective types of cranes. Figures depicting configuration of the cranes are typical only and may vary as per technical/ process requirement with mutual agreement between the customer and the supplier for optimization of the crane.

Appendix	Figures No.	Type of Crane
A	1	Double girder EOT Crane
B	2	Four girder EOT Crane

8. **Technical Performa for Indenting** – The customer shall supply the technical characteristics of the different types of cranes in the Performa given in the appendices indicated in **Cl.no # 7** appropriately, read with the corresponding figure (typical), to the supplier / designer. The customer may also indicate the type of lubrication systems preferred for the information of the supplier / designer.

TABLE 1: NOMENCLATURE OF EOT CRANES BASED ON LIFTING CAPACITY

Explanatory Notes:

Note 1 – In general purpose cranes, X/Y indicates the following:

X – Capacity of the main hook in tonnes, and

Y – Capacity of the auxiliary hook in tonnes.

Both the hoists are mounted on one trolley (double girder).

Note 2 – X + Y indicates the following:

X – Capacity of the main hoist in tonnes, and

Y – Capacity of the main auxiliary hoist in tonnes.

Main hoist is mounted on main trolley and the auxiliary hoist on a separate auxiliary trolley and both the trolleys may be on same girder (double girder) or on different girders (four girders).

Note 3 – X/Y/Z indicates the following:

X – Capacity of the main hoist in tonnes.

Y – Capacity of the auxiliary hook 1 and

Z – Capacity of the auxiliary hook 2,

All hooks are mounted on one trolley (double girder).

Note 4 – (a) X + Y / Z indicates the following:

X – Capacity of the main hoist in tonnes.

Y – Capacity of the main hook of the auxiliary trolley, and

Z – Capacity of the auxiliary hook of the auxiliary trolley,

Main hoist hooks are mounted on one trolley and both the hooks of auxiliary trolley are mounted on another trolley and both the trolleys may be on same girder (double girder) or on different girders (four girders).

Note 5 – In stripper cranes, X/Y indicates the following:

X – Lifting capacity of the main hook, and

Y – Value of the stripping force.

Note 6 - In soaker cranes, X/Y indicates the following:

X – Gripping capacity of the tongs and

Y – Hoist capacity of the tongs or auxiliary hook with slings.

For old plants with limitation of building gentry, load carrying capacities, etc., specification outside col 5 may be used.

Note 7 – In case an auxiliary lifting arrangement is necessary in stripper crane, this can be provided by having a separate lifting attachment of hook with legs similar to those in ingot mould which can be held by the tongs of the stripper crane.

TABLE 2: TYPICAL SERVICE DATA FOR EOT CRANE MECHANISM

(Clause 3)

Duty Class (Old)	Duty Class (New)	Load Factor (K1)	Yearly Utilization Factor (Ky)	Daily Utilization Factor (Kh)	Relative Running Time for the Electric Motor of the Mechanisms (% CDF)	Average Number of Switchings per Hour	Total Life of Mechanism in Hours (Min.)	Typical Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	9
I	M3	100	Irregular and infrequent work			0 to 90	2500	All mechanisms of repair cranes and motor house cranes
		75	-do-					
		50	25	33	15			
		25	50	47	15			
		10	100	100	25			
II	M5	100	100	67	15	91 to 150	9000	-All mechanisms of machine shop and assembly shop cranes - Cross travel mechanism of ladle cranes and skipper cranes. -Slewing mechanism of skipper cranes
		75	50	33	25			
		50	50	67	25			
		25	100	100	40			
		10	100	100	60			
III	M7	100	100	100	25	151 to 300	30000	- Hoist mechanisms of process cranes cover carriage and cranes serving warehouse at large scale production plants - Hoist and long travel mechanism of ladle cranes and stripper cranes - Slowing and tong opening/closing mechanism of soaker cranes
		100	100	33	40			
		75	75	67	40			
		50	100	100	40			
		25	100	100	60			
IV	M8	100	100	100	50	301 to 500	40000	- Hoist mechanisms of grab and magnet cranes - Long travel and cross travel mechanisms of soaker cranes
		75	100	100	60			
		50	100	100	60			
		25	100	100	60			
		10	100	100	60			

TABLE 2: TYPICAL SERVICE DATA FOR EOT CRANE MECHANISM – Contd.

Explanatory Notes :

Note 1 – Operating duty condition of a crane mechanism will depend on the following factors:

a) Load factor, percent Kl – $\frac{\text{Average load lifted}}{\text{Rated lifting capacity}} \times 100$

b) Yearly utilization factor, percent Ky = $\frac{\text{Number of days the mechanism is used in a year}}{365} \times 100$

c) Daily utilization factor, percent Ky = $\frac{\text{Number of hours the mechanisms is used in a day}}{24} \times 100$

d) Relative running time for the electric motor of the mechanism, percent = - $\frac{\text{The mechanism is employed per cycle}}{\text{Full cycle time}} \times 100$

$$T = \frac{n\,Ky}{100} - \frac{Ky}{100} \quad \frac{W2}{100}$$

When n = number of tears of working

Normally for calculating the service life of the mechanisms and structure in hours the following average life may be considered:

Average Life of Cranes in Years for various Duty Classes

	M3	**M5**	**M7**	**M8**
Mechanism	25	15	15	12
Structure	40	30	25	20

For bearings and gears life can be lower than the mechanism as a whole.

Note 2 – If the number of switching is not mentioned, the maximum number of switching as mentioned for individual duty class in col. 7 has to be taken into consideration.

TABLE 3: SPEEDS FOR GENERAL DUTY EOT CRANES

(Clause 4)

Duty		Speed in m / min. for capacities													
		5t	10t	15t	20t	25t	32t	40t	50t	80t	100t	125t	150t	200t	250t	320t
Long Travel	**M3**	50	50	50	50	50	50	50	50	40	32	32	25	25	20	20
	M5	80	80	80	80	80	80	80	80	80	80	80	83	83	83	40
	M7 & M8	100	100	100	100	100	100	100	100	80	80	80	80	80	80	80
Cross Travel	**M3**	20	20	20	20	20	20	20	20	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	M5	40	40	40	40	40	40	40	40	32	32	32	32	32	32	20
	M7 & M8	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Hoist	**M3**	6.3	5.0	4.0	4.0	3.2	3.2	3.2	3.2	1.0	1.0	1.25	1.0	0.5	0.03	0.4
	M5	10	8	5.3	5.3	5	5	5	5	4.5	4	3.2	2.5	2.0	1.0	1.25
	M7 & M8	20	20	20	15	15	15	12.5	12.5	10	10	10	5	5	5	5

Note – This table does not cover grabbing and magnet (shipping) cranes

TABLE 4: SPEED OF LADLE CRANES
(Clause 4)

Speed in m / min of	**Capacity of the Main Hoist in Tones**												
Main Hoist	40	63	80	125	150	180	200	250	320	400	450	500	630
Main Cross Travel	8		7	5.3	4			3.2	2.5	2.1	2.0	1.6	1.7
Long Travel	40							32					
Auxiliary Cross Travel		80						53					
	Same as general purpose EOT Cranes												

TABLE 5: SPEEDS FOR STRIPPER CRANES
(Clause 4)

Speed in m / min of	**Capacity of Crane in Tones**						
	25/200	32/200	40/300	40/400	50/400	80/400	100/500
Hoist Mechanism	12	12	14	14	14	16	18
Stripper Mechanism	4.0	4.0	3.0	3.0	3.0	3.0	2.5
Cross Travel	50						
Long Travel	90						

TABLE 6: SPEEDS FOR SOAKER CRANES

(Clause 4)

Speed	Capacity of Cranes in Tones			
	10/20	20/40	32/50	40/80
Main Hoist m / min	25	25	32	22
Auxiliary Hoist m / min	15	15	12.5	12.5
Cross Travel m / min	45, 90	45, 90	45, 90	45, 90
Long Travel m / min	120	120	100	100
Tonge rotation rev/min	10	10	10	10
Tong control m / min	32	32	25	25

TABLE 7: ACCELERATION IN EOT CRANES

(Clause 5)

Speed to be reached in m/min	Acceleration in cm/s^2
120	22
100	19
80	17
60	15
40	12
25	10
15	8
10	7

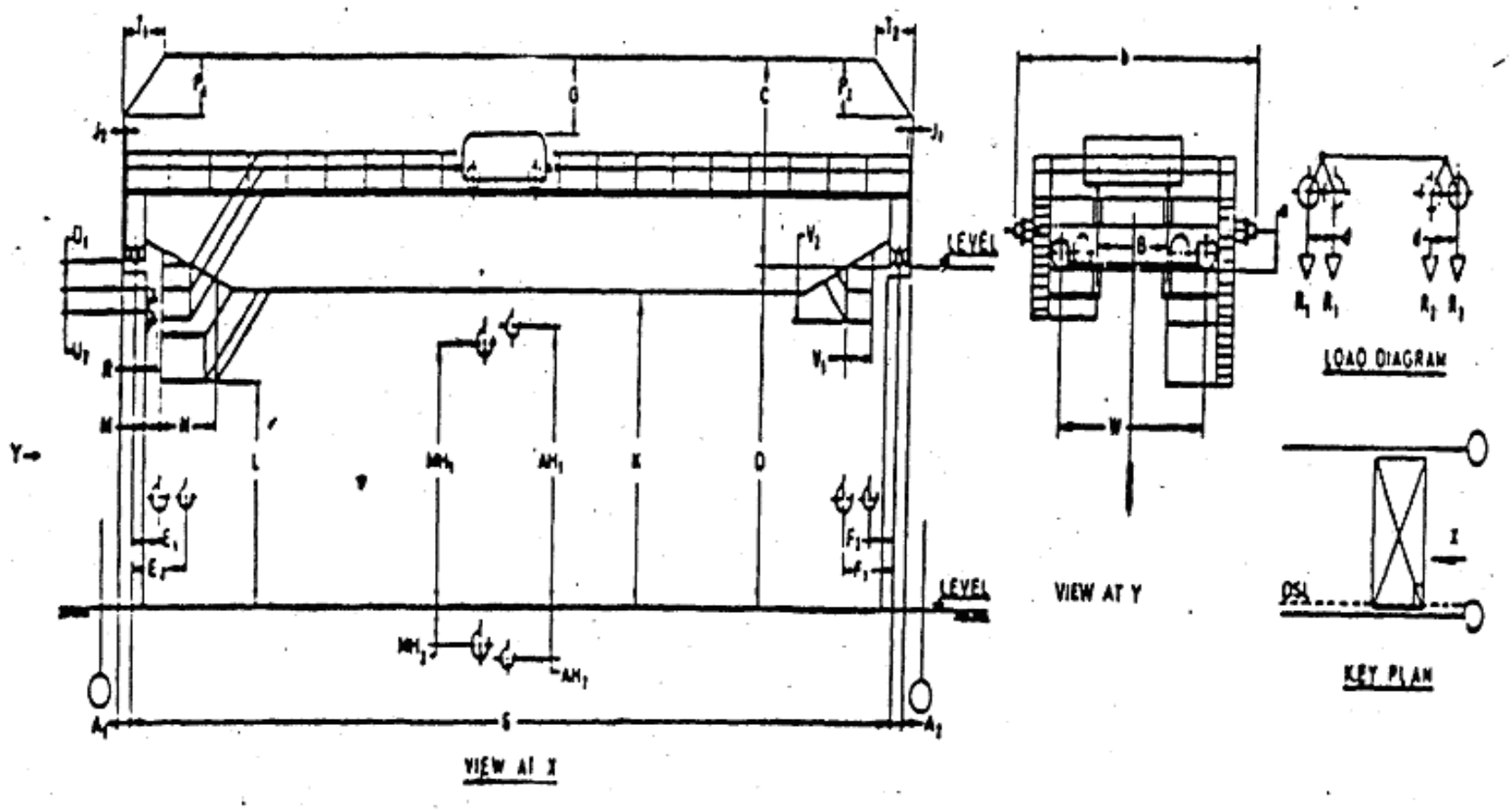

FIG. 1: TYPICAL CLEARANCE DIAGRAM AND LIMITING DIMENSIONS OF DOUBLE GIRDER EOT CRANES

APPENDIX A (Clause 7 and 8)

PERFORMA FOR INFORMATION TO BE SUPPLIED ALONG WITH THE ENQUIRY

TECHNICAL CHARACTERISTICS

No. Off	Span (m)	Capacity (Tonnes)		Speed (m / min)						Acceleration (cm/s2)		Total Lift (m)		Wheel Load not to Exceed (tonnes)		Gentry Rail	Power Supply	Control Voltage	Type of Hooks		Lifting Attachment	Place of Installation	Ambient Tempo C	Duty Cycle					Type of Cabin	Any Special Requirement
				Main hoist (MH)		Aux hoist (AH)		Travel																MH	AH	CT	LT	/ h		
		Main Hoist	Auxiliary Hoist	Normal	Cross	Normal	Cross	Cross (CT)	Long	CT	LT	MH	AH	R1	R2				MH	AH										

DIMENSIONAL REQUIREMENTS (TO BE READ WITH FIG.)

A1	A2	B	C	D	E1	E2	E3	F1	F2	G	MH1	MH2	AH1	!H2	J1	J2	K	L	M	N	P1	P2	R	S	T1	T2	U1	U2	Y1	Y2	W	s	b	d

Note 1 – All dimensions are in millimetres unless otherwise specified

Note 2 – Brakes shall be of de electro-magnetic / ac hydraulic thruster type.

Note 3 – Power supply to crane trolley shall be through rigid conductors / flexible travelling cable system/ drag chain type.

Note 4 – Anti-collision device shall / shall not be provided on crane.

Note 5 – Creep speed, if specified, shall be provided in all motions.

Note 6 – Missing dimensions shall be indicated by the supplier**.**

Note 7 – Emergency disc brakes (hydraulic operated) shall be provided for main hoist of hot metal / teeming ladle handling cranes.

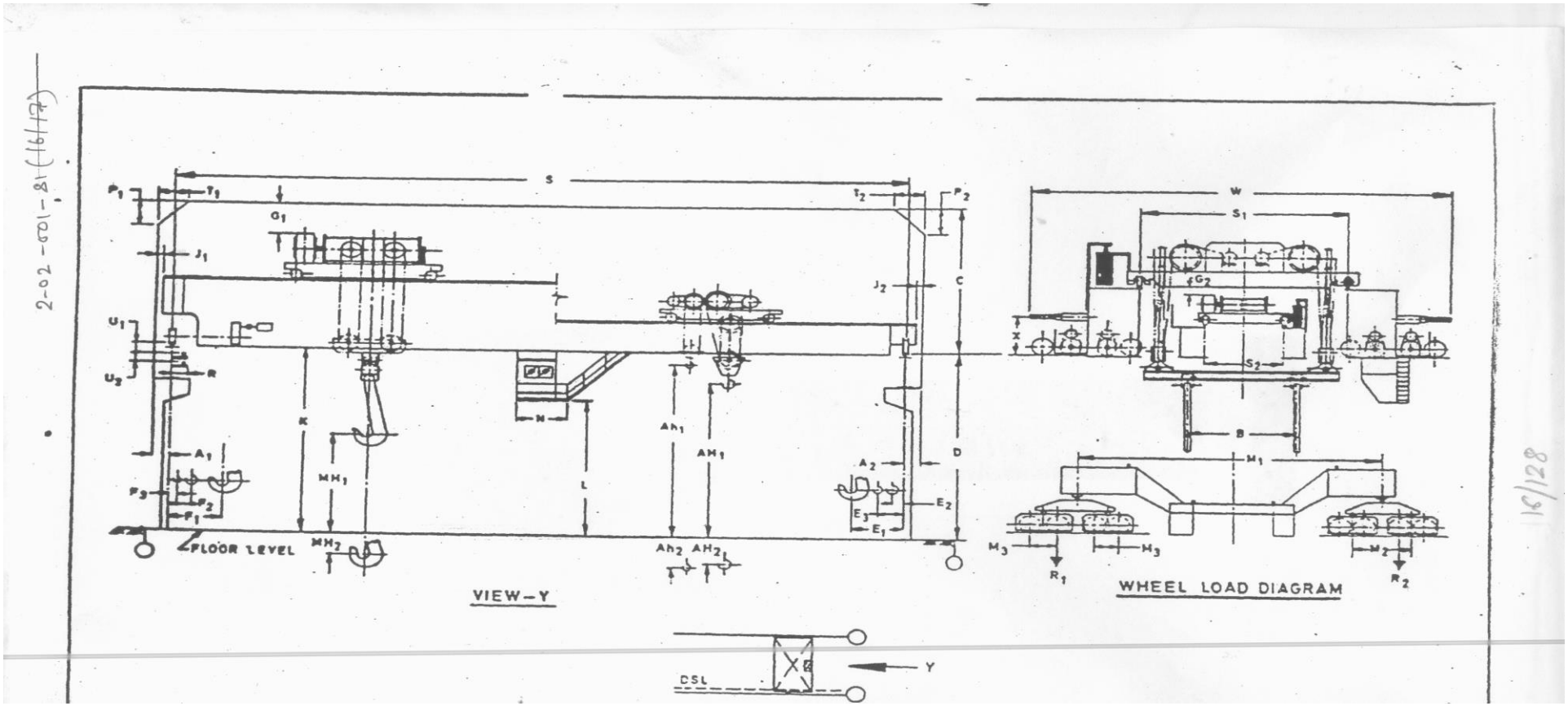

FIG. 2: TYPICAL CLEARANCE DIAGRAM AND LIMITING DIMENSIONS OF FOUR GIRDER EOT CRANES

APPENDIX B

(Clause 7 and 8)

PROFORMA FOR INFORMATION TO BE SUPPLIED ALONG WITH THE ENQUIRY

TECHNICAL CHARACTERISTICS OF LADLE CRANE

No. Off	Span	Capacity (t)			Duty						Speed (m/min)									Acceler			Total			Wheel		Gantry	Power	Control	Type of			Lifting	Place of	Ambient Temp	Start per	Type of	Any
		Main	Aux Trolley		Main	Aux Trolley		Main CT	Aux CT	LT	Main		MH		AH		Travel														MT		AT						
		MH	AH1	AH2	MH	AH1	AH2				Normal	Creep	Normal	Creep	Normal	Creep	Cross	Long													MH	MH	AH						

A1	A2	B	C	D	E1	E2	E3	F1	F2	F3	G1	G2	MH1	MH2	AH1	AH2	AH1	Ah2	J1	J2	K	L	M1	M2	M3	N	P1	P2	R	S	S1	S2	T1	T2	U1	U2	W	X

Note 1 – All dimensions are in millimetres unless otherwise specified

Note 2 – Brakes shall be of de electro-magnetic / ac hydraulic thruster type.

Note 3 – Power supply to crane trolley shall be through rigid conductors / flexible travelling cable system/ drag chain type.

Note 4 – Anti-collision device shall / shall not be provided on crane.

Note 5 – Creep speed, if specified, shall be provided in all motions.

Note 6 – Missing dimensions shall be indicated by the supplier**.**

Note 7 – Emergency disc brakes (hydraulic operated) shall be provided for main hoist of hot metal / teeming ladle handling cranes.