INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**GENERAL CODE OF PRACTICE FOR DESIGN OF E O T CRANES (ELECTRICAL ASPECTS)**	**IPSS: 2-02-004-18 (Revised)** Formerly: IPSS: 2-02-004-97
	Corresponding IS does not exist	

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 May, 1997. Thereafter, standard was revised by the Standard Committee in March, 2018.

0.2 Interplant standardization for steel industry primarily aims at achieving rationalization and unification of partsand 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 their design activities. It is not desirable to make deviations in technical requirements.

0.3 Need for a standard for the general code of practice for steel mill duty cranes covering mechanical as well as electrical aspects was long felt by the standard committee on EOT cranes, and accordingly this standard has been prepared to cover electrical aspects like drives and control system for various mechanism. The usage of this standard is expected to result in design unification of cranes in the steel industry. The other related standards to be used in conjunction with this standard are given in Appendix – B.

0.4 This revision has been carried out to incorporate the technological developments as well as other changes which came to light during the implementation of this standard.

1. SCOPE

1.1 This interplant standardprovides guide lines regarding basic considerations for crane electric, such as motors, control gear and system design.

2. GENERAL CONSIDERATIONS

2.1 The electrical equipment shall be laid out for easy accessibility, convenience of operation, inspection, maintenance and safety. Interchangeability for the same type of components shall be ensured through rationalization of ratings.

2.2 All electrical equipment shall be painted with a primer coat of red lead according to relevant IS and two finishing coats of colour as agreed to between the purchaser and the supplier.

2.3 The equipment shall be suitable for tropical and humid climate. However, maximum temperature according to relevant IPSS standard and 100 % humidity shall not occur simultaneously. The equipment shall be suitable for working at up to 1000 metres above mean sea level.

2.4 De-rating factor, as applicable shall be taken into account while selecting motors, cables etc. with regard to the given ambient temperature.

2.5 The equipment on the cranes shall be suitably protected against damage from radiant heat and shall be rendered proof against ingress of dust and vermin.

2.6 Electrical equipment provided on outdoor cranes/open yard cranes shall be of weather proof type.

2.7 Electrical equipment shall be supplied and tested according to guidelines in the IS : 4137 – 2015 for clause 2, 3 and 4 duty and shall be subject to any modifications and requirements specified by the purchaser.

2.8 The equipment shall confirm to the latest Indian Electricity Rules and Regulations with regard to safety requirements, earthing and other essential provisions specified therein.

2.9 On hot metal, metallurgical and special cranes (like soaker, stripper etc.) only copper cables shall be used. On other cranes also copper cables shall be used in the controls and magnets. In the remaining areas, aluminium conductor cables may be used as agreed to between the purchaser and the supplier.

2.10 The robust construction and ample rating margins, which experience has shown to be necessary in steel works operation, shall be ensured throughout manufacture.

3. MOTORS

3.1 **Selection of dc Mill Duty / Crane Duty Motors** – dc motors shall be selected according to the procedure given hereunder for hoist, bridge and trolley motions. Service factors for the selection shall be based on the service class of various motions according to Table – 1 & 2, unless otherwise specified. For two motor drives for bridge or trolley, kW rating of each motor shall be at least half the total kW rating. For four motor drives, kW rating of each motor shall be at least one forth the total kW rating. Where actual duty cycles are not known, the following procedures shall be followed for the selection of the suitable motor frame size :

a. **<u>Hoist Drive</u>**

In case of constant potential, the hoist motor shall be so selected that its one hour rating shall not be less than that given by the following formula :

$$\text{One-hour rating} = 0.163 \times \frac{Ks\ W\ V}{E} \text{ kilowatt}$$

Where

W = Weight of the rated load on the hook plus the weight of the hook, block and rope, in tonnes.

V = Specified hoisting speed in m/min

Ks = Service factor and

E = Combined efficiency of the gears and sheaves

$= (0.93)^{n} \times (0.98)^{m}$ for the sheave bearings

$= (0.95)^{n} \times (0.99)^{m}$ for the anti-friction bearings.

Here n is the number of gear reduction (set of gears and pinions) and m is the total number of rotating sheaves between drum and equalizer passed over by each part of the moving rope attached to the drum. Ambient correction factors, as specified by the motor

manufacturers shall be used to multiply the kW values determined by the above procedure before selecting the motor.

TABLE 1

[Clause 3.1 (a)]

SERVICE FACTOR (Ks) FOR HOIST MOTORS

Maximum Percent time for which Motor is ON	Maximum Cycles/h	Duty Class	Service Factor (Ks)
20	15	1	0.75
30	25	2	0.75
31-40	26-35	3	0.82
41-50	36-45	4	0.96

b. Bridge and Trolley Drive

Incase of constant potential, the size of bridge and trolley motor (one-hour mill rating at the selected voltage) shall not be less than that computed from the following formula :

One-hour mill rating = 2.6964 (Ks x Ka x W x V) kilowatt

Where

W = The total weight of the cranes or trolley plus load, in tonnes

V = Specified travel speed in m/min

Ks = Service factor and

Ka = A factor which takes care of power to overcome friction to give linear acceleration to the mass moved and the angular acceleration to the motor armature and other rotating parts.

Value of Ka for dc series motor drives for constant potential and for different acceleration values are given in Fig. 1 (for series motor drives the specified rate of acceleration applies ‘on the resistor’.

Ks is a service factor to provide an allowance for motor heating resulting from respective operations according to Table 2.

Ambient correction factor as specified by the motor manufacturer shall be used to multiply the kW values determined by the above procedure before selecting the motor.

TABLE 2

[Clause 3.1 (b)]

SERVICE FACTOR (Ks) FOR BRIDGE & TROLLEY MOTORS

Maximum percent time for which Motor is ON	Maximum Cycles/h	Duty Class	Service Factor (Ks)
20	15	1	1.1
30	25	2	1.2
31-40	26-35	3	1.3
41-50	36-45	4	1.4

Unless otherwise specified an overall friction factor according to Table – 3 shall be used for antifriction bearing cranes and 10.713 kg/tonne (24il/ton) for sleeve bearing cranes.

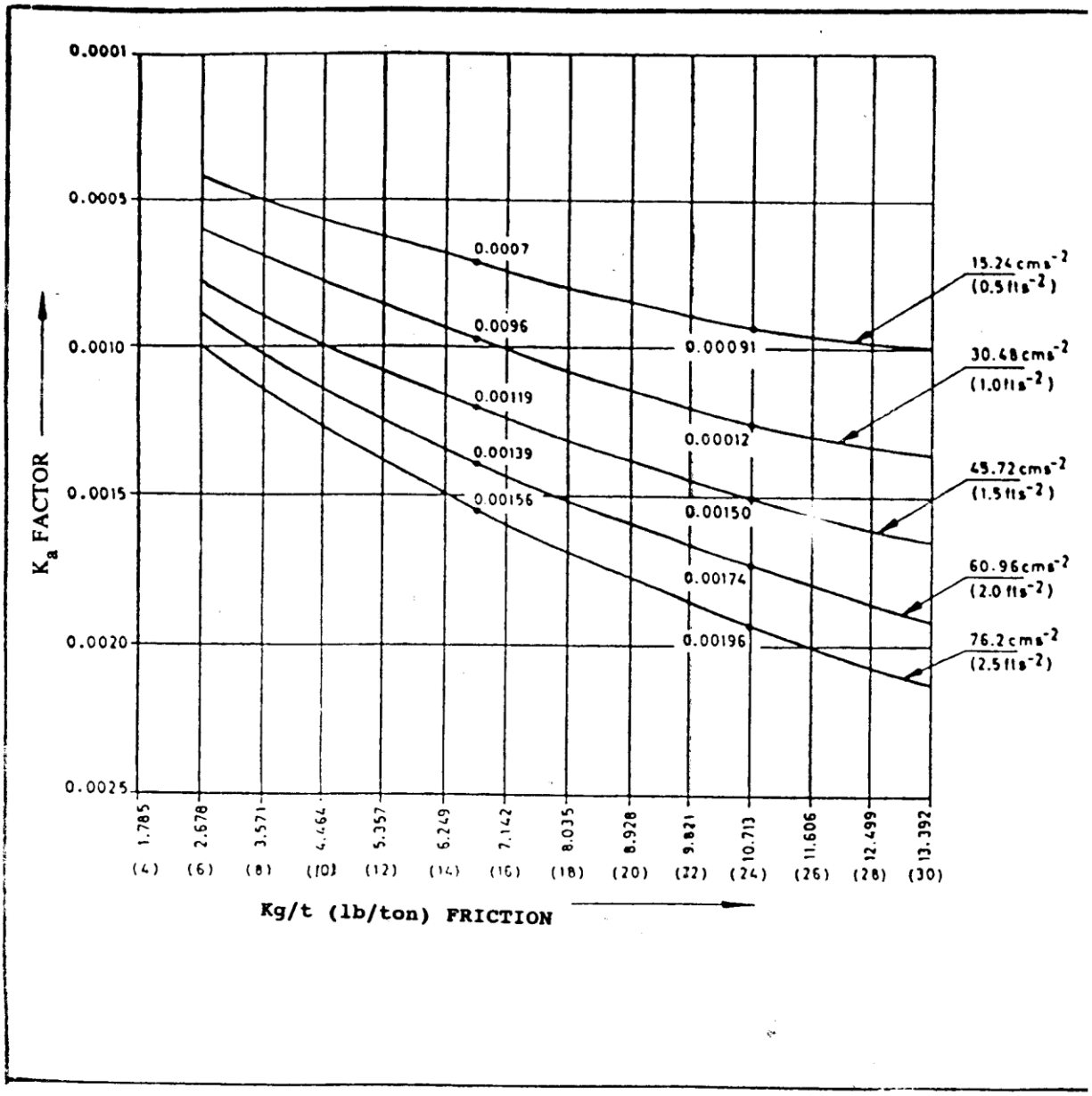

FIGURE-1
[Clause 3.1(b)]

K_a FACTOR FOR SERIES MOTOR DRIVES

TABLE 3

[Clause 3.1 (b)]

OVERALL FRICTION FACTOR (f)

Wheel Diameter in mm (inch)	Friction Factor (f) in kg/ tonne (lb/ton)
300 (12) to 450 (18)	6.696 (15)
500 (21) to 710 (27)	5.357 (12)
800 (30) to 1000 (36)	4.464 (10)

In case of duty classes 3 and 4 where the actual duty class can be adequately assessed, motor for any crane motion shall be selected on the basis of average kW loss. Where actual duty cycles are not known, the above procedure shall be followed for selection of the motor frame.

3.2 **AC Motors** – ac mill / crane duty motors shall be of slip-ring induction type and shall confirm to IPSS: 1-03-003-08.

3.2.1 The crane duty squirrel cage induction motors shall confirm to IPSS: 1-03-004-14.

3.2.2 In case of EOT cranes where motor rating is more than 3 kW, only slip-ring induction motors shall be used for motor rating less than 3 kW, squirrel cage induction motors may be used. In case VVVF controller is envisaged, squirrel cage induction motors may be used for LT and CT drives, irrespective of kW rating. However, as a special case, squirrel cage induction motors may also be used for cranes like single girder crane, under – slung crane and telpher as may be agreed to between the purchaser and the supplier.

3.2.3 **Selection of ac motors** – Where the duty cycle can be adequately assesses, motors for any crane motion shall be selected on the basis of average kW loss basis, where actual duty cycles are not known, the following procedure shall be followed for selection of the motor frame size :

a. <u>For bridge and trolley</u>

i. Motor rating in kW for bridge and trolley shall be calculated as follows :

$$kW = MVS / 6120 T (F + (1000ki a/981 E))$$

where

M = Load moved in Tonnes

V = Specified speed in meters / min

S = Service factor (for bridge and trolley) in accordance with Table – 4

F = Overall friction factor as adopted for dc cranes and having a value of 8.0 or 13.0 kgf / t for track wheels on antifriction or plan bearings respectively.

T = A factor taken for average torque produced by the motor during starting (1.3 to 1.7)

a = Specified average acceleration, cm/sec2

E = Resultant mechanical efficiency of the drive in percent and

Ki = A factor to allow for rotational inertia, user figure being 1.10

The values so obtained shall be up-rated vy factors for higher ambient temperature, ripple factor for thyristor drives and permanent resistance in rotor circuit (I e constantly cut –in resistance).

TABLE 4

[Clause 3.2.3 (a)]

VALUES OF SERVICE FACTORS (S)

Maximum Percent Time during One Operation, Hours	Maximum Round Trips per Hour	Duty Class	Bridge Service Factor		Trolley Service Factor
			Without Plugging	With Plugging	
20	15	1	1.0	1.1	1.2
30	25	2	1.1	1.2	1.3
31 to 40	26 to 35	3	1.2	1.3	1.4
41 to 50	36 to 45	4	1.3	1.4	1.5

ii. For 2 motor drive, kW rating of each motor shall be at least ½ of total kW required. Likewise, for 4 motor drives, kW rating of each motors shall be at least ¼ of total kW required.

iii. The selected frame shall be checked for starting and maximum torque as detailed below :

Acceleration torque M_A in kgf. = (103 a M ki D) / (2 En)

Where

D = Wheel diameter in meter

N = Gear ratio and

Other letters having same meaning as in item (a) (i) above

Breaking fraction torque M_B in kgf = (100 M F D) / (2 En)

Where the letters have the same meaning as in item (a) (i) above.

Starting torque = Accelerating torque (M_A) + Breaking friction torque (M_B)

It shall be ensured that maximum torque is 70 % higher than accelerating torque M_A or 20 % higher than starting torque whichever higher.

iv. Motor shall be checked for load inertia also.

Load inertia in kgf. m^2 = Equivalent inertia of parts in linear motion x Ki .

v. Duty cycle shall be according to recommendation detailed in Appendix– A, minimum being 40 %.

vi. It shall be checked that under no load conditions, the acceleration torque produced by the motor shall not cause wheel slippage. In case wheel slippage takes place under this condition, acceleration shall be reduced and motor kW rating shall be recalculated.

b. **<u>For Hoist</u>**

i. Motor rating in kW for hoist motor shall be calculated as follows :

kW (at 40 % duty cycle) = MVS/6.12 E

Where

M = Mass of the rated load on the hook plus hook block and wire rope, in tonnes.

V = Specified hoisting speed in meters / minute.

S = Service factor for hoist (in accordance with Table 5)

E = Combined efficiency of gear and sheaves

= (0.93)n x (0.98)m for sleeve bearings and

= (0.95)n x (0.99)m for antifriction bearings

N = Number of pairs of gears and

M = Total number of rotating sheaves between drum and equaliser passed over by each part of the moving rope attached to the drum.

The value so obtained shall be uprated by factor for higher ambient temperature, ripple factor for thyristor drives and permanent resistance in rotor circuit (I e constantly cut-in resistance).

TABLE 5
[Clause 3.2.3 (b)]

VALUES OF FACTOR K FOR HOIST MOTOR (INDUCTION MOTORS)

Duty Cycle	Duty Class	Service Factor K
Not more than 20 percent time ON and not more than 15 cycles per hour	1	1
21-30 percent time ON 16-25 cycles per hour	2	1
31-40 percent time ON 16-25 cycles per hour	3	1.1
41-50 percent time ON 16-25 cycles per hour	4	1.2

ii. For two motor drive each motor shall be at least half of the total kW required. In such cases, when one motor burns out, if it is required for the other motor to complete certain emergency operation before the crane can be shut down for necessary repairs, check shall be done on allowable heating up time for the emergency operation for the motor according to IS : 6381-1972 and for associated power resistors.

iii. Duty cycle shall be confirming to recommendations detailed in Appendix – A, minimum being 40 %.

c. For all drives the number of switching per hour against mechanical power requirement shall be taken into consideration in deciding the motor rating. Of the two frame sizes – calculated on the number of switching basis and the service factor basis – the higher one shall prevail.

d. **De-rating Factors**

i. When motor is designed for 40^0C ambient temperature :

Sl. No.	Ambient Temperature (0C)	De-rating Factor
1	40	1.00
2	45	0.95
3.	50	0.88
4	55	0.83
5	60	0.75

ii. When motor is designed for 50^0C ambient temperature :

Sl. No.	Ambient Temperature (0C)	De-rating Factor
1.	50	1.00
2	55	0.95
3	60	0.85

4. **CONTROLLERS**

4.1 Master controllers shall confirm to IPSS: 1-10-005-81 “Specification for master controller” and drum/ cam controller shall confirm to IPSS:1-10-006-81 “Specification for drum/cam controller”.

4.2 Each controller shall be provided with OFF position interlock and shall bear an indication of the motion of the controller and the direction of movement.

4.3 Controller ÓFF’ position shall open all supply lines of the respective motors.

4.4 The provision of single or double master controllers shall be mutually decided by the purchaser and the supplier.

5. **BRAKING**

The type of brakes and braking shall be according to IS: 4137-2015 as may be agreed between the purchaser and the supplier.

5.1 **Hoist Mechanism**

5.1.1 Where one brake is used per motor, a minimum full load hoisting torque value of 150% shall be ensured. Where two brakes per motor are used, a minimum full

load hoisting torque value of 125% for hot metal cranes and 100% for others shall be ensured. On account of space limitations, one brake may be on the motor shaft. In no case brake pulley-cum-coupling shall be used. Further, with respect to brakes, the following shall be kept in mind :

i. **For ac cranes** :

   a. Only shunt brakes shall be used.

   b. For bridge and trolley motions, only parking brakes shall be used.

   c. For hoist motion, service brakes shall be used.

ii. **For dc cranes** :

   a. For hoist motion, series wound brakes shall be used.

   b. For bridge motion, parking brakes shall be used.

   c. For trolley motion, service brakes shall be used.

iii. **For hot metal cranes** :

   The hoist motion, minimum of two brakes shall be used per motor. At least one shall be on the load side. For all other cranes of capacity 25 tonnes and above, two brakes per motor shall be used out of which at least one shall be on the load side.

iv. For long and cross travel :

   Provision shall be made in the panels for changing over the service brakes to parking brakes and vice-versa at site.

5.1.2 Double shoe brake shall be provided for each drive. Two brakes confirming to IPSS: 1-08-005-86 shall be provided on hoist mechanism for class 3 and 4 for 25 tonnes capacity and above. The brake shall be mounted on the input shaft of the gear box in case a single brake is provided for a mechanism. Hoist brakes shall be so selected that one brake lone can safely hold the full load.

The braking path of the hoist motion should be within the distance given below with all the brakes applied simultaneously except for the effect of brakes with time lag :

Speed of Hoist S (metre/minute)	**Braking Path Max (m)**
Upto 6	S/100
Above 6 and below 12	S/120
Above 12	S/150

The hoist brake shall be capable of arresting the rated load while lowering in a distance not more than 1/100th in metres of the value of the hoist speed in metres per minute specified for the mechanism.

5.1.3 Mechanical brakes shall not be used for controlling the motor speed during lowering.

6. RESISTORS

6.1 The resistors shall be air cooled, robust, heavy duty, correction resistant cast iron or punched steel grid type or edge wound iron, chromium and aluminium resistor element.

6.2 The resistance boxes for each drive shall be stacked in the racks separately as far as possible for the facility of inspection, maintenance and safety. The racks shall be of robust construction to withstand vibration due to crane operation.

6.3 Wire wound resistors shall not be used on any motion of crane.

6.4 The electrical clearance in air between resistors and earthed metal shall not be less than 75 mm.

6.5 The resistors shall be rated according to the requirements of service conditions and duty class of cranes. The value chosen shall ensure smooth and uniform acceleration and allow plugging and dynamic braking without overheating.

7 LIMIT SWITCHES

7.1 Hoist Limit Switches –All hoist motions shall be provided with limit switches to prevent the crane hook from over hoisting or over lowering. Gravity operated self resetting type power limit switches shall be connected in the motor main circuit and shall be backed up by screw type self resetting limit switch in the control circuit. For ac cranes, shunt type control switches may be used instead of power limit switches if agreed upon between the manufacturer and the purchaser.

7.2 Limit switches shall be provided for other motions as required by the purchaser.

8 EMERGENCY PUSH BUTTONS (SAFETY SWITCHES)

8.1 Safety switches of sustained contact type shall be provided at the entrance to the crane bridge so that under any emergency conditions, by operating any one of

the switches, the incoming circuit breaker tripped thus cutting of power of all the motions. A pilot lamp incorporated in the control circuit will glow up when any of these switches is operated. Further a mushroom head type ÓFF' push button shall be provided in the operator's cabin so that the main incoming breaker may be tripped under any emergency condition, by pressing the operator's head.

9 CONTACTORS

9.1 The current rating of the ac contactors shall be 50 % higher than the respective motor full load current, unless otherwise agreed upon between the purchaser and the supplier. The contactors shall be of appropriate utilization category and shall meet the specified duty cycle.

9.2 While computing the rating of contactor, proper allowance shall be given for high current that may be encountered on account of single phase brake lowering, plugging and dc injections according to the chosen control scheme.

The contactor ratings adopted for various dc motors are given below :

Motor output on half hour rating at 230 V dc (kW)	Contactor rating (A)
Up to 15	75
Above 15 and up to 30	150
Above 30 and up to 66	300
Above 66 and up to 133	600
Above 133	900

The contactor ratings adopted for various ac motors are as given below :

Motor kW at S3 40% rating at 415 V ac	Contactor rating (A)	Contactor Duty Rating
Up to 20	70	AC-2 for Slip-ring Motor AC-4 for Squirrel Cage Motor
Above 20 and up to 50	160	AC-2
Above 50 and up to 80	225	AC-2
Above 80 and up to 120	400	AC-2
Above 120 and up to 200	630	AC-2

9.3 Contactors shall confirm to IPSS: 1-04-001-03.

10 LIGHTING

Lighting shall be provided in the driver's cabin, staircases and areas where control panels, resistors and transformers shall be installed. Bulk head fitting with dust and vermin proof covers shall be used for these areas. Underslung lights with metallic reflectors on shock absorbing and anti swing Suspension, in adequate number shall be provided for uniform floor illumination.

11 SOCKET OUTLETS

Adequate number of socket outlets for hand lamps shall be provided at driver's cabin, long travel side bridge and in the area where control panels, resistors and transformers shall be installed. The sockets outlet shall be according to IS: 4137 – 2015.

12 EARTHING

Double earthing shall be provided for all electrical equipment on ac cranes to confirm to Indian Electricity Rules. One earthing circuit is to be completed by connecting all equipment with the structure which in turn shall be electrically continuous and connected to one earth collector brush. The second earthing circuit shall be completed by all equipment through to one earthing strip to second earth collector brush.

For dc cranes, earthing to the crane shall be affected through track rails and crane structure. As such, all electrical equipment mounted on the crane shall be connected to the crane structure. The crane structure in turn shall be made electrically continuous by providing jumpers over riveted or bolted joints.

13 CURRECNT COLLECTORS SYSTEM

13.1 Cross travel Conductors–In case of 2 girder cranes, the cross travel conductor shall not be mounted between the girders and shall be accessible for service. Bare copper wires shall not be used as bridge conductors. Flexible trailing cable system mounted on retracting supporting system or angle iron as specified by the purchaser may be used.

In case of 4 girder cranes, the cross travel conductor may be mounted between the two inner girders with suitable facility for servicing.

13.2 Current Collector – The current collector assembly shall confirm to IPSS: 1-10-008-08. The main current collectors and collectors for the trolley (in case angle iron or flat bar conductors are offered as bridge conductors) shall be of cast iron gravity type. Double collectors shall be furnished for all the three phase and earthing on the main current collector gear and for the magnet circuit on the trolley.

13.2.1 The collectors shall have adequate current carrying capacity. The design of collector shall be such as to minimize the chance of binding at the hinge points due to duct or corrosion.

14 POWER DISTRIBUTION

Power distribution for ac cranes shall generally comprise one incoming isolator, one air circuit breaker/ moulded case circuit breaker in combination with the contactor suitable for protection against short circuits, earth fault, over current and shall be provided with no volt release, indicating lamps, operating handle for manual operation and all safety interlocks / standard accessories. For dc cranes also, protective panels shall be provided.

14.1 The power distribution shall be planned in such a way that in case of tripping of main incoming ACB the power shall be still available for essential auxiliaries such as lighting, plug, sockets, control transformer, lifting magnet etc, as required.

14.2 Control panel for each motion shall be fed from one of the appropriate outgoing feeders.

15 CONTROL PANELS

15.1 All main and auxiliary contactors, overload relays, auxiliary relays and timers etc. shall be mounted in sheet steel cubicles of thickness not less than 2 mm with lockable hinged doors. Each motion shall preferably have an independent panel which shall be dust and vermin proof. Open yard crane panels shall be fully weather proof.

15.2 All control equipment inside control panels shall be front mounted, front wired and easily accessible for maintenance.

15.3 The control panels in both ac & dc cranes shall meet the requirements of the following standards:

a. IPSS: 1-10-013-11
b. IPSS: 1-04-041-03
c. IPSS: 1-10-042-03

16 **CREEP SPEED**

The creep speed in hoisting motion, wherever required by the purchaser shall be achieved by means of a suitable method such as:

a. Dc injection
b. Planetary gear with pony motor
c. Opposite torque conductor control or
d. Thyristor control.
e. VFD

APPENDIX A

(Clause 3.2.3)

RECOMMENDATION REGARDING DUTY CYCLE

Sl. No.	Type of Crane & Motion	Electric Motors CDF *	Sl. No.	Type of Crane & Motion	Electric Motor CDF *
1.	Travelling crane for power station		8.	Steel works or foundry ladle cranes	
	Hoisting	15 - 25		Hoisting	40 - 60
	Aux. hoisting	15 - 25		Aux. hoisting	40
	Cross traverse	15 - 25		Cross traverse	40
	Long travel	15 - 25		Long travel	40
2.	Overhead Travelling crane for assembling and dismantling of machinery		9.	Steel works pig iron breaking cranes	
	Hoisting	15 - 25		Hoisting	40 - 60
	Aux. hoisting	15 - 25		Aux. hoisting	40
	Cross traverse	15 - 25		Cross traverse	40
	Long travel	15 - 25		Long travel	40
3.	Overhead Travelling crane for workstores		10.	Steel works ingot stripper cranes	
	Hoisting	25 – 40		Hoisting	60
	Aux. hoisting	25 – 40		Aux. hoisting	25 - 40
	Cross traverse	25 – 40		Cross traverse	60
	Long travel	25 - 40		Closing motion for tongs	40 - 60
				Slewing motions	40
4.	Overhead Travelling crane for workshops		11.	Steel works soaking pit cranes, ingot charging crane	
	Hoisting	25 – 40		Hoisting	60
	Aux. hoisting	25 - 40		Aux. hoisting	25 - 40
	Cross traverse	25 – 40		Cross traverse	60
	Long travel	25 - 40		Closing motions for tongs	40 - 60
				Slewing motions	40
5.	Overhead Travelling crane with grab		12.	Steel works open hearth furnace charging cranes	
	Hoisting	40 - 60		Hoisting	60
	Aux. hoisting	25 - 60		Aux. hoisting	25 - 40
	Cross traverse	60		Cross traverse	60
	Long travel	40 - 60		Aux. cross traverse	40
				Long Travel	60
6.	Overhead Travelling crane in scrap yard		13.	Steel works forge cranes with turning gear	
	Hoisting	40 – 60		Hoisting	60

Sl. No.	Type of Crane & Motion	Electric Motors CDF *	Sl. No.	Type of Crane & Motion	Electric Motor CDF *
	Aux. hoisting	25 –40		Aux. hoisting	40
	Cross traverse	40 - 60		Cross traverse	60
	Long travel	40 - 60		Long travel	60
7.	Overhead Travelling crane with magnet for transporting plates and the like		• Minimum value or CDF shall be 40 %		
	Hoisting	40 - 60			
	Aux. hoisting	25 - 40			
	Cross traverse	40 - 60			
	Long travel	40 - 60			

APPENDIX A

(Clause 0.3)

LIST OF REFERENCE STANDARDS

Sl. No.	IS / IPSS Standards No.	Description of the Standards
1	IS 807 : 2006	Code of practice for design, manufacture erection and testing (structural portion) of cranes and hoists first revision (with amendment 1)
2	IS 3177 : 1999	Code of practice for electric overhead travelling cranes and gantry cranes other than steel works cranes (first revision)
3	IS 4137 : 2015	Code of practice for heavy duty electric overhead travelling cranes including special service machines for use in steel work (first revision)
4	IS 6381 : 2004	Construction and testing of electrical apparatus with type of protection é'.
5	IPSS : 1-02-020-84	Basic parameters for standardization of steel plant equipment
6	IPSS: 1-03-002-08	Specification for dc mill / crane duty motors (800 series) (Third revision)
7	IPSS:1-03-003-08	Specification for ac mill / crane duty slipring induction motors (second revision) (Amendment 1)
8	IPSS:1-03-004-14	Specification for ac crane duty squirrel cage induction motors (second revision)
9	IPSS:1-03-005-03	Specification for dc mill / crane duty motors (600 series) (With amendment 1 & 2)
10	IPSS:1-04-001-03	Specification for Contractors for voltage not exceeding 1000 v ac or 1200 v dc (first revision)
11	IPSS:1-04-003-03	Specification for Mechanically operated limit switches for control circuit for voltages upto and including 1000 v ac or 1200 v dc (first revision)
12	IPSS:1-04-004-11	Specification for moulded case circuit breakers for voltages not exceeding 1000 V ac or 1200 v dc
13	IPSS:1-08-001-18	Specification for Crane Wheels (first revision)
14	IPSS:1-08-002-18	Specification for Sheaves assembly for EOT Cranes (first revision)
15	IPSS:1-08-003-18	Specification for Steel wire ropes for cranes (third revision)
16	IPSS:1-08-004-18	Specification for Forged crane hooks (first revision)
17	IPSS:1-08-005-18	Specification for Brakes for cranes (first revision)
18	IPSS:1-08-006-18	Feston cable trolley
19	IPSS:1-08-007-18	Specification for hook blocks
20	IPSS:1-08-008-18	Specification for forged Ramshorn hooks
21	IPSS:1-08-009-18	Specification for Laminated ladle hooks
22	IPSS:1-08-010-18	Specification for crane wheel assembly (Live axle type)
23	IPSS:1-08-013-18	Specification for Thimbles
24	IPSS:1-08-014-18	Horizontal gear boxes for cranes

25	IPSS:1-08-017-18	Code of practice for clamping of crane rails
26	IPSS:1-08-020-18	Crane gear boxes – Acceptance Norms
27	IPSS:1-10-001-11	Lifting Magnets (First revision)
28	IPSS:1-10-002-02	Resistance boxes for power circuits (with amendment 1)
29	IPSS:1-10-003-02	Specification for Electro – hydraulic thyristor
30	IPSS:1-10-005-02	Specification for Master controller
31	IPSS:1-10-006-02	Specification for Drum/cam controllers (with amendment 1)
32	IPSS:1-10-008-08	General requirements for current collector assembly
33	IPSS:1-10-010-08	General requirements for control panels for cranes (with amendment 1)
34	IPSS:1-10-011-08	Particular requirements for control panels for ac cranes (with amendment 1)
35	IPSS:1-10-012-08	Particular requirements of control panels for dc cranes
36	IPSS : 2-02-001-18	Design parameters for EOT cranes (with amendment 1)
37	IPSS : 2-02-002-18	Acceptance norms for EOT Cranes
38	IPSS: 2-02-003-18	General code of practice for design of EOT cranes (Mechanical aspects) (first revision)
39	IPSS : 2-02-004-18	General code of practice for design of EOT cranes (electrical aspects) (first revision)
40	IPSS : 2-02-005-18	Code of practice for selection of electric cables for use on EOT cranes (first revision)
41	IPSS : 2-02-006-18	Code of practice for laying of electric cables on EOT cranes
42	IPSS: 2-02-007-18	Guidelines for safety in EOT Cranes
43	IPSS: 2-02-008-18	Tests and checks for acceptance of EOT cranes
44	IPSS : 2-02-009-18	Reference Guide for EOT Cranes