SJVN ARUN-3 POWER DEVELOPMENT COMPANY PVT. LTD. (SAPDC)

4x225 MW ARUN-3 HEP NEPAL

TECHNICAL SPECIFICATION
FOR
SUPPLY OF DAMAGED ITEMS & SUPERVISION SERVICE FOR RESTORATION OF DOUBLE GIRDER EOT CRANES (250/50/10T)

SPECIFICATION NO.: PE-TS-437-501-A001A

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, INDIA

INDEX

SCOPE OF ENQUIRY/ INTENT OF SPECIFICATION

1.1 **BACKGROUND:** Two (2) nos. 250/50T x 21 m span double girder EOT cranes with tandem operation & one (1) number Electric hoist of 10T capacity underneath each crane have been commissioned at Power House of the project site in September 2024. However some items (under scope of supply of this tender) got damaged due to water ingress, for which **supply of damaged items and supervision services** of restoration work of EOT cranes is required to be carried out by the bidder.

1.2 **SCOPE OF SUPPLY:** Items indicated in **Annexure I** are to be manufactured / procured, tested and supplied as per make, type, size, material of construction and ratings indicated in already approved drawings/documents. The approved drawings /documents shall be followed in totality. In case bidder proposes any change / alternative with respect to the make, type, size, material of construction and ratings, same shall be brought out for BHEL's acceptance after placement of order on the bidder. However, such change/s shall meet the minimum requirement of the approved drawing/document. In event of such change/s, As built drawings shall be submitted for information. Scope of supply shall also include consumables, oil, grease, cadmium compound, first fill of lubricants for complete cranes, as required.

1.3 **SCOPE OF SERVICE:** Following services are required to be provided by the bidder.

a. **Supervision services for replacement** of supplied items in two (2) nos. 250/50T x 21 m span double girder EOT cranes with one (1) number Electric hoist of 10T capacity underneath each crane.

b. **Supervision service for demonstration of operation** of two (2) nos. 250/50T x 21 m span double girder EOT cranes with one (1) number Electric hoist of 10T capacity underneath each crane including tandem operation after replacement of supplied items.

1.4 **GENERAL REQUIREMENT FOR SUPERVISION SERVICES**

a. Bidder shall be informed at least 10 days in advance for the requirement of visit at site.

b. Visiting team shall consist of one or two expert of bidder as deemed necessary by them.

c. Visits during material verification for MRC shall be free of cost by bidder at site.

d. Replacement of any parts found faulty (due to manufacturing defect, workmanship, material defect or malfunctioning) from supplied items upto guarantee period (as defined in NIT) shall be in bidder's scope.

2. **QUALITY & PERFORMANCE REQUIREMENT**

a. **Testing at Works:** For the items to be supplied at site, "Manufacturing Quality Plan including Demonstration Test Procedure with sub vendor list for 250/50/10T Power House Crane" doc no PE-V0-437-501-A501 (**Refer Annexure II)** with this specification is to be followed as applicable. Bidder shall furnish test certificates, inspection reports, offer witness of tests & submit any other document/meet any other requirement in MQP as detailed for respective items.

b. **Checks at Site under supervision of bidder**: Supervision services for pre-assembly/assembly checks (as required) and operational checks shall be provided by the bidder as per the "Standard Field Quality Plan" doc no PE-V0-437-501-528 (**Refer Annexure III**) before demonstrating operation of the cranes & lifting beam after restoration.

3. Exclusions

i) Erection and commissioning of supplied items at site.
ii) Unloading & storage at site.
iii) Internal transportation at site after unloading.
iv) Load / overload testing of cranes.

4. Drawings/documents to submitted after placement of order:

Sl no	Drawing/Document number	Drawing/Document Title
1	PE-V0-412-501-A360	Data sheet for replacement items indicating make, type, size, rating quantity etc

5. Packing requirement: All supply items shall be treated and packed for storage under the climatic conditions prevailing at the site. Refer **Annexure IV** for packing requirements.

PROJECT INFORMATION

SECTION-1

GENERAL TECHNICAL SPECIFICATION

1.0 General

Arun-III Hydro-Electric Project in Nepal is contemplated for generation of hydro power with design energy of 3924 MU per annum in 90% dependable year. Project is proposed to be Run of River with Pondage Scheme.

1.1 Site Specific Information

1.1.1 Project Name

- Project Title:……..ARUN-III HEP
- Capacity:……4 X 225MW
- Owner:……..SAPDC

1.1.2 Location

The proposed project site is located at a distance of 50 km from Khandbari, the headquarters of Sankhuwa sabha District of Nepal. It is at about 240 km from Biratnagar and about 740 km from Kathmandu. The location details of the proposed project site are as indicated below:

- Latitude …… .27º-30'N – 27 º -35'N
- Longitude …….. ...87º -12'E – 88 º-20'E
- Distance from Tumlingtar (domestic airport) town is…….About 68 km
- Distance of Kathmandu (international airport) from Tumlingtar…..About 660.km

1.1.3 Climatic Condition

Average max temp	:	30º C
Average Minimum Temp	:	20º C
Maximum river water temperature	:	25ºC
Minimum river water temperature	:	10ºC

1.1.4 Seismic Zone

The equipments shall be designed for operation in seismic zone four for earthquake resistance. The equipment and each part of it shall be strong enough and sufficiently well connected to resist total operating stresses resulting from forces in normal operation, abnormal condition and forces superimposed due to occurrence of earthquakes of intensity which cause a ground acceleration of 0.16 g in vertical direction and 0.24 g in the other horizontal directions.

1.1.5 Transportation

The nearest major airport is at Kathmandu which is at a distance of 740km from Project Site. Biratnagar is connected to Kathmandu by Road.

The major nearest seaport for the trans-shipment of heavy equipment to Nepal is Kolkata. Other sea ports for imported equipment would be Mumbai or Chennai as convenient. The two sea ports Mumbai & Chennai are connected to Kolkata and Jogbani by rail as well as roads.

Railway transport is available from Kolkata and other locations of Indian Cities to the Nepal-India border only. The broad gauge line from Kolkata ends at Jogbani, Bihar. All rail freight for Nepal has to be unloaded there. The distance of Kolkata by rail route is about 800 km. From Jogbani, the road distance to the projects sites via Biratnagar is about 300km.

Road access to Arun-3 project from Kolkata to Jogbani is 600km; from Biratnagar to Project Area via Hile is 300km. Total distance to project area from Kolkata is 900km.

Alternative route could be from Kolkata to Raxaul which is 800km, further from Birganj to Dhalkebar to Hile to Project Area which is 450km. Total distance Kolkata to Project Area is 1250km.

1.1.6 Transport Limitation

The transport limitation by road from Jogbani to the project site is the governing factor for determining permissible package size and weight.

The existing roads allow the transport of the packages of the following size and weight.

Size (in mm) (l x b x h)	9700 x 6000 x 6000*
Weight (Tonnes)	70R

Heaviest package to be transported with suitable number of axle for safe transportation of consignment for 70R bridge capacity.
* Height from the ground

1.2 Salient features of Project

The salient features of Arun-3 HEP are as follows:

A.	**Hydrology**	
i.	Catchment Area	26747 KM^2
ii.	Probable Maximum Flood (PMF)	8880 cumec
iii.	Glacial Lake Outburst Flood (GLOF)	6830 cumec
B.	**Reservoir**	
i.	Maximum Water Level (MWL)	847.73 m
ii.	Full Reservoir Level (FRL)	845 m
iii.	Minimum Drawdown Level (MDDL)	835 m
iv.	Live Storage / Active Storage / Peaking Volume	5.65 MCM
v.	Inactive Storage (below MDDL)	8.29 MCM
vi.	Submergence Area at FRL	66.3 Ha
C.	**Dam**	
i.	Type of Dam	Concrete Gravity Dam
ii.	Dam top Level	El.849 m
iii.	River bed Level	El. 790 m
iv.	Dam Height above River bed	59 m
v.	Deepest Foundation Level	El.779 m
vi.	Height above deepest Foundation Level	70 m

vii.	Length of Dam at Top	197.30 m
viii.	Top Width of Dam	7 m
D.	**Diversion Arrangement**	
D.1	**Diversion Tunnel**	425 m long, 11 m diameter circular-shaped to divert 1300 cumecs
D.2	**Upstream Coffer Dam**	
i.	Type	Concrete Dam
ii.	Top Level	El. 817 m
iii.	Height of U/s Coffer Dam	26 m
iv.	Length	120 m
D.3	**Downstream Coffer Dam**	
i.	Type	Rock fill Dam
ii.	Top Level	El. 797.5 m
iii.	Height of D/s Coffer Dam	8.5 m
iv.	Length	92 m
E.	**Spillway**	
i.	Design Flood	PMF-8880 cumec GLOF -6830 cumec
ii.	Energy Dissipation System	Trajectory Bucket type
iii.	i)Sluice spillway No. Size ii)Overflow spillway No. Size	 6 9.0 m (W)X 14.0 m (H) 1 5.0 m (W)X 5.0 m (H)
iv.	Crest Level	El 808m-Sluice type

			El 840m-Overflow spillway	
F.	**Power Intake**			
i.	No. & Type		2 Nos., Straight intake with bell mouth	
ii.	Invert Level		El.819m	
iii.	Top Level		El.849m	
G.	**Intake Tunnels**			
	No. & Type		2 Nos., 7 m diameter, horse-shoe shaped	
	Length		181.50 m & 173.30 m	
	C.L. of Intake Tunnel		El 822 m	
H.	**Head Race Tunnel**			
i.	Diameter and shape		9.5m circular	
ii.	Length		11778.68 m	
iii.	Design Discharge		344.68 cumecs	
iv.	No. of Adits & size		4 Nos.,7 m X 7 m D - shaped	
v.	Adit	Adit Length	RD of HRT	Distance between Adits
	1	691.32m	1052.51 m	
	2	768.39m	5148.20 m	4095.69 m
	3	386.13 m	8205.02 m	3056.82 m
	4	365.32 m	11727.41 m	3522.39 m
I.	**Surge Shaft**			
i.	Size & shape		Open to sky, Restricted Orifice 1No., 24.0m diameter, Circular	
ii.	Height		149 m	

iii.	Top Level		El 940.00 m	
iv.	Gates, No. & Size		2 Nos., 5.5m (W)X 7.5m (H)	
v.	Surge Levels			
	Load case 100-0-0 (up)		El. 879.75 m	
	33-100-0 (up)		El. 863.35 m	
	100-0-33 (down)		El. 826.79 m	
	10-100-100 (down)		El. 801.61 m	
J.	**BUTTERFLY VALVE CHAMBER - UNDER GROUND**			
i.	Size		62 m (L) x 12 m (W) x 21 m (H)	
ii.	Butterfly valve		2 Nos. 5.5 m dia.	
K.	**Pressure Shaft**			
i.	Nos.		Underground, 2 Nos.	
ii.	Type & Size		Circular, each 5.5 m dia bifurcating into two nos of 4.0 m diameter to feed four units	
iii.	Length of pressure shafts 1 and 2			
	Pressure shaft-I	447.413 m	Pressure shaft-2	411.681 m
	Branch 1	82.208 m	Branch 3	55.970 m
	Branch 2	58.82 m	Branch 4	54.358 m
L.	**POWER HOUSE COMPLEX**			
i.	Power House Cavern		Underground on Left bank	
ii.	Installed capacity		900 MW	
iii.	No. of units		4	
iv.	Unit Capacity		225 MW	
v.	Size of Power House Cavern		179.50m (L) x 22.5m (W) x 49.5m(H)	

vi.	Centre line of Turbine	EL. 525 M
vii.	MIV Floor level	El 520.5M
viii.	Turbine Floor Level	EL. 529 M
ix.	Generator Floor Level	EL. 534 M
x.	Machine Hall Level	EL. 539 M
xi.	Service Bay Level	EL. 539 M
xii.	Dewatering Gallery	EL. 512.50 M
M.	**TURBINE**	
i.	Type	Vertical Francis
ii.	Number	4
iii.	Rated Capacity	225 MW
iv.	Head Loss for calculation of Design net head	21.46 m
v.	Design Net Head	286.21 m
vi.	Rated Discharge	86.17 m3/Sec
vii.	Speed	250 rpm
N.	**GENERATOR**	
i.	Type	Vertical shaft, Francis turbine driven, alternating current synchronous generators
ii.	Number	4
iii.	Rated Output	250 MVA
iv.	Continuous overload output (110% of rated)	275 MVA
v.	Rated Voltage	15.75 kV
O.	**Bus Duct**	4 Nos. The bus duct shall be natural air cooled and rated for 17.5 kV and

		shall be designed to carry 10.5 kA continuous current.
P.	**UNDERGROUND TRANSFORMER CAVERN**	
i.	Size	146.14m (L) x 16 m(W)x 23m(H)
ii.	Transformer Type	Single Phase
iii.	Number and rating	13 nos. (including 1 spare), 15.75/420/√3kV, 50Hz, 92MVA
iv.	Transformer Hall level	El. 552 m
Q.	**Switchyard & Transmission**	
i.	Type of Switching	Gas Insulated Substation and Pothead Yard
ii.	Size	207m (L) x 106m (W)
iii.	Switchyard level	El. 557 m
iv.	Number of bays	11 Nos. (4 Nos. GT Bays + 2 Nos. Line Bays + 2 Nos. Line Reactor Bays + 2 Nos. Bus Reactors Bays+ 1 No. Bus Coupler Bay)
v.	Transmission System	400kV Arun III HEP – Muzzafarpur via Dhalkebar D/c Quad Moose Lines with LILO of both circuits at Dhalkebar 400/220kV substation (310kms)
R.	**Draft Tube Gate**	4 Nos. fixed wheel type of size 5m(W) X 5.5m(H)
S.	**Tail Race**	
i.	Type and size	Circular shaped, 10 m
ii.	Length of TRT	108.12 m
iii.	Minimum Tail Water Level	El 533m
iv.	Maximum Tail Water Level	El 535m
v.	Average Tail Water Level	El 534m

1.2.1 Power System Study Report

Power system study report containing various data on Generator, Governor, Excitation System, Insulation coordination etc. shall be shared with the successful bidder for reference after award of the contract**.**

1.3. Water Sample Details

Petro graphic Analysis Report of silt in the river at Project site is attached as Annexure - B of this Section.

1.4. Operating Pattern of the Plant

During High flow season (i.e. from June to September), Plant shall be operated as base load station. However, during lean flow season (i.e. from December to March), it shall be operated as peaking Plant.

ANNEXURE I- LIST OF ITEMS TO BE SUPPLIED FOR RESTORATION OF DOUBLE GIRDER POWER HOUSE CRANES INCLUDING TANDEM OPERATION

ANNEXURE I: LIST OF DAMAGED ITEMS TO BE SUPPLIED FOR RESTORATION OF DOUBLE GIRDER POWER HOUSE CRANES INCLUDING TANDEM OPERATION

SR NO.	DESCRIPTION	OTHER TECHNICAL DETAILS	QTY	UOM
	CRANE 1:- OG-06 A			
1	VFD Altivar-71 (30kw - 40HP) 380/480v For LT Motion (Make: Schneider Electric)		1	no.
2	Long Travel DBR (OHMS-14, 42 Amp) (make Electromag Mehods)		1	no.
3	MH - DC Brake		1	no.
4	Long Travel All Thruster Brakes (All Thruster Brake Condition) (make Electromag Mehods)	Brake dia 160mm	4	nos.
5	Brake rectifier 400 V AC to a190 V DC		7	nos.
6	CT Motor Thruster Brake (make Electromag Mehods)	Brake dia 100mm	1	
7	MH, AH, Monorail MH Motion Encoders, connector & adapter		3	nos.
8	Gravity Limit Switch (MH, AH & Monorail MH) (Make SOC)	10 Amp	3	nos.
9	Main Hoist and AH Load Cell Completed set, Load cell Pin, Load cell controller & Remote Display (Make: IPA)	Load cell unit: 110 V AC Display: Dot Matrix LCD with LED back light	1	set
10	Monorail Main Hoist Motor 190V DC Disc Brake (Make Emco Precima)	FDB20 Disc brake with rectifier	1	no.
11	Monorail CT Motor 190V DC Disc Brake (Make Emco Precima)	FDB10 Disc brake with rectifier	1	no.
12	All Panels Heaters & thermostat as per Design	240 V AC, 20W	6	nos.
13	Monorail CT Master Control (Volts -500, Amps- 40/10, C/S-50 Steps-4, Cams-6 (make Electromag methods)		1	no.
14	Main Hoist Thruster Brake (make Electromag methods)	Brake dia 400mm	1	no.
15	AH Thruster Brake (make Electromag methods)	Brake dia 400mm	1	no.
16	Encoder		6	nos.
17	Long Travel Anti Collision Device with Reflector As per	IP: 24V-240V, 3	1	no.
18	Cross Travel Limit Switch (TYPE-LS/1SH/2 (Make SOC)	IP:24V-240V, 3A, OP:1C/O, sensing range 0.1m -5m	2	nos.
19	Long Travel Limit Switch (TYPE-LS/1SH/2 (Make SOC)	10Amp, 1 way lever	1	no.
20	PLC Ethernet Switch (make Pheonix)		1	no.
21	3 Position Selector Switch witch NO, NC		5	
22	Canopen		2	nos.
23	Remote & Receiver complete set (Make SNT)		1	no.
24	Monorail Main Hoist Motor RPM-961, KW-6.5, HP- 8.6, A-15.20 (Make ABB)		1	no.
25	Monorail Cross Travel Motor (RPM-900, Kw- 0.55, Hp-0.75 Amps- 1.64 Make ABB)		1	no.
26	PLC Module on returnable basis		2	nos.
27	Essential Power Output DC 24V 120W		1	no.
28	All Panels MCCB Handles (make Siemens)		10	nos.
29	Main Hoist Rotary Limit Switch (Make SOC)	10 Amp	1	no.
30	AH Rotary Limit Switch (Make SOC)	10 Amp	1	no.
31	Monorail Cross Travel Limit Switch (TYPE- LS/1SH/2 (Make SOC)	10Amp	1	no.
32	Monorail Main Hoist Rotary Limit Switch (Make SOC)	10Amp	1	no.
	CRANE 2:- OG-06 B			
1	Long Travel All Thruster Brakes (make Electromag methods)	Brake dia 160mm	4	nos.
2	CT Thruster Brakes (make Electromag methods)	Brake dia 100mm	2	nos.
3	MH, AH, Monorail MH Motion Encoders, connector & adapter (Make: Baumer)		4	nos.
4	Gravity Limit Switch (MH, AH & Monorail MH) (Make SOC)	10 Amp	3	nos.
5	Main Hoist And AH Load Cell Completed set, Load cell Pin, Load cell controller & Remote Display	Load cell unit: 110 V AC Display: Dot Matrix LCD with LED back light	1	set
6	Remote & Receiver complete set (Make SNT)		1	set
7	Monorail CT Motor 190V DC Disc Brake (Make Emco Pricima)	FDB20 Disc brake with rectifier	1	no.
8	Panels Heaters & thermostat As per Design	240 V AC, 20W	7	nos.
9	Main Hoist Rotary Limit Switch (Make SOC)	10 Amp	1	no.
10	Bearing for LT wheel as per the design		8	nos.

11	AH Rotary Limit Switch (Make: SOC)	10Amp	1	no.
12	Long Travel Master Control (Volts -500, Amps40/10, C/S-50 Steps-4, Cams-6 (make Electromag methods)		1	set
13	Main Hoist Thruster Brake (make Electromag methods)	BRAKE DIA 400MM	1	no.
14	AH Thruster Brake (make Electromag methods)	BRAKE DIA 400MM	1	no.
15	Long Travel Anti Collision Device With Reflector As per Design.	IP: 24V-240V, 3	1	no.
16	Cross Travel Limit Switch (TYPE-LS/1SH/2 (Make SOC)	10 AMP	2	nos.
17	Long Travel Limit Switch (TYPE-LS/1SH/2 (Make SOC)	10 AMP	1	no.
18	Monorail Cross Travel Limit Switch (TYPE-LS/1SH/2	10 AMP	1	no.
19	Monorail Main Hoist Rotary Limit Switch (Make: SOC)	10 AMP	1	no.
20	PLC Ethernet Switch (Make Phonix)		1	no.
21	3 Position Selector Switch witch NO, NC		5	nos.
22	Canopen module		2	nos.
23	Essential Power Output DC 24V 120W		1	no.
24	PLC Penal Relay with Base 24V DC 8pin (Make: OMRON)		4	nos.
25	Monorail Cross Travel Motor (RPM-900, Kw-0.55, Hp-0.75 Amps- 1.64		1	no.
26	All Panels MCCB Handles		10	nos.
27	Long travel Motor (Rpm-961, Kw-6.5, HP-8.6, A- 15.20 (Make: ABB)		1	no.
28	PP Panel Change over Switch as per design		1	no.

Common for both cranes

1	PLC Ethernet Cable		35	meter
2	Touch up paint: Polyurethane		80	ltr
3	Cadmium compound for wire ropes		25	kg

	Note:-
1	Makes indicated above are the makes installed in the crane supplied at site.
2	For other technical details of above items, refer approved drawing/documents attached in tender technical specification.

ANNEXURE II- MANUFACTURING QUALITY PLAN
(Relevant clause/s as applicable for respective item shall be followed by the bidder.)

PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN			CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-501-A501	REV. NO. 2	ISSUE DATE : 06/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Saki vihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance Norms	Format of Record	Inspection Agency			Remark
					M/C	S				M	C	S	
1	2	3	4	5	6		7	8	9	** 10			11
1	Fabricated Components												
a.	Steels Plates (Box Girder , End Carriage , Crab Frame , Load Frame / Cradle , Fab.Rope Drum & Gear Box Casings)	1. Chemical , Physical & Heat treatment (as applicable)	Major	Corelation with T.C / Check test in absence of T.C	1 / Heat / Batch	---	E250 Grade BR IS: 2062 / APPROVED Drg. / Doc	E250 Grade BR IS: 2062 / APPROVED Drg. / Doc	Mfr's T.C / Check Report	P	V	V	Refer Note : 1
		2. NDT	Major	UT	100%	---	ASTM A 578 Level B	ASTM A 578 Level B	UT Report	P	V	V	UT on 12.5 mm & above thickness plates.
		3. Material Identification , Trasfer Stamping & dimensional thickness check	Major	Visual Check , Measurement	100%	---	Check Report	Check Report	Check Report / Log Book	P	V	V	
b.	weld setup	dimension	Major	Measurement	100%	---	Component Drawing	Component Drawing	Inspection Report	P			
1A	Seamless Pipe for Rope Drum	1. Chemical & Physical	Major	Corelation with T.C / Check test in absence of T.C	100%	---	ASTM-A 106 GR-B	ASTM-A 106 GR-B	Mfr's T.C / Check Test Report	P	V	V	Refer Note : 1
		2. NDT	Major	Micro Etching / Flattening for seamless pipe	100%	---	ASTM-A 106 GR-B	ASTM-A 106 GR-B	MTC / Lab TC	P	V	V	
		3. NDT	Major	UT	100%	---	ASTM 578 Level B	ASTM 578 Level B	UT Report	P	V	V	
2	Welding WPS (Welding procedure specification) in line with ASME Sec. IX (QW - 482) - For Box Girders , Endcarriage , Crab Frame , Rope Drum & Load Frame / Cradle & Gear Box Casing.												
a.	WPS . PQR & WPQ	Welding Parameters	Major	Review of Documents	100%	---	ASME Sec. IX	ASME Sec. IX	QW-482 . QW-483 , QW-484 as per ASME Sec IX	P	V	V	WPS/PQR/WPQ approved / ~~Reviewed by Reputed Client / Agency~~ shall be submit for review.(Log Book to be maintained during fabrication)
b.	Root Run / Back chipping	NDT	Major	DPT	100%	---	ASME Sec. - VIII, Div I , Appn - 8	ASME Sec. - VIII, Div I , Appn - 8	Welder log book / DP Report	P	V	V	
c.	Butt weld	NDT	Critical	RT	100% in tension, 25% in compression, 100% in Rope drum	100% in tension, 25% in compression, 100% in Rope drum	ASME Sec. V	ASME Sec. - VIII, Cl UW-51 & 52	RT Report	P	V	V	RT Film shall be Reviewed by BHEL / SJVN.
			Critical	UT	100% UT for non RT area 10% UT in RT area	100% UT for non RT area 10% UT in RT area	ASTM Section V , asme Sec VIII Division I and Appendixe 12	ASTM Section V , asme Sec VIII Division I and Appendixe 12	UT Report	P	W	W / V	UT shall be Witnessed by "C" & "S" during final inspection of crane.
			Critical	DPT	100%	10%	~~ASTM A 578 Level B~~ / ASME Sec. - V & VIII.	~~ASTM A 578 Level B~~ / ASME Sec. - VIII, Div-I , Appn - 8	Inspection Report	P	W	W / V	DP Test of Butt welds for rope drum to be conducted after final machining. 10% random witness.
d.	Fillet weld	Size and surface defects	Major	Visual Check	100%	---	Manufacturing Drawing	Manufacturing Drawing	Inspection Report	P	V	V	

NTPC , BHEL & other's reputed PSUs

SUJIT S. CHAKRABORTY 16/7/2019
Manager (Q.C.)
Furnace and Foundry Eqpt. Co.

Bharat Heavy Electricals Limited * PPEI Sector-16A NOIDA 201 301 * PEM/Mech. Aux.

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SJVN	PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY PLAN				CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)						
	ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-501-A501			REV. NO. 2	ISSUE DATE : 04/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Saki Vihar Road, Andheri East , Mumbai - 400072				

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check M/C	Quantum of Check S	Reference Document	Acceptance Norms	Format of Record	Inspection Agency M	Inspection Agency C	Inspection Agency S	Remark
1	2	3	4	5	6		7	8	9	** 10			11
		NDT	Major	DPT	100%	10%	ASME Sec. V	ASME Sec. - VIII, Div-I, Appn - 8	Inspection Report	P	W	W / V	1. NDT of weld joints in close up box girder 10% random witnessed by BHEL / SJVN at the time of final inspection. 2. DP Test of fillet welds for rope drum to be conducted after final machining 10% random witnessed by BHEL / SJVN
a)	NDT & DIMENSIONS of weld joints	NDT & DIMENSION	Major	DPT/MPI	100%	10%	-- DO --	-- DO --	-- DO --	P	V	V	
				DIMENSION	100%	100%	-- DRG.	& DRG.					
e.	Inspection of fabricated components. (Box Girders (Before Closing))	Frame , Hand Railing , Rope drum etc. Camber , Verticality, bend , Surface finish & Material tracibility etc.	Major	Visual check & Dimensional Measurement	100%	---	TS / DRG. / IS3177 / IS 807	TS / DRG. / Relevant Standard	Inspection Report	P	V	V	
f.	Heat Treatment of Rope Drum (If fabricated)	Stress Relieving	Major	Review SR Chart	100%	---	Approved Drawing / Relevant standard / ASME Section V , ASME Section VIII , Division-I , UCS-36 / Fafeco Standard	Approved Drawing / Relevant standard / ASME Section V , ASME Section VIII , Division-I , UCS-36 / Fafeco Standard	SR Chart	P	V	V	FAFECO Standard Procedure No.: FAFECO-STD-QM-SRP-1
3	Gear Box Casing												
a.	Material	Surface Condition	Major	Visual Check	100%	---	Manufacturing Drawing	Manufacturing Drawing	Inspection Report	P	V	V	
		Chemical & Physical	Major	Corelation with T.C / Check test in absence of T.C	100%	---	Manufacturing Drawing / IS:2062	Manufacturing Drawing / IS:2062	Mfr's T.C & Inspection Report	P	V	V	
b.	Dimension	Dimensional conformity	Major	Measurement	100%	---	Manufacturing Drawing	Manufacturing Drawing	Vendor Inspection Report	P			
c.	Heat Treatment	Stress Relieving	Major	Review of SR Chart	100%	---	Approved Drawing / Relevant standard / Fafeco Standard	Approved Drawing / Relevant standard / Fafeco Standard	SR Chart	P	V	V	
4	PLATFORM	Dimensional conformity	Minor	Measurement	100%	---	Manufacturing Drawing	Manufacturing Drawing	Vendor Inspection Report	P	V	V	
5	L.T FRAMES & HAND RAILING.	Dimensional conformity	Minor	Measurement	100%	---	Manufacturing Drawing	Manufacturing Drawing	Vendor Inspection Report	P	V	V	
6	CABIN	Dimensional conformity	Minor	Measurement	100%	---	Manufacturing Drawing	Manufacturing Drawing	Vendor Inspection Report	P	V	V	
7	Current collector arms	Verification of make , Type , Rating and Dimensional conformity	Minor	Measurement	100%	---	Manufacturing catalogue	Manufacturing catalogue	Vendor Inspection Report	P	V	V	
8	DSL GUARD	Verification of make , Type , Rating and Dimensional conformity	Minor	Measurement	100%	---	TS / DRG. / IS 2062	TS / DRG. / IS 2062	Vendor Inspection Report	P	V	V	

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18.07.19

2/23

SJVN	PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL		MANUFACTURING QUALITY ASSURANCE PLAN						CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited, Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)				
	ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA		SUB-ITEM	QAP NO.: PE-V0-437-501-A501			REV. NO. 2	ISSUE DATE : 06/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Sakivihar Road, Andheri East , Mumbai - 400072				
Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance Norms	Format of Record	Inspection Agency			Remark
					M/C	S				M	C	S	
1	2	3	4	5	6		7	8	9	** 10			11
9	Rails	Dimensional conformity	Major	Measurement	100%	100%	GA Drawing / IS:3443 / Vendor TC / Appd.Data Sheet	GA Drawing / IS:3443 / Vendor TC / Appd.Data Sheet	Vendor Inspection Report	P	V	V	
		Chemical , Mechanical & Hardness	Major	Chemical , Mechanical & Hardness	100%	100%	IS:3443 - 1980	IS:3443 - 1980	Mfr's T.C	P	V	V	
10	MECHANICAL COMPONENTS												
A	Wheels												
	I) Raw Material	1. Chemical composition & Mechanical properties.	Major	Corelation with Mfr's T.C	100%	100%	Manufacturer Drg . / IS 1570 / BS-970	Manufacturer Drg . / IS 1570 / BS-970	Test Certificate	P	V	V	Refer Note :1
		2. Heat Treatment	Major	Review MTC	100%	100%	Approved Drawing / Relevant standard	Approved Drawing / Relevant standard	MTC	P	V	V	
	ii) Machined	a) Dimensions	Major	Measurement	100%	100%	Manufacturing Drawing	Manufacturing Drawing	Inspection Report	P	V	V	
		b) Hardness		Mechanical	100%	100%	Approved Data Sheet / Mfg. Drg	Approved Data Sheet / Mfg. Drg	Inspection Report	P	V	V	
		c) UT		NDT	100%	100%	ASTM A 388	ASTM A 388 & Acceptance as V	UT Report	P	V	V	
		d) DPT		NDT	100%	100%	ASME Sex. - VIII. Div I. Appn - 8	ASME Sex. - VIII. Div I. Appn - 8	Inspection Report	P	V	V	
	b) Raw material for Gears , Pinions , Shaft , Axels , Coupling Shaft etc.	i) Chemical composition & heat treatment Physical Properties.	Major	Corelation with T.C / Check test in absence of T.C	100%	100%	Manufacturer Drg . / BS : 970 / IS 1570 / Approved data sheet	Manufacturer Drg . / BS : 970 / IS 1570 / Approved data sheet	Mfr's T.C / Check Test Report	P	V	V	
		ii) UT (after machining)	Major	UT	100%	100%	ASTM A 388	ASTM A 388 & Acceptance as V	UT Report	P	V	V	Annex V (Page 23/23)
		iii) Hard ness	Major	Check for Hardness	100%	100%	Approved Data Sheet / Mfg. Drg / IS 3177	Approved Data Sheet / Mfg. Drg / IS 3177	Inspection Report	P	V	V	
		iv) Dimensions	Major	Measurement	100%	100%	Manufacturing Drawing	Manufacturing Drawing	Inspection Report	P	V	V	
		v) D.P Test on Teeth , Bore & Tooth OD	Major	NDT	100%	100%	ASTME - 165	No Linear Indication	Inspection Report	P	V	V	
	c) Casting for Gears and pinions, if applicable	i) Chemical & Physical	Major	Chemical & Physical	100%	100%	Approved Drg . / Data sheet	Approved Drg . / Data sheet	Mfr's T.C	P	V	V	
		ii) NDT	Major	UT	100%	100%	ASTM A 609	ASTM A 609	UT Report	P	V	V	
		iii) Dimensions	Major	Measurement	100%	100%	Manufacturing Drawing	Manufacturing Drawing	Inspection Report	P	V	V	
B	Pulley, Brake drum, coupling & other Major steel casting & forging												
	I) Material	Chemical / Physical	Major	Corelation with Mfr's T.C	100%	100%	Manufacturer Drg .	Manufacturer Drg .	Mfr's T.C	P	V	V	

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18.07.19

3/23

PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN			CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-601-A501	REV. NO. 2 / ISSUE DATE : 06/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Sakivihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check M/C	Quantum of Check S	Reference Document	Acceptance Norms	Format of Record	Inspection Agency M	Inspection Agency C	Inspection Agency S	Remark
1	2	3	4	5	6		7	8	9	** 10			11
	ii) Machined	a) Dimensions	Major	Measurement	100%	100%	Components Drawing	Components Drawing	Inspection Report	P	V	V	
		b) DPT after machining	Major	NDT	100%	100%	ASTM E - 165	ASTM E - 165	Inspection Report	P	V	V	
		c) Hardness	Major	Check for Hardness	100%	100%	Approved Data Sheet / Mfg. Drg.	Approved Data Sheet / Mfg. Drg.	Inspection Report	P	V	V	
C	Gear Box assy & idle running	Check for oil leakage, Noise level, Vibration, Backlash, rise in temp. after 2 Hrs. of running , reduction ratio, backlash and contact pattern	Major	Visual & Measurement	100%	100%	Vendor Standard	Smooth Running no oil leakage , Noise 85 db at 1 Mtr. Max. Temp. rise 30° C above amb temp.	Inspection Report	P	V	V	
D	a) Top block , Bottom block	Dimensional conformity	Major	Measurement	100%	100%	Assembly Drawing.	Assembly Drawing.	Vendor Inspection Report	P	V	V	
	b) Hook	i) Chemical Composition , Heat treatment , Mechanical properties on integral test bar.	Major	Chemical , Heat treatment & Tensile , % Elongation	100%	100%	IS : 1875		Test Certificate , HT Chart & Inspection report	P	V	V	
		ii) UT on raw material of Hook	Major	UT	100%	100%	ASTM A 388	Annexure - IV (UT Procedure) Annexure - V		P	V	V	Ann: IV (Page 11/23 - 22/23)
		iii) Forging operation of hook	Major	Visual	100%	100%	IS:5749 / IS:15560	IS:5749 / IS:15560		P	V	V	Ann. 5 - 23/23
		iv) Proof Load Test	Major	Mechanical	100%	100%	IS:5749 / IS:15560	IS:5749 / IS:15560		P	W	W	
		v) UT & MPI after proof load test.	Major	UT & MPI	100%	100%	ASME Sec. V / SE 709	Annexure - IV (UT Procedure) Annex - V		P	W	W	
		vi) Identification Punch (By BHEL or Customer, after proof load & NDT Witness	Major	Visual	100%	100%	------	------	------	P	W	W	CHP - Customer Hold Point
E	Rope Drum Assembly	i) Dimension	Major	Measurement	100%	100%	Mfg. Drawing	Mfg. Drawing	Inspection Report	P	V	V	
		b) DPT After Machining	Major	NDT	100%	100%	ASTM E - 165	Crack & No Linear Indication	Inspection Report	P	V	V	

16/7/2019
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Quality Assurance & Inspection Dept.
Signature
Date 18.07.19

4/23

SJVN	PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN			CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
	ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-501-A501	REV. NO. 2 / ISSUE DATE : 08/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Sakivihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance Norms	Format of Record	Inspection Agency			Remark
					M/C	S				M	C	S	
1	2	3	4	5	6		7	8	9	** 10			11
11	Electrical Components												
a)	Motors (=< 50KW)	a) Make , Rating , Routine Test , IP class	Major	Review Mfr's TC	100%	---	TS / DRG. / IS : 325	TS / DRG. / IS : 325	Mfr's T.C	P	V	V	Refer Note 3 for Motor above 50kW separate QA shall be followed
		b) Type test	Major	Review Mfr's TC	100%	---	TS / DRG. / IS : 325	TS / DRG. / IS : 325	Mfr's T.C	P	V	V	
b)	Brakes	Make , Type , Rating , Dia , Functional test / Routine test	Major	Review Mfr's TC	100%	---	TS / DRG. / Relevant Standard	TS / DRG. / Relevant Standard	Mfr's T.C	P	V	V	
c)	Control Panel	Interlocking functional , IR , HV , Sheet thikness , cable laying , dressing , ferulling Overall , Dimensions , painting shade , Panel surface finish , Paint thikness , adhesive test , Component fixing , Degree of Protection by paper inserting method	CR	Test for HV , IR , Functional Check	100%	---	IS : 3177 / Approved Panel Drg. & BOM / Data sheet	IS : 3177 / Approved Panel Drg. & BOM / Data sheet	Inspection Report	P	W	V	Refer Note No.4 VVVFD Test Certificate to be submitted from Approved Vendor for verification.
d)	Radio Remote , Master Controller and Pendant Controller.	HV , IR , Functional	Major	H.V & I.R and IP Class	100%	---	BOM / Mfr. Catalogue	BOM / Mfr. Catalogue	TC	P	V	V	Refer Note No.4
e)	Limit Switches	HV , IR , Functional	Major	H.V & I.R and IP Class	100%	---	BOM / Mfr. Catalogue	BOM / Mfr. Catalogue	TC	P	V	V	
f)	Trailing Cable , Power Control Cable & DSL	Make , Type , Rating , Routine , Acceptance test insulation resistance values	Major	Verification	100%	---	TS / DRG. / Relevant Standard	TS / DRG. / Relevant Standard	TC	P	V	V	
g)	Tranformer	Make , Rating , Routine test	Major	Visual	100%	---	Approved Drg.	Approved Drg.	TC	P	V	V	
h)	SFU , MCCB , MCB , Contactors , DSL , Relays , Fuses	Make , Type , Rating size , Functional , Continuity check	Major	Visual	100%	---	Approved Drg.	Approved Drg.	TC	P	V	V	
i)	Resistance box (DBR)	Make , Type , Rating size , Functional , Continuity check , HV & IR , Temperature rise	Major	Visual	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	TC	P	V	V	
j)	VVVF Drives	Make , Type , Rating , Routine test	Major	Visual	100%	---	Approved Drg.	Approved Drg.	TC	P	V	V	
k)	Anti collision devices , Cable gland , Lugs , Rectifier , Indicating lamps , terminal blocks load cell.	Make , Type , Rating	Major	Visual	100%	---	Approved Drg.	Approved Drg.	TC / IR	P	V	V	
12	Bought Out Items												

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Quality Assurance & Inspection Dept.
Sign
Dt. 18.07.19
SJVN Limited, Shimla

5/23

PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN			CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-601-A501	REV. NO. 2 / ISSUE DATE : 04/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Saki Vihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance Norms	Format of Record	Inspection Agency			Remark
					M/C	S				M	C	S	
1	2	3	4	5	6		7	8	9	** 10			11
a)	Wire Rope & Slings	Identification & Grade	Major	Visual	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Mfr's T.C	P	V	V	
		Dimensional Check	Major	Measurement	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Inspection Report	P	V	V	
		Check for Twist, Kinks, proper thimble end connection & splicing	Major	Visual	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Mfr's T.C	P	V	V	
		Breaking Strength	Major	Review Mfr's TC	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Mfr's T.C	P	V	V	
b)	Socket / Clamps for Wire Rope	Tensile test	Major	1 sample	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Inspection Report / TC	P	V	V	Rope shall fail first than the socket or joints
c)	Sole Plate & Clamps	a) Chemical / Physical	Major	Corelation with Mfr's T.C	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Inspection Report	P	V	V	
		b) Dimensions	Major	Measurement	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Inspection Report	P	V	V	
		c) DPT	Major	NDT	100%	---	ASTM E - 165	No Linear indication	Inspection Report	P	V	V	
d)	Bearing	Make & Type	Major	Verification	100%	---	TS / DRG. / Relevant Standartd	TS / DRG. / Relevant Standartd	Inspection Report	P	V	V	
e)	Spares (Mandatory / recommended spare / commisioning spares)	Type , Rating / Size	Major	Review of Internal Inspection Reports / Mfr's TC / COC	100%	---	Approved spare list	Approved spare list	Inspection Report / COC	P	V	V	Refer Note 6
13	Assembly of Cranes												
a)	Bridge with LT	Dimension , Wheel level alignment , camber , verticality , bend	Major	Measurement	100%	---	GA Drg. / IS : 3177	GA Drg. / IS : 3177	Inspection Report	P	W	V	
b)	Crab Assembly	Dimension , Wheel level alignment	Major	Measurement / Visual	100%	---	GA Drg. / IS : 3177	GA Drg. / IS : 3177	Inspection Report	P	W	V	
c)	Final Inspection (At Works) with actual panel and pendent	Overall inspection of crane , Dimensions , Ratings , Hook reaches, Clearance, Span, Diagonal dimensions , Skewness , Wheel base & Gauge , Overhang , LT Buffer , headroom , Cambering of Girder , Visual & Dimensional Check of Load frame / Cradle , Visual & Dimensional Check of slings , Electrical Panel , Insulation Test on Electrical component of Crane , Equipment Layout on Bridge Platform , Elevations / Levels etc.	Major	Measurement	100%	100%	Approved GA Drg. / IS : 3177	Approved GA Drg. / IS : 3177	Inspection Report	P	W	W	

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Quality Assurance & Inspection Dept. BJVN Limited, Shimla Date 18.07.19

G/23

PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN			CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited, Project Engineering Management,PPEI Building, HRDI and E&I complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-501-A501	REV. NO. 2 / ISSUE DATE : 06/07/2018	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Saki Vihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check M/C	Quantum of Check S	Reference Document	Acceptance Norms	Format of Record	Inspection Agency M	Inspection Agency C	Inspection Agency S	Remark
1	2	3	4	5	6		7	8	9	** 10			11
		No Load & Load Tests											
		a) No Load : Hoists , CT & Current Measurement , No Load Running of LT Machinery for Direction and Speed with VVVFD , Check of working range , Testing of fault panel function , Test of emergency stop at no load , functional check	Major	Measurement	100%	100%	Approve Drgs	Approve Drgs	Inspection Report	P	W	W	
		b) SWL : Hoists , CT Speed , Current & Deflection Measurement , Simultaneous operation of main and auxiliary hoists , Functional check of emergency stop , Overload Protection , Visual inspection & DPT of accessible weld joints after load test , Measurement of throat opening of hook after load test , witness for variable frequency drive. ***	Major	Operational check & Measurement	100%	100%	Approved GA Drg. / IS : 3177	Approved GA Drg. / IS : 3177	Inspection Report	P	W	W	Refer Annexure - II (Page-9/23) for Load & over Load Test
	*** DP test of Hook after Load test.	c) Overload: Hoisting only (at 125% of SWL)	Major	Only watching motions	100%	100%	Approved GA Drg. / IS : 3177	Approved GA Drg. / IS : 3177	Inspection Report	P	W	W	— DO —
		d) Operation check of brakes and Limit Switches	Major	Operational check	100%	100%	Approved GA Drg. / IS : 3177	Approved GA Drg. / IS : 3177	Inspection Report	P	W	W	
14	Inspection of Electric Hoist	Measurement of Speed , load test , Operation of all protective Device , Overload test (@125% of SWL) , Holding capacity of brakes	Major	Operational check & Measurement	100%	100%	Approved Drg. / IS : 3938	Approved Drg. / IS : 3938	Inspection Report	P	W	W	Load and Over Load test shall be done by shop testing beam & stand
15	Painting	Surface preparetion , Painting DFT & Adhesion test	Major	Visual	100%	---	Approved Drg. / Document	Approved Drg. / Document	Inspection Report	P	V	V	
16	Packing	Visual	Major	Visual	100%	---	Manufacturer Standard	Manufacturer Standard	Packing List	P	V	V	

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Quality Assurance & Inspection Deptt. BHEL Limited, Shimla Date 18.07.19

7/23

PROJECT NAME (MW) : 4x225 MW ARUN III HEP NEPAL	MANUFACTURING QUALITY ASSURANCE PLAN				CONTRACTOR NAME & ADDRESS : Bharat Heavy Electricals Limited. Project Engineering Management,PPEI Building, HRDI and ESI complex, Plot no. 25, Sector -16 A,Noida-201 301 (U.P.)
ITEM DESCRIPTION : 250/50/10Tx21 M SPAN DG EOT CRANE FOR POWERHOUSE AREA	SUB-ITEM	QAP NO.: PE-V0-437-501-A501	REV. NO. 2	ISSUE DATE : 06/07/2019	SUB CONTRACTOR NAME & ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Sakivihar Road, Andheri East , Mumbai - 400072

Sl.No.	Components & operations	Characteristics	Class	Type of check	Quantum of Check M/C	Quantum of Check S	Reference Document	Acceptance Norms	Format of Record	Inspection Agency M	Inspection Agency C	Inspection Agency S	Remark
1	2	3	4	5	6		7	8	9	** 10			11
Note 1 :	Original TCs / Photocopies certified in original by mill / dealer shall be furnished for review. check test in absence of co-related TCs Check test shall be carried out from one piece per heat / per batch each plate / bar for above 10 mm thk. , certificates shall be offered for review at the time of stage inspection of components / assembly. Supplier shall ensure that pitted material is not used.												
Note 2 :	X-Ray to be taken for Thikness upto 19 mm and Gamma Ray for Thikness above 19 mm. If Gamma Ray is used for lower thickness slow speed film like D2 or equvalent which was given enough readable and interpretable film quality to be used for clarity. All NDT shall be carried out by Qualified level II personel.												
Note 3 :	Less than 20KW : Acceptance of motor less than 20KW is based on COC of the manufacturer & the contractor confirming as follow: It is hereby confirmed that the above mentioned motor / motors was / were manufactured taking care of customer specific requirement regarding ambient temp. , voltage & frequency variation , hot starts , pull out torque , starting KVA / KW , temp. rise , distance between center of stud & gland plate and tested in accordance with approved drawing / data sheets.												
	20 KW to 50 KW : Acceptance of motor rating between 20 KW & 50 KW is based on customer review of routine test inspection report as per IS 325 along with COC the manufacturer & the contractor confirming as follow: It is hereby confirmed that the above mentioned motor / motors was / were manufactured taking care of customer specific requirement regarding ambient temp. , voltage & frequency variation , hot starts , pull out torque , starting KVA / KW , temp. rise , distance between center of stud & gland plate and tested in accordance with approved drawing / data sheets.												
Note 4 :	Performance of electrical & control devices along with the interlocks , protection & sequence to be checked during crane assembly and parked at works.												
Note 5 :	All Material of construction shall be as per approved Drg. / Data Sheet / Specifications.												
Note 6 :	Quality Plans as approved for main equipment shall be applicable for the type of control measure i.e make test / checks etc. for the procurement / manufacture of mandatory spares. However , for those spares which are not covered in the approved Quality Plan, Manufacturer shall furnish Certificate of Conformance (COC) along with Guarantee and Interchange ability certificate.												
Note 7 :	De energized & Energized test shall be conducted as per attached Annexure III → (Page 10/23)												

Annexure IV (Page 11/23 – 22/23) ; Annx V (Page 23/23)

LEGENDS		
M : MANUFACTURER	C : CONTRACTOR	S : SJVN LTD.
P : PERFORM	V : VERIFICATION	W : WITNESS / CHP
IR : INSPECTION REPORT	DRG : DRAWING	CHP : CUSTOMER HOLD POINT
MA : MAJOR	MN : MINOR	CR : CRITICAL
ME : MEASUREMENT	NDT : NON DESTRUCTIVE TESTING	HT : HEAT TREATMENT
TR1 : CERTIFICATE OF COMPLIANCE TO TS / STANDARD REQUIREMENT WITHOUT ANY CHECK LIST OF TESTS CARRIED OUT.	TR2 : CERTIFICATE OF COMPLIANCE TO TS / STANDARD REQUIREMENT WITH CHECK LIST OF TESTS CARRIED OUT.	TR3 : CERTIFICATE OF COMPLIANCE TO TS / STANDARD REQUIREMENT WITH CHECK LIST OF TESTS CARRIED OUT.

MANUFACTURER / SUB-CONTRACTOR :		CONTRACTOR :	FOR SJVN USE :	REFERENCE DOC. NO. OF SJVN	
PREPARED BY :	REVIEWED BY :	REVIEWED & RECOMMENDED BY	REVIEWED BY	RECOMMENDED BY	APPROVED BY
NAME , DESIGNATION & SIGNATURE		NAME , D TURE	NAME & SIGNATURE	NAME & SIGNATURE	SIGNATURE & SEAL

16/7/2019
SUJIT S. CHAKRABORTY
Manger (Q.C.)
Furnace and Foundry Eqpt. Co.

Bharat Heavy Electricals Limited * PEM/Mech. Aux. * PPEI Sector-16A NOIDA 201 301

Quality Assurance & Inspection Dept. SJVN Limited, Shimla — Signature — Date 18.07.19

8/23

9/23

JOB NO. OG - 06

ANNEXURE- II

PROCEDURE FOR LOAD TEST & OVERLOAD TEST FOR 250/50/10T x 21 M SPAN EOT CRANE. ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

Following procedure to be followed for load & Overload test as per IS 3177. (At work)

Load test:

After the no load running test has been completed , the crane should be tested with loads in the followin manner.

a) Raise a load equal about 50 percent of the rated load not higher than required to clear its support & stop adjust the brake . if nacessary . Raise a SWL 250T Load upto 5 Minuts about 1000 mm above its support & stop. Lower the load about 300 mm & stop. Check drift of load during stopping.

If load drift, brakes are not in proper adjustment and should be corrected. Repeat this operation until proper adjustment of brake is obtained. Lower load carefully back to its support.

b) Load the hoist motion with 100% of rated capacity and follow the same procedure as mentioned in (a).

i. Mark the span center of crane & also mark wheel base of the trolley.

ii. Keep the trolley at the span center & check reading for deflection. (No load deflection).

iii. Hoist the load high enough to clear all obstructions but not higher than necessary & move trolley across entire span and check deflection reading with trolley at middle and extreme end of bridge

iv. Measure full load current for hoist motor.

v. Lower the hoist remove all the load & measure deflection reading again which should match with no load deflection reading & ensure that no permanent set.

vi. Lift the 250T SWL & move the trolley for a distance of 500 mm in both directions.

vii. Measure full load current for cross travel motor.

viii. Preparation for load test shop wire rope & shop testing cable to be used.

Over load test: (As per IS 3177)

Load the hoist motion with 125% of rated capacity . lift the load for 1000 mm height and then lower the load.

Bharat Heavy Electricals Limited PPEI Sector-16A NOIDA 201 301 PEM/Mech. Aux.

SUJIT S. CHAKRABORTY
Manger (Q.C.)
Furnace and Foundry Eqpt. Co.

Quality Assurance & Inspection Dept. BHEL Limited, Shimla

9/23

Annexure – III

10/23

PROJECT:ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL)
PACKAGE: POWER HOUSE 250/50/10T DOUBLE GIRDER EOT CRANES
DOCUMENT:MANUFACTURING QUALITY PLAN FOR POWER HOUSE EOT CRANES
DOCUMENT NO.: PE-V0-437-501-A501

ANNEXURE III: DE-ENERGISED & ENERGIZED TESTS

S. No.	Type of Test	Activity	Result (Accepted / Not Accepted
1	**DE-ENERGISED TESTS**		
a	Steel Structure	Visual check	
b	Bolts and Nuts	Visual check *	
c	Securing devices for all wire ropes.	Visual check *	
d	Crane Cabin-Platform.	Visual check *	
e	Gangway.	Visual check *	
f	Surface/Painting.	As per Clause 15 of MQP	
g	Boggies - Traveling Wheels.	Visual check	
h	All Main Hooks W / Housing and Safely Latch	Visual check	
i	All aux Hooks W/Housing and Safety Latch.	Visual check	
j	Bolts for all motors.	Visual check	
k	Inspection of spare parts.	As per Clause 12 (e) of MQP	
l	Insulation tests of various drive motors	Perform	
m	Air gap of brakes measurement.	Perform **	
n	Examine wire ropes.	Visual check	
o	Inspect clean and oil all moving mechanical parts.	Visual check	
p	Check oil level in hoists and traveling motors gearboxes and 'top-up'.	Visual check *	
q	Check and grease rope guide and drums.	Visual check *	
r	Check and examine cable trolley, track system, moving and connection parts.	Visual check *	
s	Check bus-bar suspension bolts, brackets and current collectors.	Visual check *	
t	Check and examine all electrical control panel cables, connection terminals.	Visual check	
u	Check and examine all contactor and thermal protection device	Visual check	
v	Check cable glands and insulation of cables.	Visual check *	
w	Setting on the control card (APC, exi. I/O comm.). if applicable	Visual check & Perform *	
x	Clean up dust and oil.	Visual check	
2	**ENERGIZED TESTS**		
a	Testing of the APC and exi. i/O boards, if applicable.	*	
b	Testing of the digital inputs/outputs, if applicable	At shop	
c	Testing of the analogue in puts, if applicable.	At shop	
d	Testing or the control panel function.	As per Clause 11 (c) of MQP	
e	Testing of the lights.	*	
f	Testing of the anti-condensation heaters.	*	
g	Testing of the phase order of the 415 V AC.	At shop	

* Partial numbers of nut & bolts shall be install during testing at works further cabin , platform , gangway , lights , actual wire rope , ~~panels~~ , cables , glands , etc. shall not be install with the crane during testing of the crane at works , however visual check can be performed.

** Proper brake setting shall be done as per requirement.

06/7/2019

SUJIT S. CHAKRABORTY
Manger (Q.C.)
Furnace and Foundry Eqpt. Co.

Bharat Heavy Electricals Limited
PPEI
Sector-16A
NOIDA
201 301
PEM/Mech. Aux.

Quality Assurance & Inspection Dept.
Inspection Call No Applied
Signature
Date 15.07.19
BHEL Limited, Shimla

MAKE LIST OF BOUGTH - OUT ITEMS & SMI FOR 250/50/10T x 21 M SPAN EOT CRANE
ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)
ANNEXURE - I

	DESCRIPTION		MAKES		
	LIST OF BOI (Bougth out items)				
1	Motors - Squirrel Cage	:	BHARAT BIJLEE , MARATHON , CROMPTON , SIEMENS		
2	Elecrical Switch Gear	:	SIEMENS	L & T	BCH
3	Contactors	:	SIEMENS	SCHNEIDER	BCH
4	Cables	:	POLYCAB-DAMAN	FINOLEX-PUNE	UNIVERSAL
5	VVVF Drives	:	SCHNEIDER , L & T - YASAKAWA , ABB , ROCKWELL , VACON , SIEMENS		
6	Panels	:	RITTAL / PYROTECH / FAFECO		
7	Control Transformer	:	NEC	IND COIL	KAPPA
8	Overload Relays	:	SIEMENS	SCHNEIDER	L & T
9	Thermal Over Load Relay	:	SIEMENS	SCHNEIDER	L & T
10	Main Circuit Breaker	:	SIEMENS	SCHNEIDER	L & T
11	Shrouded DSL/Current Collectors	:	SUSHIL	STROMAG	
12	Radio Remote Control	:	SNT/HBC		
13	Anti-collision Device	:	SICK	IFM	Mfr Approved Source
14	MPCB(for CT,LT with suitable rating)	:	SIEMENS	SCHNEIDER	L & T
15	Safety Switches	:	SIEMENS	SCHNEIDER	L & T
16	Load Cell	:	IPA		
17	PLC	:	SCHNEIDER-NASIK , SIEMENS-NASIK , ROCKWELL , ABB		
18	MCCB	:	SIEMENS	SCHNEIDER	L & T
19	Push Button/Indicating Lamps	:	SIEMENS	SCHNEIDER	L & T
20	~~Under Bridge Lights~~ Lighting	:	PHILIPS , CROMPTON , BAJAJ , GE		
21	Steel (IS 2062 Grade A/B)	:	SAIL , JINDAL , ESSAR , RINL , UTTAM		
22	Bearings	:	FAG	SKF	
23	Wire Ropes	:	BHARAT WIRE ROPE	USHA MARTIN	BOMBAY WIRE ROPE
24	Hooks (M/H)	:	Smriti Forging-Kolkata / Steel Foprging	Raw Forging for Hook from M/s Mickeil-Durgapur &, Sunil Forging-Riagad	
25	Hook (A/H)	:	Smriti Forging-Kolkata / Steel Foprging	STEEL FORGING & ENGG.- Kolkata	
26	Buffers		OEM (FAFECO)		
27	Welding Rods	:	AS PER APPROVED WPS		
28	Rail	:	SAIL	JINDAL	
29	Seamless Pipe	:	ISMT / MSL / TENARIS / JINDAL		
30	Casting-Gears(Dia.more than 400mm) Pulley, Break Drums.	:	PARIKH METALIC/TIRTH ALLOY/MITC/KOLHAPUR STEEL/GNAT FOUNDRY/KIRTI ALLOYS/BARODA METAL STEEL/PANCHMAHAL METAL PVT LTD/MISTRY METAL CAST.		
31	Castings: GB Casing		MAKSIM ALLOYS	JATIN INDUSTRIES	FAFECO
32	Forging - Wheels.	:	VIKRANT FORGE / SUNIL FORGE / YASH FORGING / FAFECO / STEEL SHAPE.		
33	Forging - Gears,Break Drums,Coupling,Shafts	:	KISAN DIE TECH/ARRORA FORGINGS/TIRTH ALLOY/YASH FORGING/FAFECO/STEEL SHAPE.		
34	Forging Cross Head	:	VIKRANT FORGE / SUNIL FORGING / FAFECO		
35	Fabrication : G.B.Casing		FAFECO		
36	Isolater / SFU	:	SIEMENS	SCHNEIDER	L & T
37	Single Phasing Preventer	:	MINILEC	L & T	SIEMENS
38	Individual Toggle Switch for Lighting Distribution	:	KAYCEE		
39	Festoon Trolley	:	INSUTECH / RADIANT / KALPATARU INDUSTRIES / FAFECO		
40	Festoon Cables	:	UNIVERSAL	APPAR	POLYCAB
41	CABLE LUGS (Heavy DUTY)	:	DOWELLS	CHETNA	BILLET
42	CABLE GLAND	:	ARUP ENGG	QUALITY PRECISION	COMET/SUNIL & CO.
43	HRC FUSE	:	SIEMENS	L & T	BUSMAN
44	HOOTER	:	BEACON / OSC	TARGET	KHERAJ
45	FIRE EXTINGUISHER.	:	BIS APPROVED SOURCE WITH VALID LICENSE		

Sr. No	LIST OF SMI (Self Manufacturing Items)			
1	Master Controller	SOC	EMM	
2	EHT Brakes	SOC	EMM	
3	Limit Switches	SOC	EMM	
4	Wheels	FAFECO		
5	Gear Box	FAFECO		
6	Brake Drums	FAFECO		
7	Couplings	ALLIANCE	OEM	
8	RESISTANCE BOX	SOC/EMM	OEM	
9	ELECTRIC HOIST	FAFECO	INDEF	

FURNACE & FOUNDRY EQUIPMENT CO. MUMBAI

ANNEXURE III- FIELD QUALITY PLAN
(Relevant clause/s as applicable for respective item shall be followed by the bidder.)

HEAVY ELECTRICALS

Job No 437	Customer	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD.(SAPDC)				
Status Contract	Project	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)				
Distribution	Consultant:	SJVN Ltd				
	BHARAT HEAVY ELECTRICAL LTD POWER SECTOR-PROJECT ENGINEERING MANAGEMENT NOIDA			Name	Sign	Date
			Prepared by	MN		22.02.21
			Checked by	SC		22.02.21
			Approved By	SC		22.02.21

22/02/2021

DOCUMENT NAME : FIELD QUALITY PLAN
FOR
250/50/10T DG EOT CRANES FOR POWER HOUSE AREA

Document No:- PE-V0-437-501-526

Rev Z03

FOUNDRY EQUIPMENT CO. MUMBAI

BHARAT HEAVY ELECTRICALS LTD. 22.02.2021

SJVN Arun-3 Power Development Company Pvt. Ltd

To be Issued to Contractor

Approved by Consultant — Category: APPROVAL WITH COMMENTS

Rev	Reviewed	Recommended	Approved
0			

Quality Assurance & Inspection Deptt. Recommended for Approval Signature Date 01.03.21 SJVN Limited, Shimla

with modifications done in Red.

01/03/2021

SJVN	PROJECT NAME (MW) Arun-3 HEP (4X225 MW)	FIELD QUALITY ASSURANCE PLAN (FQAP)				CONTRACTOR NAME&ADDRESS: Bharat Heavy Electricals Limited. PSNR, HRDI and ESI complex, Plot No.25, Sector-16A, Noida-201 301 (U.P.)
	ITEM DESCRIPTION	SUB-ITEM	QAP NO.	REV. NO	ISSUE DATE	SUB-CONTRACTOR NAME& ADDRESS: Furnace & Foundry Equipment Co. Sub Survey No.1, Plot No.4, Chandivali Farm, Sakivihar Road, Andheri East, Mumbai-400072
	Power House DG EOT Crane (250/50/10 T)	----	PE-V0-437-501-528	~~02~~ 03	22.02.2021	

SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
					M	C				M	C	S	
1	2	3	4	5	6		7	8	9	10			11
1.0	Receipt of material	a) External conditions of Equipment free from Damages etc. b) Number of packages in each Equipment and physical condition of each package	Major	Visual Verification	100%	100%	Packing List/Drawing/TS/ MDCC/ Data Sheet	Should be free from damages	Log Book	-	P	W	
2.0	Storage	a) Proper placement of equipment. b) Ensure that no damage or rusting takes place during storage. c) Ensure that all delicate Equipment are stored in protected area.	Major	Visual Check	100%	100%	All parts fully covered	Safe Storage	Log Book	-	P	W	
3.0	Pre-erection & erection check												
3.1	Site Welding, if required	a) Joint preparation, edge preparation & root gap	Major	Visual Check	100%	100%	DRG/TS	DRG/TS	SIR	P	W	W	
		b) NDT	Major	Surface Examination (DPT)	100%	100%	ASMEV&VIII	ASMEV&VIII	SIR	P	W	W	
		c) Visual check	Major	Visual Check	100%	100%	DRG/ TS	DRG/TS	SIR	P	W	W	
3.2	Embedments/ Sole Plates	a) Installation/fixing of embedments as per drawing	Major	Visual & Measurements (Levelling and alignment check)	100%	100%	DRG/TS/Rel. Std.	DRG/TS	SIR	P	W	W	
		b) Levelling & alignment before & after concreting	Major	Visual &Measurement	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	

01/03/2021

Quality Assurance & Inspection Deptt. SJVN Limited, Shimla — Recommended for Approval — Signature — Date 02.03.2021

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BHARAT HEAVY ELECTRICALS LTD. HYDRO-NOIDA

FURNACE & FOUNDRY EQUIPMENT CO. MUMBAI

22/02/2021 (Q. CHAKRABORTY)

3.3	**Blockout**		Visual & Measurement	Major	Check for visual, Dimensions & co-ordinates of block out	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std	SIR	P	W	W	
3.4	**Gantry Girder Level, diagonal, head room height, side clearance etc.**		Visual and Measurement	Major	Visual &Measurement Checks	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
3.5	**Rail**	a)	Measurement of Span & Side Clearances	Major	Measurements	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		b)	Measurement of Rail Centre distance at every 6 mtr. Length, Diagonal, straightness of each rail	Major	Measurements	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		c)	Difference in Rail Level	Major	Levelling Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		d)	Verification of expansion gap within rail w.r.t. civil drawing	Major	Visual & Measurements	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		e)	Tightening of rail clamps (I.T Rail)	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		f)	Waviness of rail (horizontal and vertical planes)	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
3.6	**Erection of End carriage**	a)	Free Movement of wheel over rail.	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		b)	All wheels in contact with I..T. rail.											
3.7	**Erection of Girders & Joint with end carriage / Bogie**	a)	Matching of fasteners holes for joint end carriage & Girder for joining bogies with girder	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		b)	Check Span both drive & idle side and Trolley wheels	Major	Measurement	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		c)	Check diagonal distance over I.T wheels	Major	Measurement	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
3.8	**Fixing Crab on CT Rail (Girder Rails)**	a)	Alignment of CT mechanism	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/ Rel. Std.	SIR	P	W	W	
		b)	Alignment of MH & AH mechanism	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/ Rel. Std.	SIR	P	W	W	
		c)	Wheel Contact & Free movement of Wheel Over rail	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/ Rel. Std.	SIR	P	W	W	
3.9	**Rope Waving, Hook Block fixing**		Reeving of Wire rope & Free movement of Pulleys & hook head room	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
3.10	**Tightening Check of all Load bearing members**		Torque tightening measurement (if any)	Major	Tightening Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	

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BHARAT HEAVY ELECTRICALS LTD. PSWR-HYDRO-NOIDA

FURNACE & FOUNDRY EQUIP. Mumbai

22/02/2021 S. CHAKRABORTY

3.11	Electrification &Cabling	a)	Check LT, CT, Hoist mating for proper electrical work	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		b)	Mounting of Control Panel	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		c)	IR Test of Control Panel	Major	Measurement	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		d)	Brake Setting	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		e)	Cable laying	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		f)	Verification of earthing & Control Circuit	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		g)	Cable termination & Tightness	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		h)	Measurement of IR value of all electric motors	Major	Measurements	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
		i)	Verification of Crane Earthing	Major	Visual Verification	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
3.12	Erection of DSL, if applicable		Check for straightness, level, alignment with respect to gantry rails, fixing arrangement, painting	Major	Visual Check	100%	100%	DRG/TS/Rel. Std.	DRG/TS/Rel. Std.	SIR	P	W	W	
4	**Pre-Commissioning & Commissioning Check**													
4.1	Oil Leakage from gear box, Checking of gears, bearings, couplings and rotating parts for proper oil level or lubrication and hydraulic brakes for brake fluid.		Visual Check for Oil Leakage, Oil Level & Lubrication.	Major	Visual Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
4.2	No- Load Static test	a)	Checking of satisfactory operation and to determine if lamp fixture on each bridge walk way are operable and convenient for re-lamping	Major	Operational Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std.	SIR	P	W	W	
		b) (j)	Test for checking correctness of all circuits, interlocks and sequences of operation	Major	Operational check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	

Quality Assurance & Inspection Dept. Recommended for Approval Signature Date 01.03.2021 SJVN Limited, Shimla

01/03/2021

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BHARAT HEAVY ELECTRICALS LTD. HOWRAH

FURNACE FOUNDRY EQUIP. CO.

22/02/2021 (G. CHOWDHURY)

		b) ii) Overall inspection & verification of usage dimensions, clearances, Hook reaches & other imp. items	Major	Measurement & Visual checks	100%	100%	DRG/IS3177/IS 807/TS/ Rel. Std.	DRG/IS3177/IS 807/TS/ Rel. Std.	SIR	P	W	W	
		c) Checking of the controller for each motion to ensure that hook and travel motions is in accordance with marked controller directions	Major	Visual Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		d) Verification of Insulation resistance for electrical equipment and wiring circuits	Major	Measurement	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		e) Operational tests on all protective devices	Major	Operational Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		f) Check of drift point for smooth and effective operation	Major	Visual Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		g) Operational tests on each controller, switch, contactor, relay and other control devices including limit switches.	Major	Operational Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		h) Tightness of nuts and bolts	Major	Visual Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		i) Check effectiveness of brake and pad for main and aux. hoist, check all components for overheating	Major	Operational Check	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
		j) Measurement of throat openings of the hooks & checking w.r.t dimensions furnished by the supplier.	Major	Measurement	100%	100%	DRG/IS3177/IS 807/TS/Rel. Std	DRG/IS3177/IS 807/TS/Rel. Std	SIR	P	W	W	
4.3	No Load Operation test	a) Measurement of Speed and Current in all motions at No Load	Major	Measurement	100%	100%	DRG/IS 3177/IS 807 /TS	DRG/IS 3177/IS 807/TS	SIR	P	W	W	
		b) Emergency stop test at No Load	Major	Emergency stop test at No Load	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		c) No Load Operation Tests shall be carried out as per the TS.	Major	Operational & functional Checks	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.4	Limit Switch Setting	a) Checking working of Limit Switch for LT, CT with hook approach, hoist motion with given height of lift	Major	Visual Check	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		b) Interlock check for LT, CT & Hoisting	Major	Visual Check	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.5	VVVF Drive Setting	Setting Parameters	Major	Verification	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.6	Load Test (at rated load)	a) Measurement of speed and current for all motions.	Major	Measurement	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		b) Measurement of deflection at SWL (Rated Load)	Major	Measurements	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	

Quality Assurance & Inspection Dept. Recommended for Approval Signature Date 01.05.24 SAIL Limited, Bhilai

with modifications done in Red.

FOUNDRY EQUIPMENT CO. * FURNACE

22/02/2021

Q. CHAKRABORTY

		c) Movement at SWL in all motions in hoisting & lowering motions	Major	Movement check	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		d) Functional Check of Brakes at No load &SWL.	Major	Functional Check incl check of drift point for smooth and effective operation	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		e) Load Operation Tests shall be carried out as per the TS.	Major	Operational & functional Checks	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.7	Over Load Test	a) Check bridge structure for excessive deflection at 125% of SWL (Rated load)	Major	Measurements	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		b) Movement at 125% overload in hoisting & lowering motions	Major	Movement Check	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		c) Measurement of throat opening of hook after Over-Load Test.	Major	Measurement	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
		d) Over-Load Tests shall be carried out as per the TS.	Major	Operational & functional Checks	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.8	Commissioning Check at No Load & at Rated Load	Check trouble free running of crane, set right wherever any trouble	Major	Trouble free Operation	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.9	Tandem operation test for power house crane including anti-collision test	a) Electrical & Mechanical interlocking checking b) Movement checking with tandem beam	Major	Operational Test	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.10	Performance Test	Performance test shall be carried out as per TS	Major	Performance Test	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.11	Load Frame/Cradle	Tests on load frame/cradle shall be carried out as per TS	Major	Visual Verification	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.12	De-Energized Tests	De-Energized Tests shall be carried out as per the TS.	Major	Visual Verifications and Measurements	100%	100%	TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	
4.13	Paint Touch-up, if required.	Paint touch up on damaged area	Major	Visual Check	100%	100%	DRG/IS 3177/IS 807/TS	DRG/IS3177/IS 807/TS	SIR	P	W	W	

Quality Assurance & Inspection Dept. SJVN Limited, Shimla — Recommended for Approval — Date 01.03.2021

with modifications done in red.

BHARAT HEAVY ELECTRICALS LTD. PSWR-HYDRO-NOIDA

FOUNDRY EQUIPMENT * FURNACE

22/02/2021 S. CHAKRABARTY

LEGENDS

M	MANUFACTURER	C	CONTRACTOR	S	SAPDC
P	PERFORM	V	VERIFICATION OF RECORDS	W	WITNESS
IR	INSPECTION REPORT	DRG.	DRAWING	SIR	SITE INSPECTION REPORT
MA	MAJOR	MN	MINOR	Rel. Std.	Relevant Standards
ME	MEASUREMENT	NDT	NON - DESTRUCTIVE TESTING	TS	TECHNICAL SPECIFICATIONS

NOTE: 1. FQAP SHALL BE READ IN CONJUNCTION WITH QUALITY ASSURANCE REQUIREMENT GIVEN AS PART OF TECHNICAL SPECIFICATION

2. IN CASE OF ANY CONTRADICATION BETWEEN FQAP AND APPROVED DRAWING/TS/DESIGN MEMO, then APPROVED DRAWING/TS/DESIGN MEMO SHALL PREVAIL.

3) FQAP is Prepared for test & inspection of major components during/ after erection & commissioning at site & does not define Erection sequence.

MANUFACTURER / SUB-CONTRACTOR:		CONTRACTOR:	FOR SJVN USE:	REFERENCE DOC NO. OF SJVN:	
PREPARED BY:	REVIEWED BY	REVIEWED & RECOMMENDED BY	REVIEWED BY	RECOMMENDED BY	APPROVED BY
Mr. Mahendra Nerkar QA/QC Engineer	Mr. Sujit Chakraborty QA/QC Engineer	Tejpal Singh Saini General Manager (Hydro)			

with modifications done in Red.

ANNEXURE IV: PACKING REQUIREMENT

PACKING REQUIREMENT	
	COMMON GUIDELINES FOR PACKING
1	**GENERAL:**
1.1	The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.
1.2	All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.
1.3	The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement.
1.4	Each package shall be accompanied by a packing note quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

2.	**TYPES OF PACKING:**
	The following 5 types of packing have been standardized for packing of General Components/ Assemblies.
a	**OP**' - Open Type.
b	**PP**' - Partially Packed.
c	**CP**' – Crate/Box Packing - Components/Equipment requiring physical protection.
d	**'CQ**' - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
e	**'CR'** - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

3.	**DESCRIPTION OF TYPES OF PACKING:**
	The various types of packing, as standardized above, are described below.
3.1	**'OP' - Open Type**
	In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.
3.2	**PP' - Partially Packed**
3.2.1	Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene
3.2.2	Film. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film.
3.3	**'CP' - Crate Packing**
	Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.
3.4	**'CQ' - Case Packing -** Machined Components/Assemblies/Equipment
3.4.1	Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.
3.4.2	For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.
3.5	**CR' - Case Packing** - Electrical & Electronic Components/Assemblies
	Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel.

4	**PREPARATION OF PACKING CASES**
4.1	**DIMENSIONS:**
a)	Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units/manufacturers.
b)	Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.
c)	Minimum number of planks shall be used for a shook.
d)	Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.
e)	Width of binding planks shall be minimum 100mm.
f)	Distance between any 2 binding planks shall be less than 750mm.
g)	diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
h)	Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
i)	Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

4.2	**HOOP IRON STRIPS**
	These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

4.3	**BRACKETS**
	These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of “L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

4.4	**MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM**
	100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

4.5	**RUBBERISED COIR:**
	The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

5	**MULTI LAYER CROSS LAMINATED POLY FILM WHILE PACKING OF CUBICLES/CASING**
5.1	The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 4.4) using blue nails wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.
5.2	The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film. This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.
5.3	The cubicles shall be covered with Multi-layer cross laminated poly film.

6	**PACKING OF LOOSE ITEMS/SPARES**
6.1	Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 5.4) using blue nails.
6.2	Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
6.3	Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
6.4	Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
6.5	Silica gel held in cotton bags shall be kept at proper places in the box.
6.6	Packing slip kept in polyethylene bag shall be placed in the box.
6.7	Two numbers of hoop iron strips shall be strapped tightly on the case using clips.
6.8	Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
6.9	Loose items to be kept inside the cubicle/casing
	- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

7	**TYPICAL PATTERN OF WOODEN BOX**

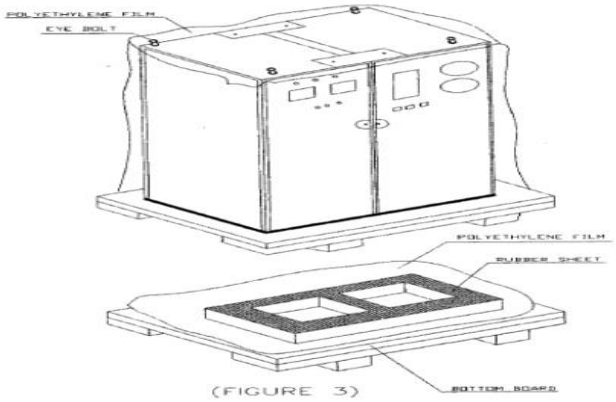


Figure 2

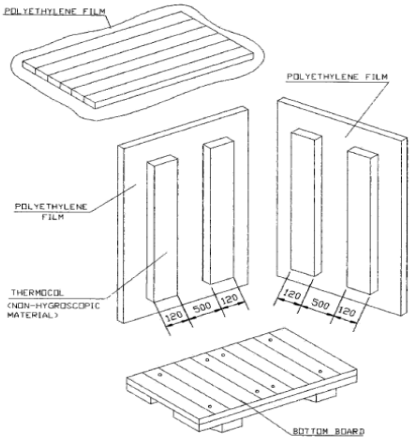


Figure 1

8	**SEALED PACKING:**
	Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by

9	**MARKINGS/STENCILINGS**
9.1	**"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".**
9.2	Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.
9.3	In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel.
9.4	Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.
9.5	Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.
9.6	In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

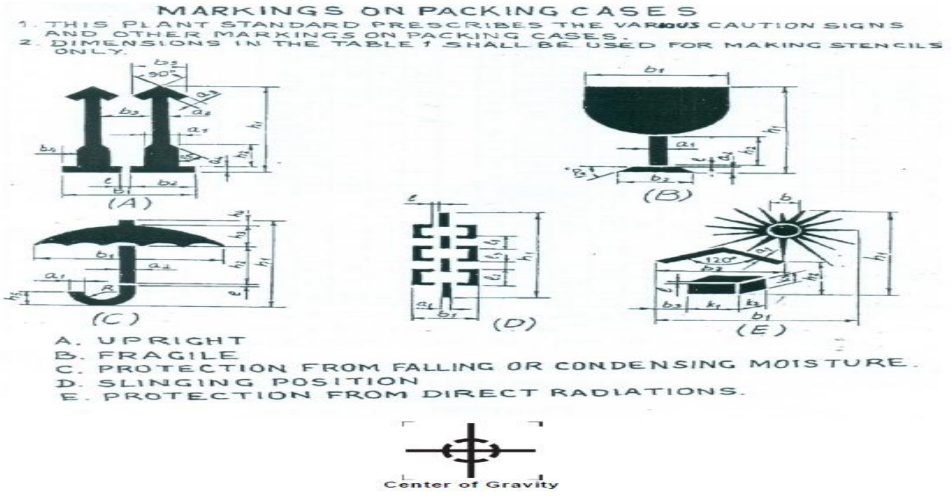


Figure 3

	BHEL – <unit> - <location> - <pin>				
CONSIGNEE					
MATERIAL					
CUSTOMER REF.			MO. NO.		
DESPATCH ADVICE NOTE NO			CASE NO		
DIMENSIONS(MM) L x B x H			NET WT –KGS	GROSS WT –KGS	
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT				

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

10	**STANDARD METHOD OF PACKING**

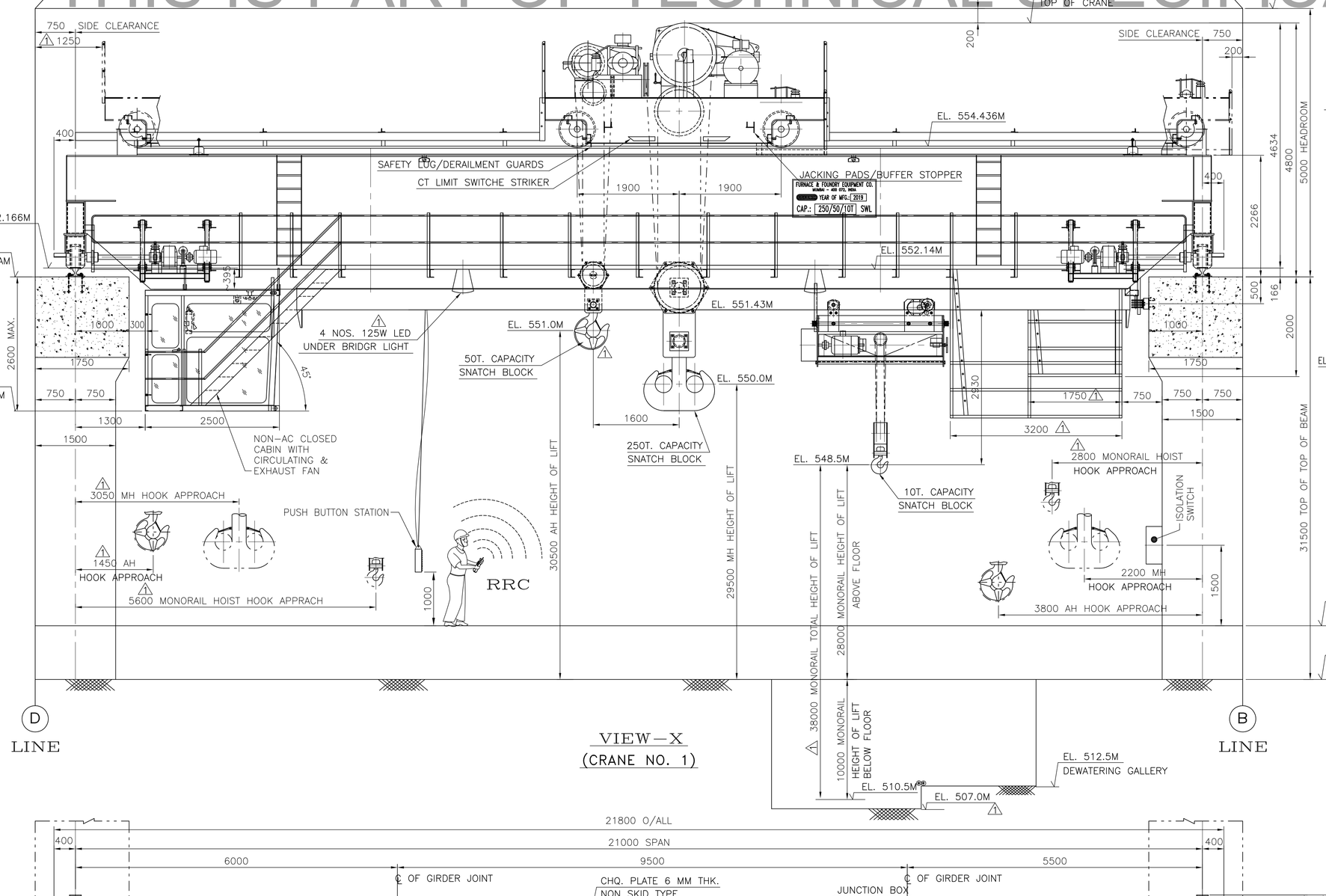
Table 1 - Standard Method of Packing

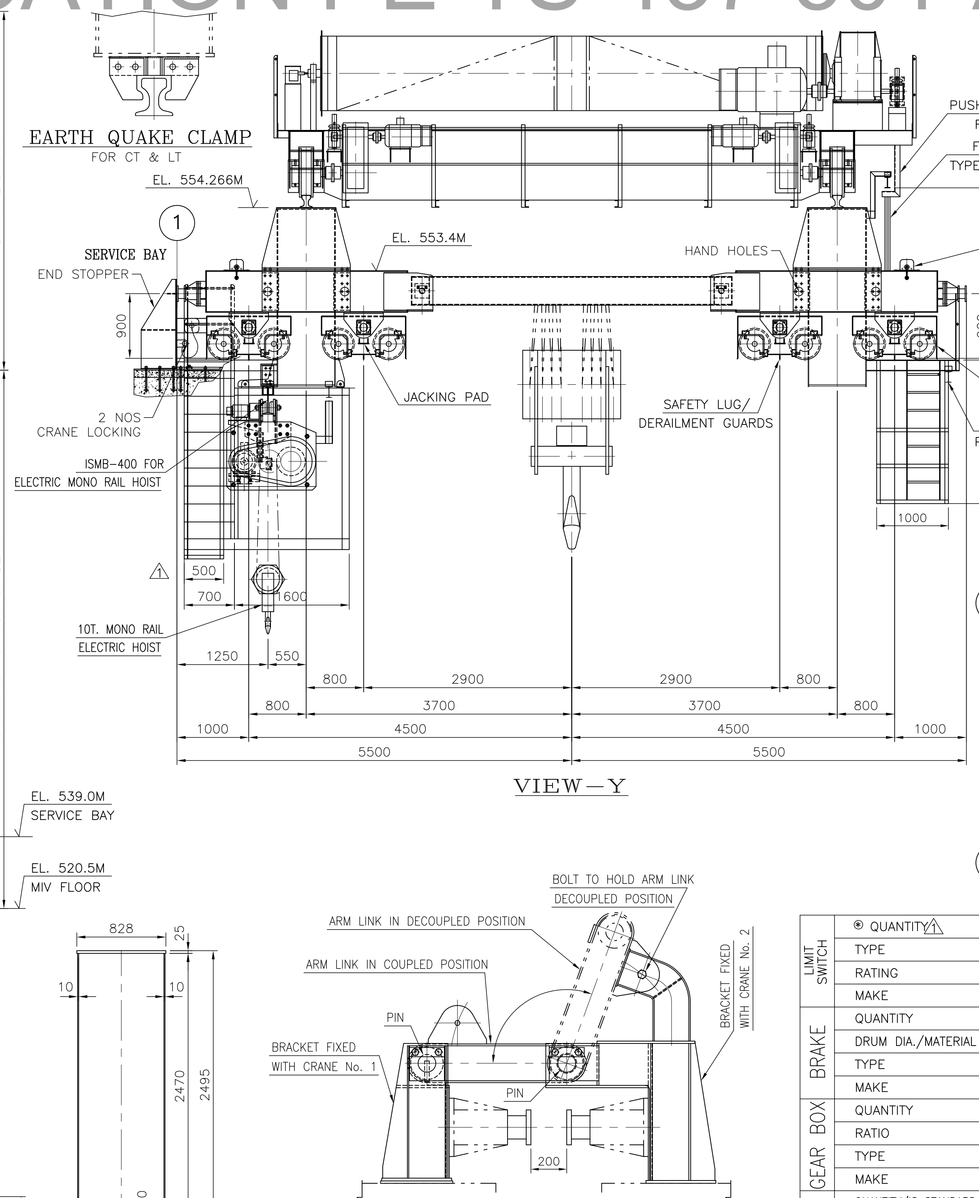
S. No.	DESCRIPTION	CASE	CRATE	BUNDLE	BARE	DRUM
1	BEARING BLOCKS	O				
2	FANS	O				
3	PAINT TINS		O			
4	PAINT DRUMS					O
5	MOTORS, TRANSMFORMERS, VVVFD, LIMIT SWITCHES, ELECTRIC HOIST ASSEMBLY, RELAYS, FUSES, LIGHTING FIXTURES, PENDANT, ISOLATING SWITCH, RRC, TRANSMITTERS AND OTHER ELECTRICAL ACCESORIES	O				
6	SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES, PANELS,		O			
7	INDICATORS, VIBRATOR SWITCHES	O				
8	OPERATIONAL SPARES , MAINTENANCE TOOLS AND TACKLES	O				
9	ALL OTHER LOOSE ITEMS	O				

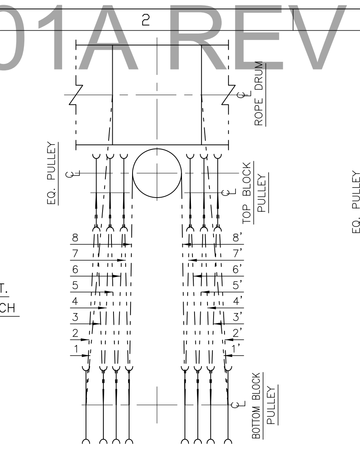
Note

1	Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

ANNEXURE V: APPROVED DRAWINGS AND DOCUMENTS

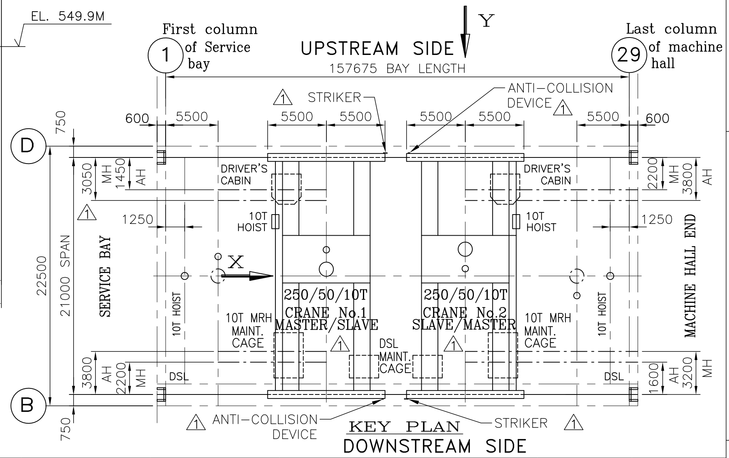


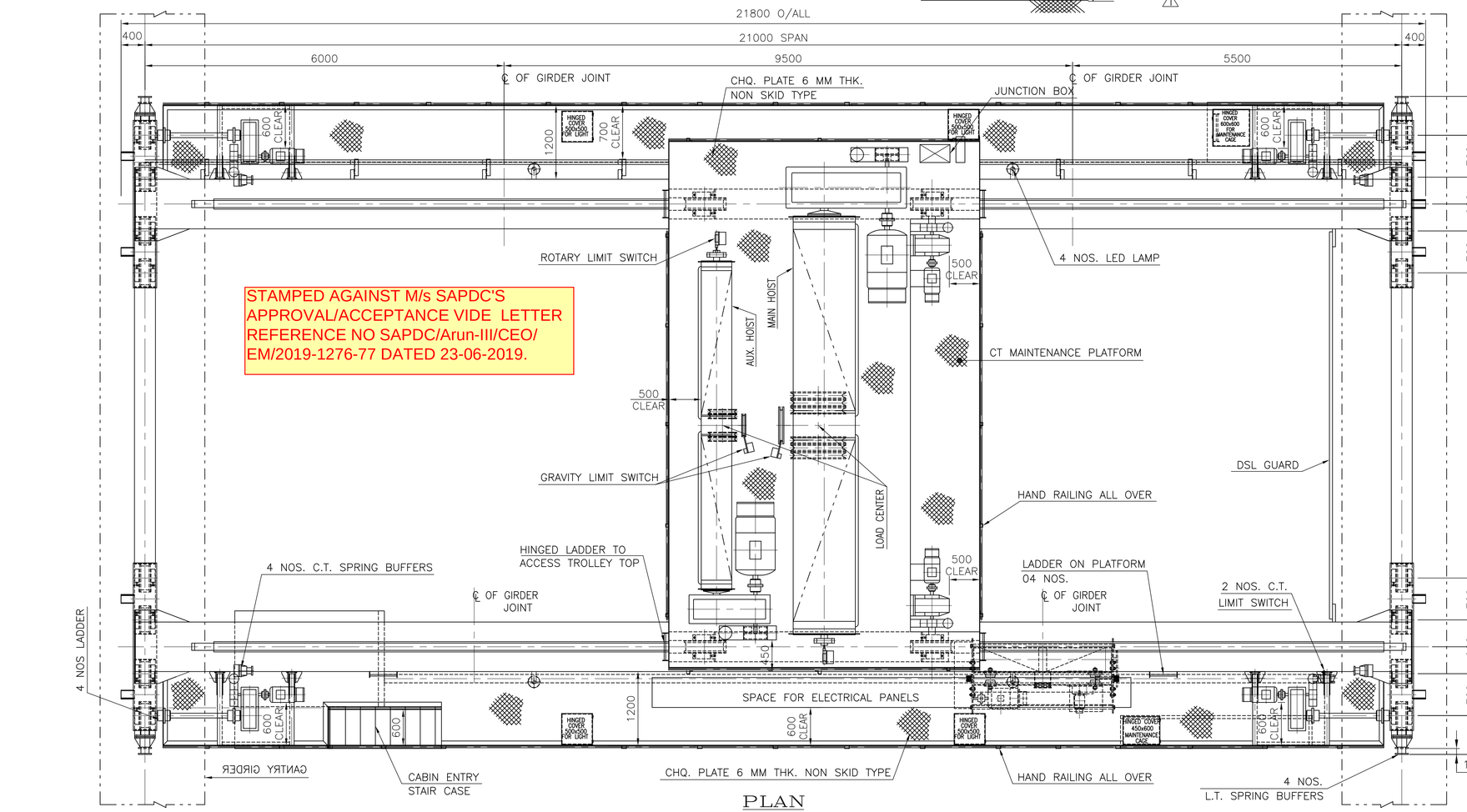




ROPE REEVING DIAGRAM
FOR MAIN HOIST (16 FALLS)

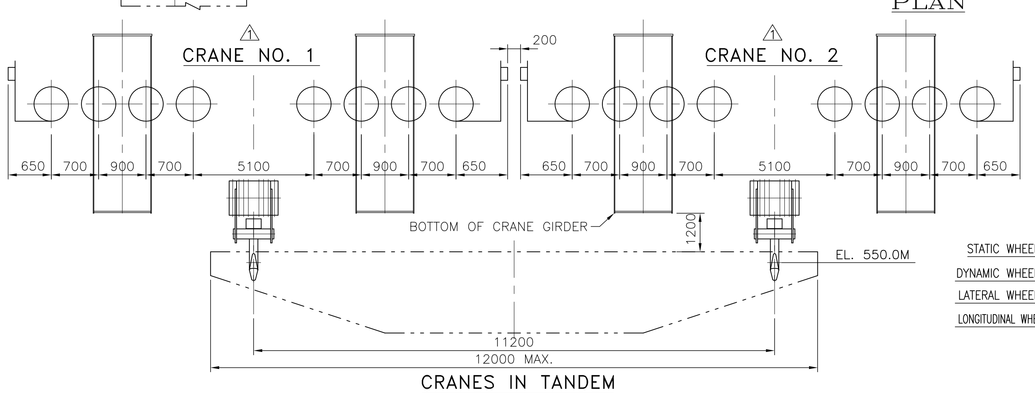
ROPE REEVING DIAGRAM
FOR AUX. HOIST (12 FALLS)



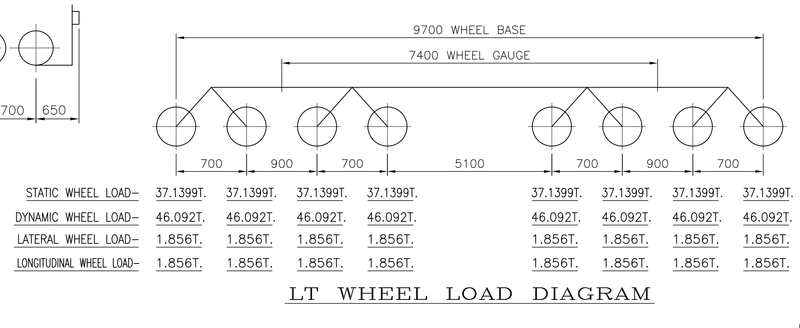


PLAN

STAMPED AGAINST M/s SAPDC'S APPROVAL/ACCEPTANCE VIDE LETTER REFERENCE NO SAPDC/Arun-III/CEO/EM/2019-1276-77 DATED 23-06-2019.

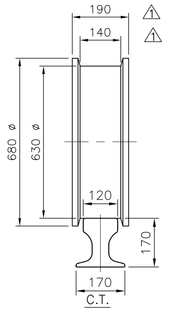


CRANES IN TANDEM

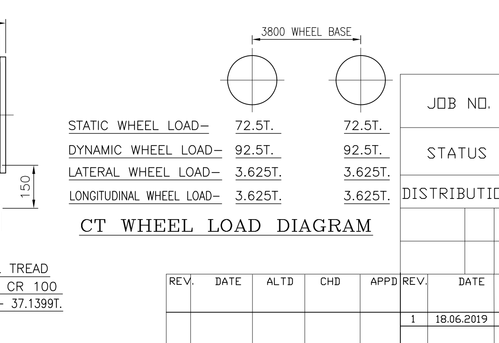


STATIC WHEEL LOAD–	37.1397T.	37.1397T.	37.1397T.	37.1397T.		37.1397T.	37.1397T.	37.1397T.	37.1397T.
DYNAMIC WHEEL LOAD–	46.092T.	46.092T.	46.092T.	46.092T.		46.092T.	46.092T.	46.092T.	46.092T.
LATERAL WHEEL LOAD–	1.856T.	1.856T.	1.856T.	1.856T.		1.856T.	1.856T.	1.856T.	1.856T.
LONGITUDINAL WHEEL LOAD–	1.856T.	1.856T.	1.856T.	1.856T.		1.856T.	1.856T.	1.856T.	1.856T.

LT WHEEL LOAD DIAGRAM



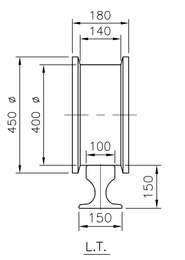
1) DEFLECTION:–LESS THAN SPAN/900
2) CAMBER =25 MM



MECHANICAL COUPLING
FOR TANDEM OPERATION
(TOWING ARRANGEMENT)

NOTES:–

1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2) HOOKS ARE PROVIDED WITH SAFETY LATCH AND SWIVEL LOCK.
3) DSL ON COLUMN B SIDE.
4) FOR TANDEM OPERATION BOTH THE CRANES ARE TO BE COUPLED MECHANICALLY AS WELL AS ELECTRICALLY.
5) 1 NO. LIFTING BEAM TO LIFT MAX. 41OT. INCLUDING SELF WEIGHT OF BEAM & SUITABLE FOR TANDEM OPERATION BY BOTH CRANES PROVIDED.
6) VVVF, CONTROL IS PROVIDED FOR M.H., A.H., C.T., L.T. & MONORAIL MOTIONS.
7) CRANE NO. 1 AS SHOWN & CRANE NO. 2 IDENTICAL EXCEPT CABIN & MAINTENANCE CAGE ON OPPOSITE HAND. REFER KEY PLAN.
8) TRANSPORTATION LIMITATION AS 9.7M LENGTH, 6M WIDTH, 6M HEIGHT
9) ANTI COLLISION DEVICE PROVIDED BETWEEN THE TWO CRANES.
10) EACH GIRDER IS PROVIDED WITH TWO NOS OF MACHINE BOLTED JOINTS TO SUIT TRANSPORT RESTRICTION. JOINTS TO BE STAGGERED IN BOTH THE GIRDER
11) CENTRALIZED GREASE LUBRICATION WITH HAND OPERATED GREASE PUMP FOR ALL BEARINGS.
12) ISOLATING SWITCH SHALL BE SUITABLY PROVIDED FOR THE DSL AT A HEIGHT OF 1.5M FROM SERVICE BAY LEVEL.
13) OPERATION SHALL BE FROM OPERATORS CABIN, PENDANT PUSH BUTTON & RADIO REMOTE CONTROL.
14) HANDRAIL OF 32 MM NB MEDIUM CLASS OF IS:1239 HAVING TOP AND BOTTOM RAIL AT HEIGHT OF 1000 MM AND 500 MM AND VERTICAL POST SPACING NOT EXCEEDING 1100 MM WITH PROVISION OF KICK PLATE (100 MM HIGH AND 6MM THICK)
15) FIRE EXTINGUISHER SHALL BE PROVIDED (ONE NO. IN CABIN AND THREE ON BRIDGE).
16) 4 NOS LED LAMPS SHALL BE PROVIDED ON BRIDGE GIRDER PLATFORM FOR ILLUMINATION
17) TWO NOS. ISOLATING SWITCH SHALL BE PROVIDED AT EXTREME ENDS OF THE BAY LENGTH, AT A DISTANCE OF APPROXIMATELY 15–20 MTRS. FROM THE CENTRE LINE OF FIRST & LAST COLUMN FOR MAINTENANCE OF THE CRANE.
18) LOAD CELL WITH DIGITAL DISPLAY MONITORING DEVICE ON FRONT SIDE OF EACH EOT CRANE TO BE PROVIDED FOR MH & AH.
19) DSL PHASE INDICATING LAMPS PROVIDED.
20) STEEL LADDERS 450MM WIDE AND STAIRS (NON–SLIP TREADS) 600 MM WIDE.
21) HOOK MATERIAL,
CLASS 2 AS PER IS 1875:1992 (RE AFFIRMED 2004) FOR HOOKS CONFORMING TO IS : 5749 CLASS 1A OR CLASS 3 FOR HOOK OF GRADES L & M RESPECTIVELY
AS PER IS:1875–1992 FOR HOOKS CONFORMING TO IS:15560
22) EACH TRUCK WILL HAVE HAND HOLES WITH REMOVABLE COVERS, IN EACH CLOSED COMPARTMENT OF END TRUCKS TO FACILITATE PAINTING OF THE INTERIOR WITH A SPRAY GUN WITHOUT MAJOR DISASSEMBLY.
23) REFERENCE DRAWINGS,
1. POWER HOUSE GENERAL ARRANGEMENT PLAN AT EL.539.0M: DRAWING NO. 120000202556 REV 03
2. POWER HOUSE GENERAL ARRANGEMENT CROSS SECTION: DRAWING NO. 120000202551 REV 03
24) DUST COVERS SHALL BE PROVIDED WHERE NECESSARY TO PROTECT SLIDING AND ROTATING PARTS AND TO PREVENT DUST FROM MIXING WITH THE LUBRICANT.
25) PAINTING DETAILS SHALL BE INDICATED IN "DATA SHEET & CATALOGUE OF EVERY COMPONANT OF 250/50/10T. POWER HOUSE CRANE WITH PAINTING DETAILS : DRG.NO. PE–V0–437–501–A527"
26) LOAD TESTING OF CRANE AT SITE INCLUDING LOAD ARRANGEMENT (ARRANGEMENT OF STEEL PLATE OR/AND CASTING OF CONCRETE BLOCKS ETC.) AND ALL LOGISTICS SHALL BE DONE BY BHEL
27) ⊛ IN MAIN AND AUX. HOIST MOTION 1NO. ROTARY LIMIT SWITCH SHALL BE PROVIDED WITH ASSY. 1 NO. ROTARY LIMIT SWITCH SHALL BE SUPPLIED AS LOOSE SUPPLY.
28) ⊛⊛ MONORAIL APPROACH IS EXTENDED UPTO 510.5M. FURTHER EQUIPMENT CAN BE HANDLED WITH THE HELP OF SLINGS WHICH ARE SUPPLIED ALONG WITH CRANES.



STATIC WHEEL LOAD–	72.5T.	72.5T.
DYNAMIC WHEEL LOAD–	92.5T.	92.5T.
LATERAL WHEEL LOAD–	3.625T.	3.625T.
LONGITUDINAL WHEEL LOAD–	3.625T.	3.625T.

CT WHEEL LOAD DIAGRAM

LIMIT SWITCH	⊛ QUANTITY⚠	2+1 ⚠	2+1 ⚠	1+1		2	2
	TYPE	ROTARY+GRAVITY	ROTARY+GRAVITY	ROTARY/LEVER		1 WAY–LEVER	1 WAY–LEVER
	RATING	10 AMPS.	10 AMPS.	10 AMPS.		10 AMPS.	10 AMPS.
	MAKE	AS PER APPROVED SUB VENDOR LIST					
BRAKE	QUANTITY	1+1	1+1	1/1		2+2	4+4
	DRUM DIA./MATERIAL	400+FDR30/CS–IS:2707(GRADE–1)	400+FDR30/CS–IS:2707(GRADE–1)	FDW20/FDW08		100+FDW17	160+FDW20
	TYPE	EHT+DISC	EHT+DISC	DISC		EHT+DISC	EHT+DISC
	MAKE	AS PER APPROVED SUB VENDOR LIST					
GEAR BOX	QUANTITY	1	1	1/1		2	4
	RATIO	383.7:1	52.5:1	211:1/48.7:1		191.22:1	48.57:1
	TYPE	H1050+250S	H650S	NH650SP/N1V–120+0		VH400+100S	H350
	MAKE	AS PER APPROVED SUB VENDOR LIST					
	QUANTITY/IS STANDARD	1/IS:325	1/IS:325	1+1/IS:325		2/IS:325	4/IS:325
MOTORS	MAKE	AS PER APPROVED SUB VENDOR LIST					
	INSULATION	CLASS F	CLASS F	CLASS F		CLASS F	CLASS F
	CDF–ST/HR	40%–300ST/HR	40%–300ST/HR	40%–300ST/HR		40%–300ST/HR	40%–300ST/HR
	SYNCHRONOUS RPM	1000	1000	1000		1000	1000
	K.W.–TYPE	58.9–SC	55.0–SC	6.5/0.55–SC		4.0–SC	6.5–SC
	ENCLOSURE	TEFC–IP55	TEFC–IP55	TEFC–IP55		TEFC–IP55	TEFC–IP55
PULLEYS	MATERIAL	CS–IS:1030 (200–400W)					
	BOTTOM BLOCK QTY.	8 NOS.	6 NOS.	2 NOS.			
	BOTTOM BLOCK DIA.	800	400	320			
	TOP BLOCK QTY.	6 NOS.	4 NOS	–			
	TOP BLOCK DIA.	800	400	–			
	EQUALISER QTY.	1 NO.	1 NO.	1 NO.			
	EQUALISER DIA.	630	320	200			
DRUMS	QUANTITY/MATERIAL	SEAMLESS PIPE ASTM–106 OR FABRICATED FE410W IS:2062 GR A/B & STRESS RELIEVED					
	LENGTH	7000	5500	⚠ 2400	WHEEL MATERIAL	C55Mn75 OF IS:1875–1992	
	PCD	1038	510	410	HOOK MATERIAL	REFER NOTE No. 21	
WIRE ROPE	MAKE	AS PER APPROVED SUB VENDOR LIST			⚠ WHEEL BEARING	ANTI FRICTIONAL 22226	SHPERICAL TYPE 22222
	FOS	6	6	6	WHEEL LOAD	72.5T.	37.1399T.
	QUALITY kN	1960	1960	1960	BUFFER TYPE	SPRING	SPRING
	CORE	STEEL	STEEL	STEEL	TREAD WIDTH	140	140
	CONSTRUCTION	6x36	6x36	6x36	NOS. OF WHEEL	4	16
	DIAMETER IN MM.	38	19	16	WHEEL DIA.	630	400
	NO. OF FALLS	16	12	4	RAIL SIZE	CR 120	CR 100
DATA	AMB. TEMP.	40°C			CRAB WEIGHT	40.0T	
	CONTROL VOLTAGE	110V, 1 PHASE, AC			CRANE WEIGHT	115T (INCLUDING CRAB)	
	MAIN/CREEP SPEED(5%) M/MIN.	1.0/0.05	5.0/0.25	3/0.15 FOR HOIST & 10/0.05 FOR CT		10.0/0.5	25.0/1.25
	HEIGHT OF LIFT	29500	30500	⚠ 38000			
	DUTY	CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR					
	POWER SUPPLY	415V ±10%, 3Ph, 4WIRE, 50Hz ±3%.			WHEEL GAUGE	7400	21000
	CAPACITY	250 T.	50 T.	10 T.	WHEEL BASE	3800	9700
		MAIN HOIST	AUX.HOIST	MONORAIL HOIST/CT	–	C.T.	L.T.

CUSTOMER	SJVN ARUN–3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN–3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	Suraj		21.05.19
	DES'N	MKM		21.05.19
	CHD	MKM		21.05.19
	APP'D	SMG		21.05.19

FAFECO — FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/100

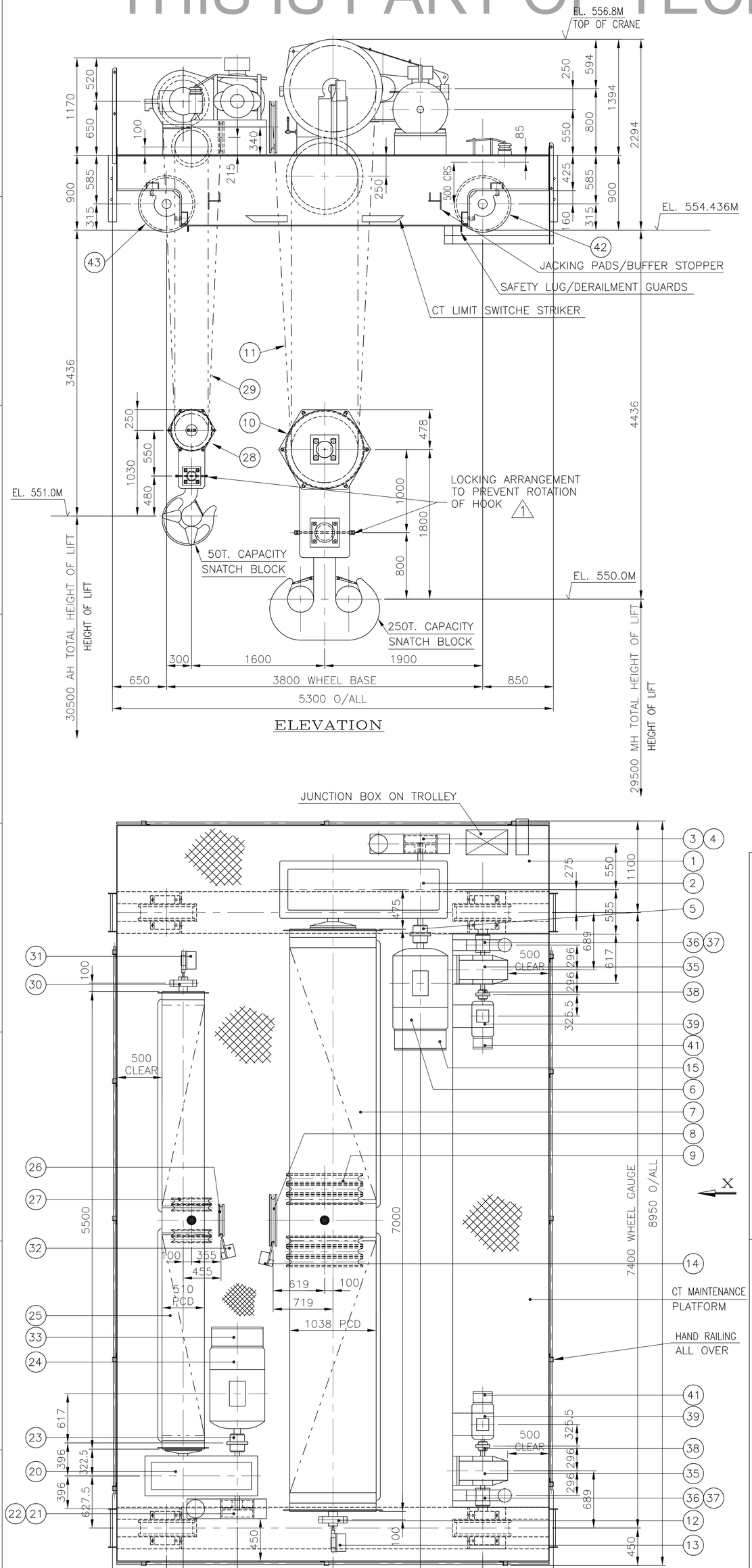
JOB NO. 437
STATUS CONTRACT
DISTRIBUTION

REV.	DATE	ALT'D	CHD	APP'D
1	18.06.2019	Suraj	MKM	SMG

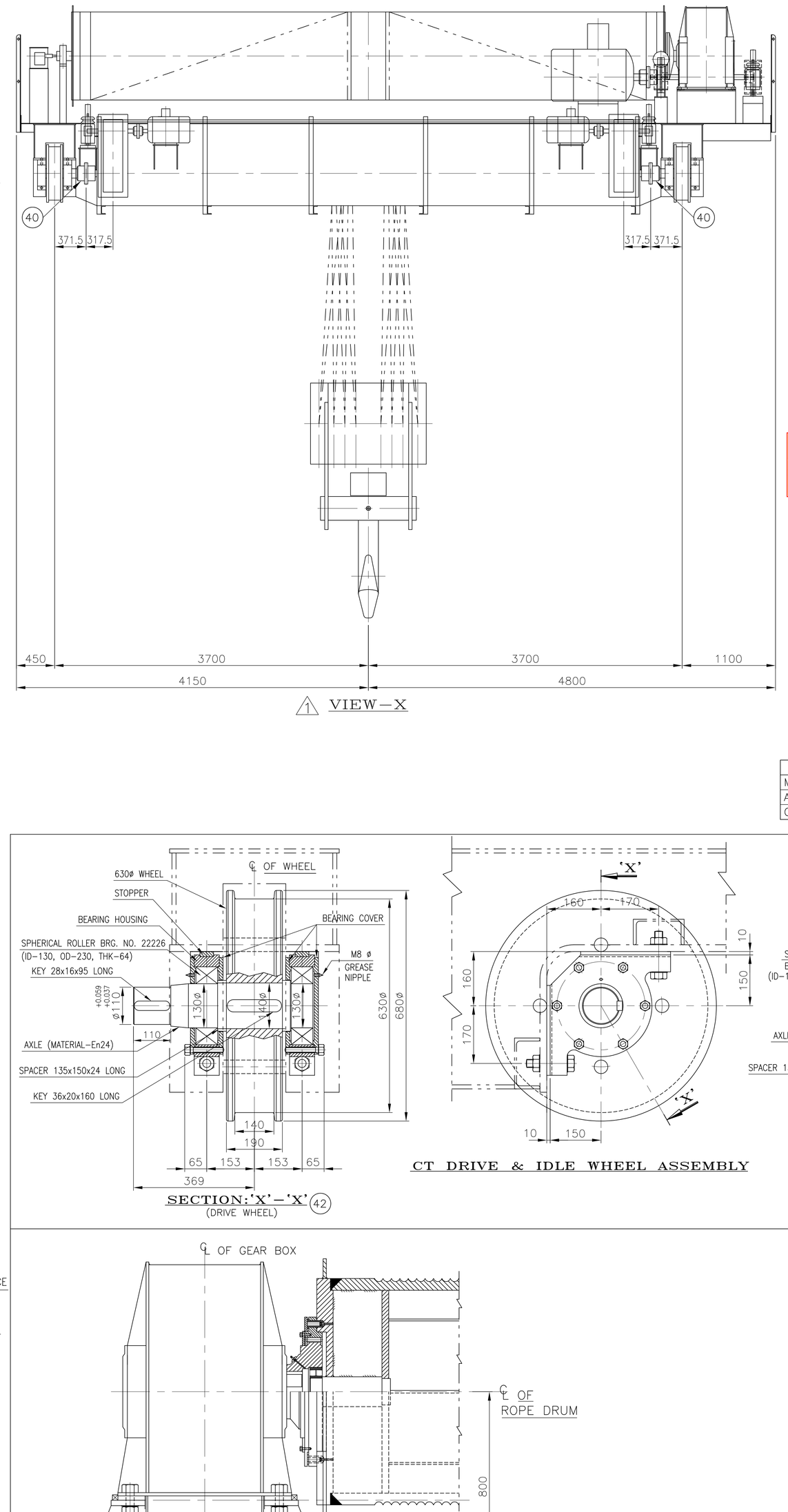
TITLE
General arrangement and assembly drawing including Wheel load details, Monorail details for 250/50/10T Power House Crane with CT DSL details

DEPT. | SCALE – 1:60
SIGN
DATE
DRAWING NO PE-V0-437-501-A505
SHEET 1 OF 1 | REV. 1

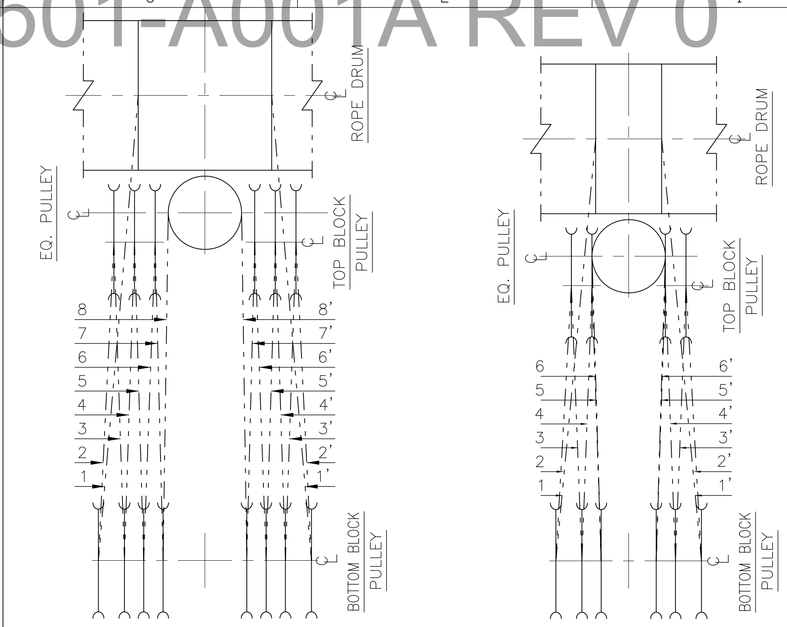
SIZE-1A1



ELEVATION



1 VIEW—X



ROPE REEVING DIAGRAM FOR MAIN HOIST (16 FALLS)

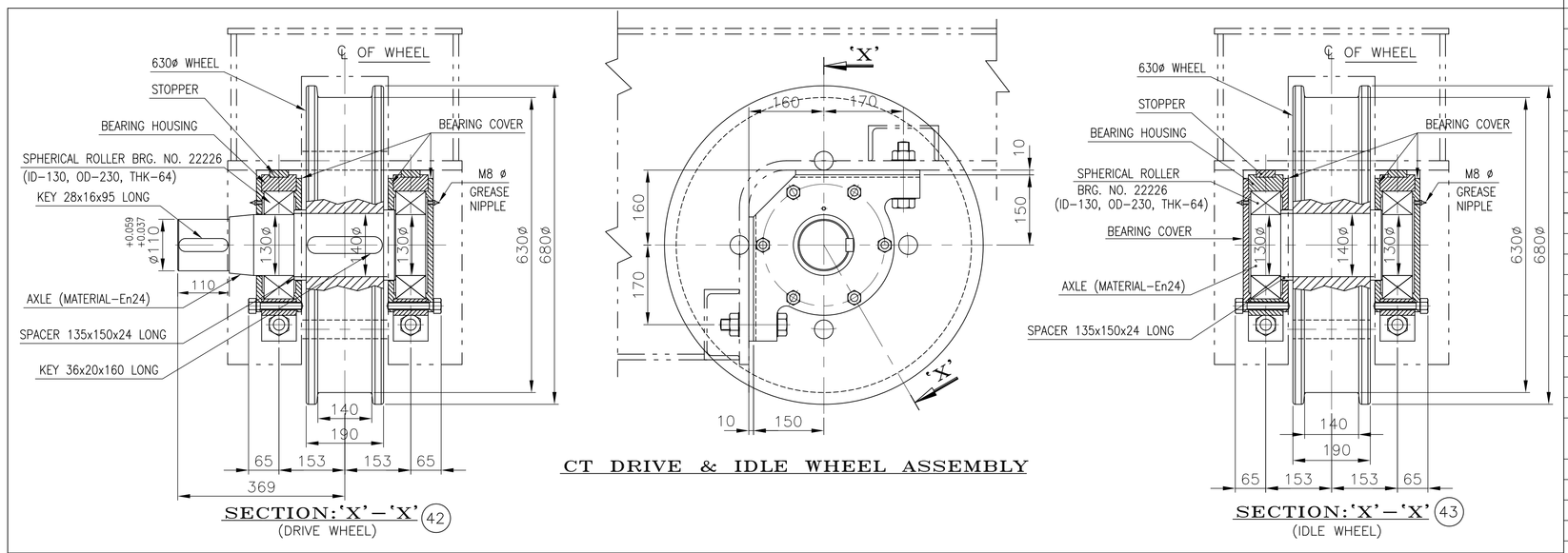
ROPE REEVING DIAGRAM FOR AUX. HOIST (12 FALLS)

STAMPED AGAINST M/s SAPDC'S APPROVAL/ ACCEPTANCE VIDE LETTER REFERENCE NO SAPDC/Arun-III/CEO/EM/2019-1276-77 DATED 23-06-2019.

NOTES:—
1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2) HOOKS ARE PROVIDED WITH SAFETY LATCH AND SWIVEL LOCK.
3) VVVF CONTROL IS PROVIDED FOR M.H., A.H. & C.T. MOTIONS.
4) CENTRALIZED GREASE LUBRICATION WITH HAND OPERATED GREASE PUMP FOR ALL BEARINGS.
5) MAKE AS PER APPROVED SUB VENDOR LIST
6) CRAB ASSLY SHOWN AS FOR CRANE NO 1, CRAB ASSLY FOR CRANE 2 OPPOSITE HAND.
1 7) HOOK MATERIAL, CLASS 2 AS PER IS 1875:1992 (RE AFFIRMED 2004) FOR HOOKS CONFORMING TO IS : 5749 CLASS 1A OR CLASS 3 FOR HOOK OF GRADES L & M RESPECTIVELY AS PER IS:1875—1992 FOR HOOKS CONFORMING TO IS:15560

MOTION	MAIN/CREEP SPEED (5%) M/MIN.	HEIGHT OF LIFT
MAIN HOIST	1.0/0.05	29500
AUX HOIST	5.0/0.25	30500
CROSS TRAVEL	10.0/0.5	

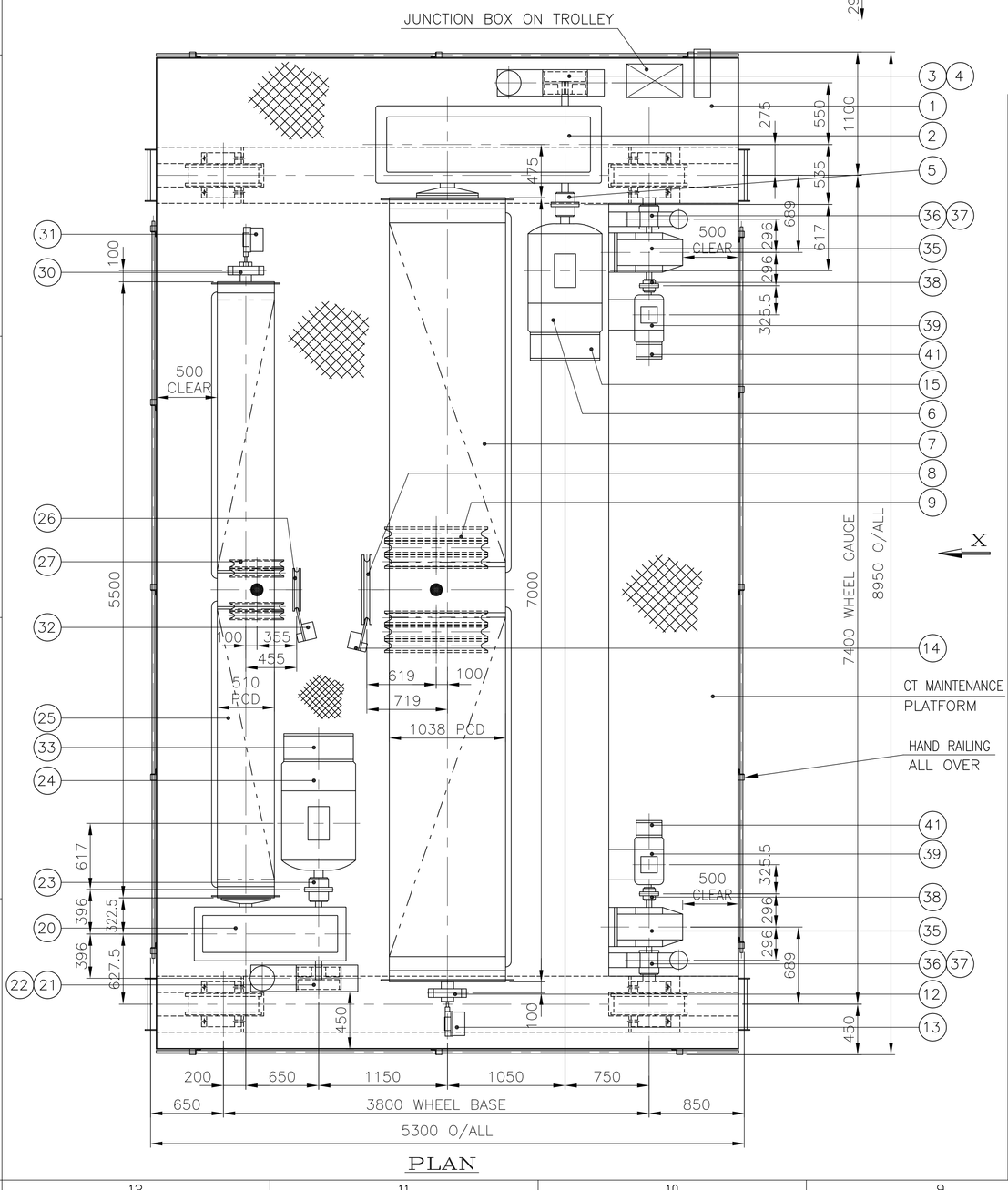
SR. NO.	DESCRIPTION	QTY	MATL.	REMARK
43	630 ø IDLE WHEEL ASSEMBLY	2		
42	630 ø RUNNER WHEEL ASSEMBLY	2		
41	DCEM DISK BRAKE – FDR17, 8Kgm	2		
40	FULL GEARED COUPLING AFG 105	2	45C8	
39	SC MOTOR 4.0Kw, 6 POLE, 40% CDF, 300ST/HR, SYNCHRONOUS RPM 1000 IEFC IP55, CLASS OF INSULATION F WITH TEMP RISE B	2		
38	FULL GEARED COUPLING, AFG 101	2	45C8	
37	BRAKE DRUM – 100 ø	2	55C8	IS:1570(PART 2 /SEC 1)–1979
36	EHT BRAKE – 100 BRAKING TORQUE 6kg.m, THRUSTER CAP. 18Kgs	2		
35	GEAR BOX VH400+100S RATIO 191.22:1	2		
	CROSS TRAVEL			
33	DCEM DISK BRAKE – FDR30, 80Kgm	1		
32	GRAVITY LIMIT SWITCH. CAP 10 AMPS.	1		
31	ROTARY LIMIT SWITCH. CAP 10 AMPS.	1		
30	BEARING HOUSING WITH BRG. NO.–22218	1		
29	19ø WIRE ROPE,6x36 CONST.,STEEL CORE,1960 kN,BREAKING LOAD 252kN GRADE,435 LG	1	PLOUGH STEEL	
28	50T CAPACITY SNATCH BLOCK WITH 400 ø PULLEYS x 12 FALLS	1		
27	TOP BLOCK PULLEY – 400 ø	4	CS200–400W	IS:1030 Gr. II WITH Y.P. GREATER THAN SIZE OF LITS
26	EQUALISER PULLEY – 320 ø	1	M.S.	IS:1030 Gr. II WITH Y.P. NOT LESS THAN 2/3RD OF T/SIZE (UNNOTCHED) AND ELONGATION NOT LESS THAN 15%
25	ROPE DRUM PCD 510 x 7000 LG. WITH GEARED ROPE DRUM COUPLING	1	M.S.	SEAMLESS PIPE, ASTM–106,GR SAPDC/E/437/501/A001A/REV/0 GR.B OR E.R.W/ERW WELDED.
24	SC MOTOR 58.9Kw, 6 POLE, 40% CDF, 300ST/HR, SYNCHRONOUS RPM 1000 IEFC IP55, CLASS OF INSULATION F WITH TEMP RISE B	1		
23	FULL GEARED COUPLING AFG 104	1	45C8	
22	BRAKE DRUM – 400 ø	2	CS280–520W	CS–IS:1030/CL 4 IS:1875
21	EHT BRAKE – 400 BRAKING TORQUE 80kg.m, THRUSTER CAP. 46Kgs	2		
20	GEAR BOX H650 RATIO 52.5:1	1		
	AUX HOIST			
15	DCEM DISK BRAKE – FDR30, 80Kgm	1		
14	GRAVITY LIMIT SWITCH. CAP 10 AMPS.	1		
13	ROTARY LIMIT SWITCH. CAP 10 AMPS.	1		
12	BEARING HOUSING WITH BRG. NO.–22222	1		
11	38ø WIRE ROPE,6x36 CONST.,STEEL CORE,1960 kN,BREAKING LOAD 1008kN GRADE, 575M LG	1	PLOUGH STEEL	
10	250T CAPACITY SNATCH BLOCK WITH 800 ø PULLEYS x 16 FALLS	1		
9	TOP BLOCK PULLEY – 800 ø	6	CS200–400W	IS:1030 Gr. II WITH Y.P. GREATER THAN SIZE OF LITS
8	EQUALISER PULLEY – 630 ø	1	CS200–400W	IS:1030 Gr. II WITH Y.P. GREATER THAN SIZE OF LITS
7	ROPE DRUM PCD 1038 x 7000 LG. WITH GEARED ROPE DRUM COUPLING	1	M.S.	SEAMLESS PIPE, ASTM–106,GR SAPDC/E/437/501/A001A/REV/0 GR.B OR E.R.W/ERW WELDED.
6	SC MOTOR 58.9Kw, 6 POLE, 40% CDF, 300ST/HR, SYNCHRONOUS RPM 1000 IEFC IP55, CLASS OF INSULATION F WITH TEMP RISE B	1		
5	FULL GEARED COUPLING, AFG–104	1	45C8	
4	BRAKE DRUM – 400 ø	2	CS280–520W	CS–IS:1030/CL 4 IS:1875
3	EHT BRAKE – 400 BRAKING TORQUE 80kg.m, THRUSTER CAP. 46Kgs	2		
2	GEAR BOX H 1050+250S RATIO 383.7:1	1		
	MAIN HOIST			
1	CRAB FRAME WORK	1	M.S.	E250 BR IS:2062–2011 (1.00% Alloy)



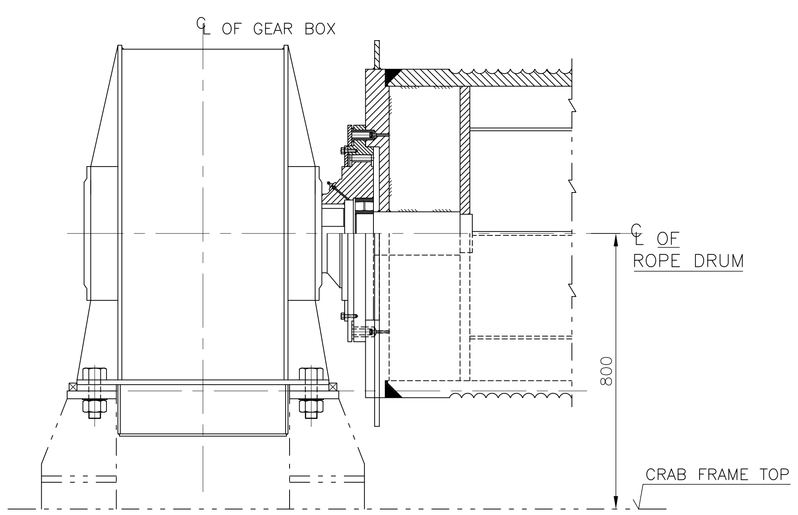
CT DRIVE & IDLE WHEEL ASSEMBLY

SECTION:'X'–'X' 42 (DRIVE WHEEL)

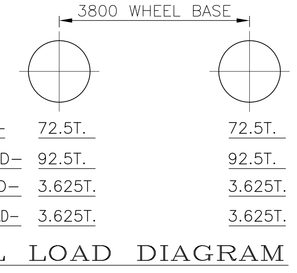
SECTION:'X'–'X' 43 (IDLE WHEEL)



PLAN



1 SECTIONAL VIEW OF CONNECTION BETWEEN ROPE DRUM AND GEAR BOX



STATIC WHEEL LOAD–	72.5T.	72.5T.
DYNAMIC WHEEL LOAD–	92.5T.	92.5T.
LATERAL WHEEL LOAD–	3.625T.	3.625T.
LONGITUDINAL WHEEL LOAD–	3.625T.	3.625T.

CT WHEEL LOAD DIAGRAM

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
1	18.06.2019	Suraj	MKM	SMG

CUSTOMER	SJVN ARUN–3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN–3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHEL — BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	Suraj		30.05.19
	DES.N	MKM		30.05.19
	CHD	MKM		30.05.19
	APPD	SMG		30.05.19

FAFECO — FURNACE & FOUNDRY EQUIPMENT CO. CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no. OG-06/250-50-10Tx21M/110

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

TITLE

Crab sub assembly with CT wheel assembly for 250/50/10T Power House Crane

DEPT. SCALE – 1:35

SIGN

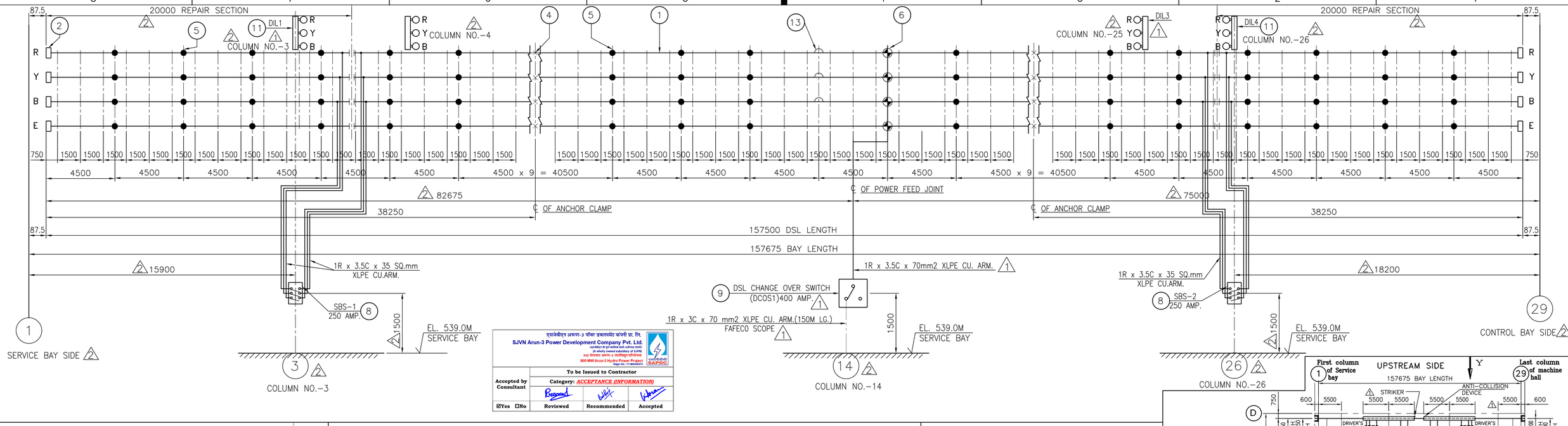
DATE

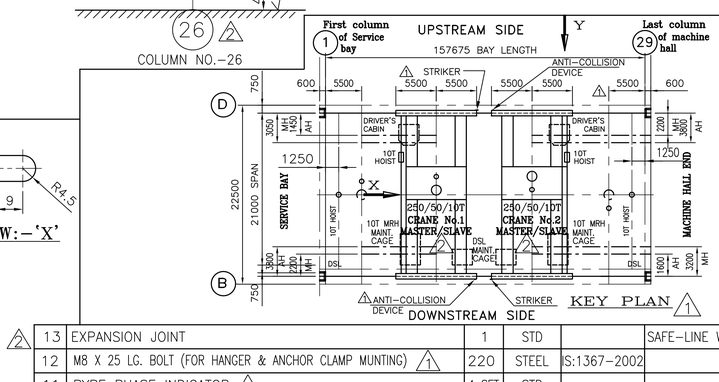
DRAWING NO PE-V0-437-501-A506

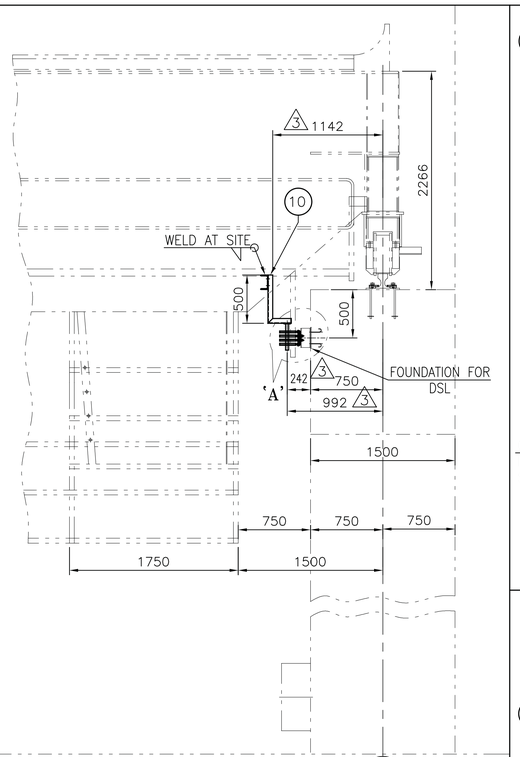
SHEET 1 OF 1

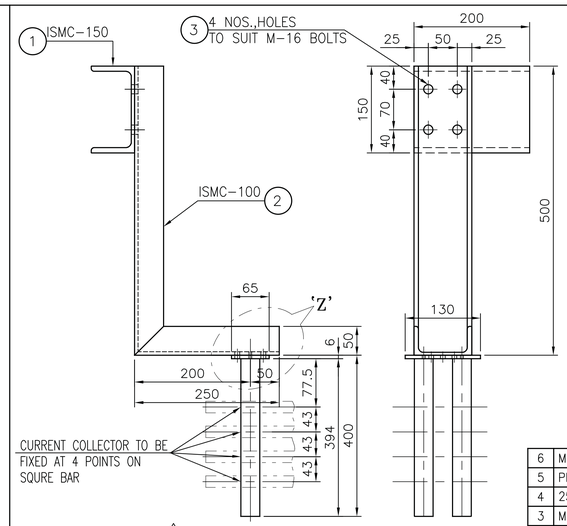
REV. 1

SIZE–A1

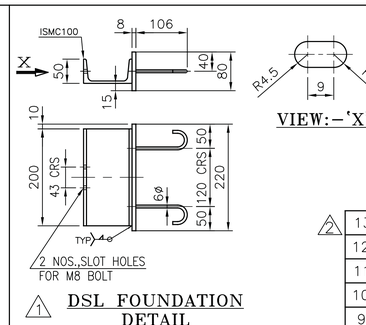


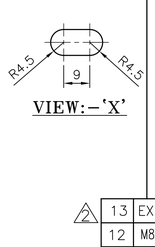






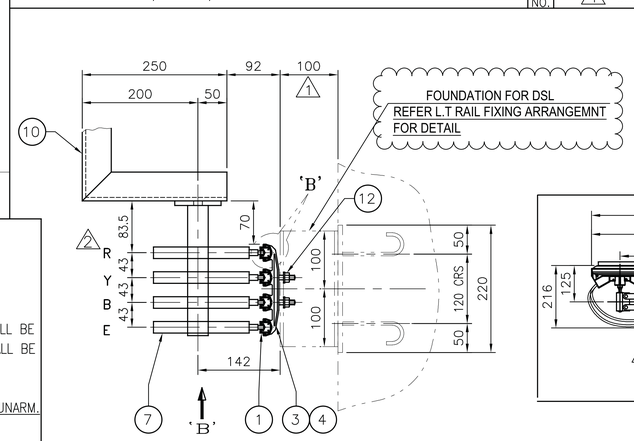
SR. NO.	DESCRIPTION	QTY	MATL.	REMARK
6	M8 BOLT x 25 LG.	3	STEEL	IS:1367–2002
5	PLATE 6 THK. x 65 x 130 LG.	1	M.S	IS:2062–1994
4	25 SQ. BAR x 225 LG.	1	M.S	IS:2062–1994
3	M16 BOLT x 50 LG. WITH NUT & S.W.	4	STEEL	IS:1367–2002
2	ISMC–100 x 50 x 750 LG.	1	M.S	IS:2062–1994
1	ISMC–150 x 75 x 200 LG.	1	M.S	IS:2062–1994

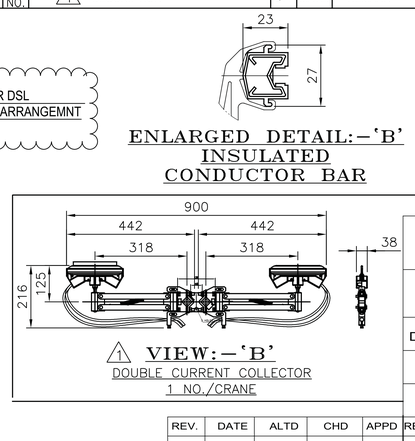




SR. NO.	DESCRIPTION	QTY.	MATL.	REMARK	MAKE
13	EXPANSION JOINT	1	STD		SAFE–LINE W–
12	M8 X 25 LG. BOLT (FOR HANGER & ANCHOR CLAMP MUNTING) 1	220	STEEL	IS:1367–2002	
11	RYBE PHASE INDICATOR 1	4 SET	STD		
10	DOUBLE CURRENT COLLECTOR BRACKET 1	2	M.S.	IS:2062:1994	FAFECO
9	400A. CAPACITY DSL CHANGE OVER SWITCH (DCOS1) 1	1	STD	–	SAFE–LINE W
8	SICK BAY SWITCH (SBS–1&2) 1	2	STD	–	
7	DOUBLE CURRENT COLLECTOR (1 NO. EACH FOR 1 CRANE, 2 NOS. FOR 2 CRANES) 1	1+1			
6	POWER FEED AND COVER	4	STD	–	
5	JOINT COVER	136	STD	–	
4	ANCHOR CLAMP	8	STD	–	SAFE–LINE 'W'
3	HANGER CLAMP	102	STD	–	
2	END COVER	8	STD	–	
1	400A. CAPACITY SHROUDED CONDUCTOR 4.5M LG.	140	COPPER	IS:2062:1994	

DUTY:– CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR





NOTES:–
1) ALL DIMENSIONS ARE IN MM.
2) FOR DSL FOUNDATION REFER L.T RAIL FIXING DRAWING.
1 DWG. NO.– OG–06/250–50–10Tx21M/188
BHEL DWG. NO.– PE–V0–437–501–A532
1 3) THE SUPERVISION AND ERECTION OF EMBEDDED PARTS OF CRANE RAILS SHALL BE BHEL'S RESPONSIBILITY AS PER CLAUSE 23.5.3.1 (3). INSERT FOR DSL SHALL BE SUPPLIED BY CRANE'S SUPPLIER(M/S FAFECO) AND SUPERVISION SHALL BE BHEL'S RESPONSIBILITY.
1 4) FAFECO SHALL SUPPLY TEMPORARY CABLE OF 3.5C x 70mm2 PVC/XLPE CU. UNARM. OG BAY LENGTH + 25 MTRS = 158+25=183 Mtrs LONG.
5) Complete erection and commissioning of the shrouded conductor is in BHEL scope. Any additional quantity required shall be taken care by BHEL.

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
1	25.10.2019	AMIT	NM	SMG
2	04.12.2019	Kishor	SMM	SMM
3	20.02.2020	Suraj	MKM	MKM

Consultant:- SJVN LTD.
Recommended for Acceptance (information category) on 11.03.2020
SUB GROUP | SECTIONAL HEAD | HOD
Checked | Reviewed | (On tour)

Accepted by Consultant | To be Issued to Contractor
Category: ACCEPTANCE (INFORMATION)
☑Yes ☐No | Reviewed | Recommended | Accepted

JOB NO.	437
STATUS	CONTRACT
DISTRIBUTION	

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	AMIT		02.08.19
	DESN	MKM		02.08.19
	CHD	PGS		02.08.19
	APPD	SMG		02.08.19

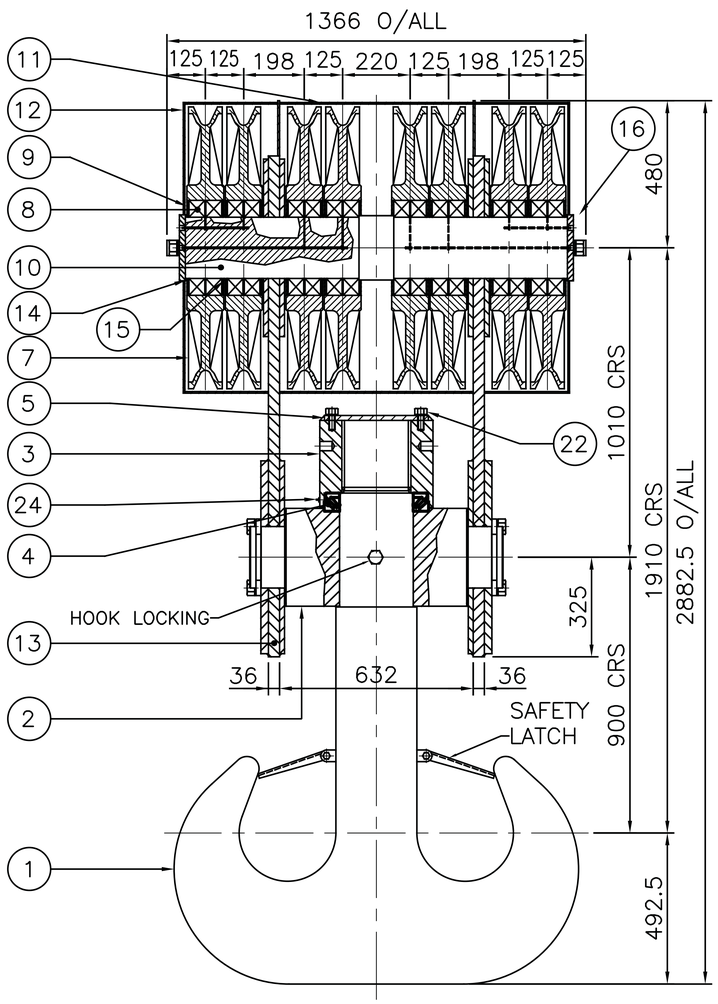
FAFECO FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

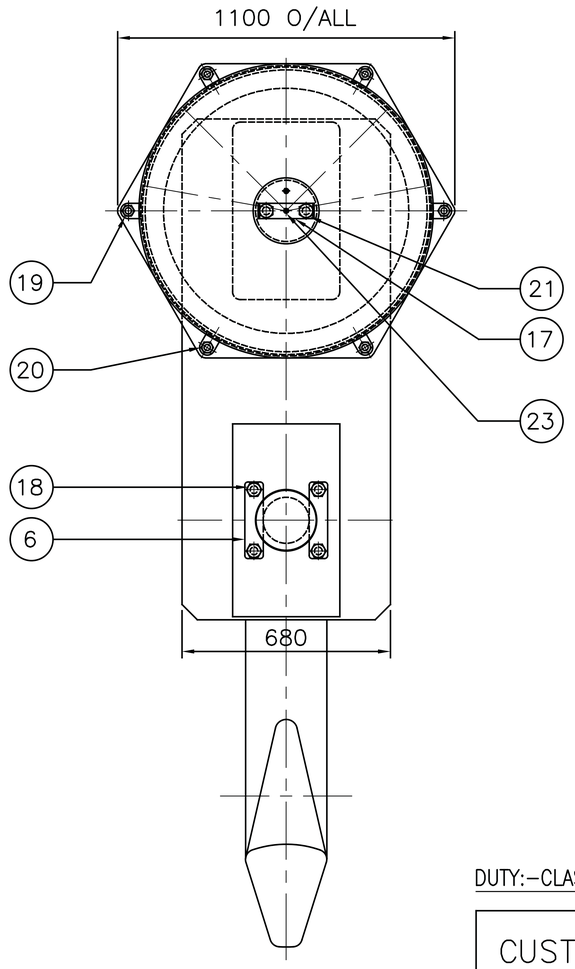
FAFECO Drawing no. OG–06/250–50–10Tx21M/170

TITLE: GENERAL ARRANGEMENT FOR PVC SHROUDED DSL 1 FOR 250/50/10T Power House crane

DEPT. | SCALE - 1:50
SIGN
DATE
DRAWING NO PE–V0–437–501–A508
SHEET 1 OF 1 | REV. 3
SIZE–A2

THIS IS PART OF TECHNICAL SPECIFICATION PE–TS–437–501–A001A REV 0





24	1/8" GREASE NIPPLE	1		IS:4009
23	1/4" GREASE NIPPLE	4		IS:4009
22	BOLT M-20x50 LG. WITH SP. WASHER	2	STEEL	IS:1367-1980
21	BOLT M-25x60 LG. WITH SP. WASHER	4	STEEL	IS:1367-1980
20	BOLT M-16x25 LG. WITH SP. WASHER & NUT	4	STEEL	IS:1367-1980
19	BOLT M-16x40 LG. WITH SP. WASHER & NUT	8	STEEL	IS:1367-1980
18	BOLT M-25x90 LG. WITH SP. WASHER	8	STEEL	IS:1367-1980
17	LOCKING BEND PLATE 3mm.THK FOR PULLEY AXLE	2	M.S.	IS:2062-1994
16	END PLATE 20 mm. THK	2	M.S.	IS:2062-1994
15	SPACER (ID.=200, OD.=210,THK.=19)	4	M.S.	IS:2062-1994
14	SPACER (ID.=200, OD.=210,THK.=12)	6	M.S.	IS:2062-1994
13	SUSPENSION PLATE 36 mm.THK	2	M.S.	IS:2062-1994
12	PULLEY GUARD	2	M.S.	IS:2062-1994
11	PULLEY GUARD	1	M.S.	IS:2062-1994
10	PULLEY AXLE	1	EN24H&T	
9	BEARING COVER	16	M.S.	IS:2062-1994
8	DEEP GROOVE BALL BEARING NO. 6040 (200,310,51)	16		
7	ROPE PULLEY 800 ø (OD-915,THK.=120)	8	CS280-520W	IS:1030-1994
6	LOCKING PLATE 16 mm.THK FOR CROSS HEAD	4	M.S.	IS:2062-1994
5	LOCKING PLATE 16 mm.THK FOR HOOK NUT	1	M.S.	IS:2062-1994
4	THRUST BALL BEARING NO. 29248 (240,340,60)	1		
3	HOOK NUT	1	20C8	IS:1570(PART 2 /SEC 1)-1979
2	CROSS HEAD	1	EN8	
1	250T. CAPACITY RAMSHORN HOOK	1	CLASS 2 OF IS:1875-1992	IS:5749-1970
SR. NO.	DESCRIPTION	QTY	MATL	REMARK

NOTE :-

1) ALL DIMENSIONS ARE IN MM.
2) SNATCH BLOCK TOTAL WEIGHT=4500 KG.

DUTY:-CLASS M5 AS PER IS:3177-1999 REAFFIRMED 2006 & IS:807, INDOOR

STAMPED AGAINST M/S SAPDC APPROVAL/ACCEPTANCE VIDE LETTER NO. SAPDC/PP&M/EM-2/2019-1238 dated 13.08.2019

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		03.07.19
	DESN	MKM		03.07.19
	CHD	MKM		03.07.19
	APPD	SMG		03.07.19

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/115

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
					-	-	-	-	-

TITLE
250T Main hoist hook block assembly
for 250/50/10T
Power House Crane with CT DSL details

DEPT.
SCALE - 1:20
SIGN
DATE

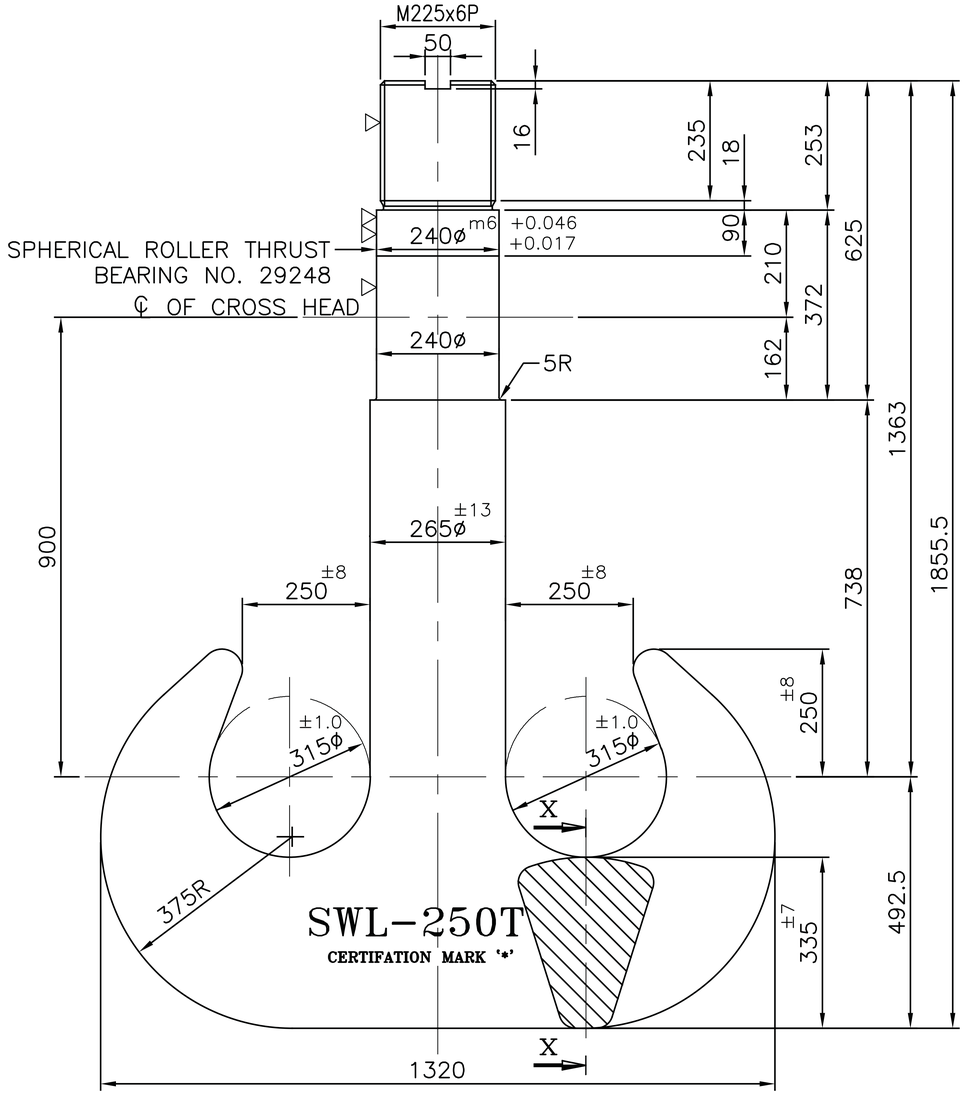
DRAWING NO
PE-V0-437-501-A509

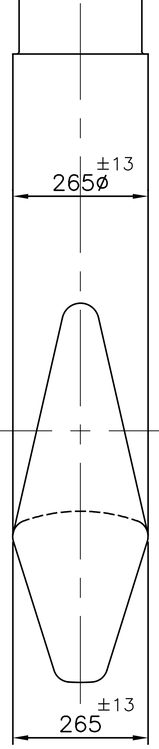
SHEET 1 OF 6
REV. 1

SIZE-A3

FOLD-01

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0





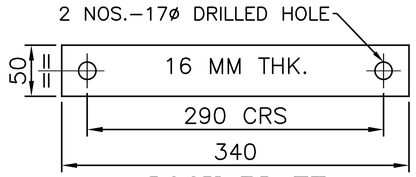
250T. RAMSHORN HOOK (IS:5749–1970)

MATL. : CLASS 2 OF 1875–1992

HEAT TREATMENT NORMALISED BETWEEN 880° TO 910°

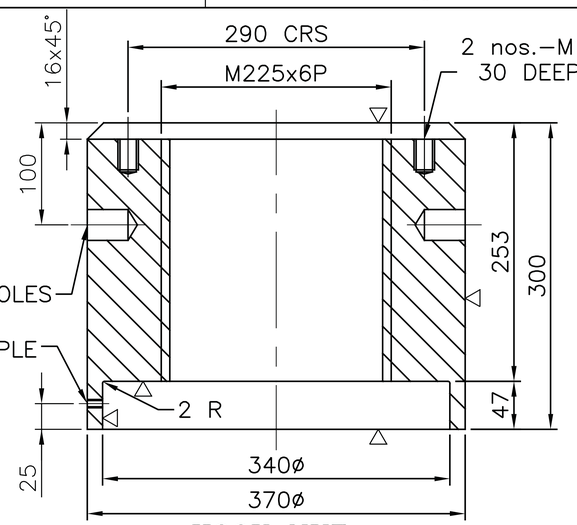
NOTE :–

1) PROOF LOAD 333 TON AS PER IS:5749–1970
2) QTY. 1 NO. PER CRANE.
3) SAFETY LATCH ON HOOK IS PROVIDED.
4) SWIVELLING HOOK IS MOUNTED ON THRUST BEARING NO.–29248 AND PROTECTIVE SKIRT IS PROVIDED TO ENCLOSE THE BEARING.
5) TOTAL WEIGHT OF HOOK=1400 KGS.~
6) LOCKING DEVICE ON SWIVELLING HOOK IS PROVIDED.



LOCK PLATE △1

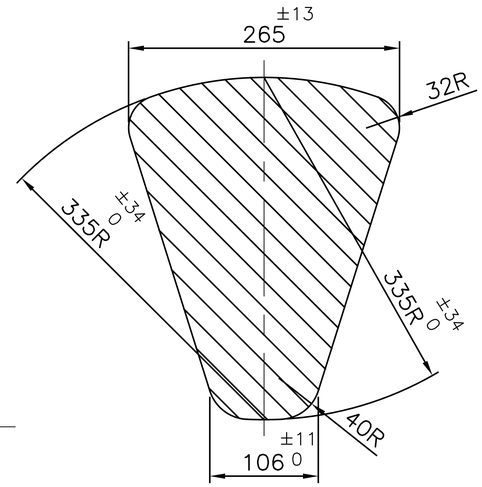
WEIGHT=2.135 KGS.



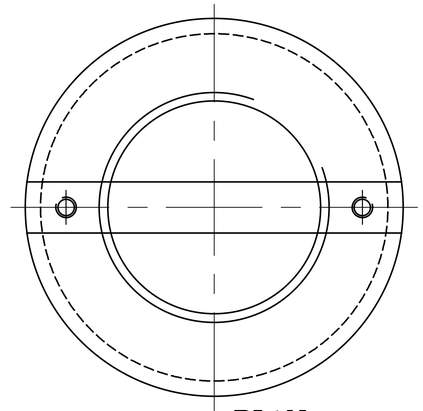
HOOK NUT

MATL. : 20C8 OF IS:1875–1994

△1 WEIGHT=140.20 KGS.



SECTION XX



PLAN

DUTY:–CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		03.07.19
	DESN	MKM		03.07.19
	CHD	MKM		03.07.19
	APPD	SMG		03.07.19

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/250TRH16800

TITLE

250T Main hoist hook with nut details for 250/50/10T Power House Crane with CT DSL details

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD
1	8.7.2019	KISHOR	MKM	MKM

DEPT.

SCALE – 1:12

SIGN

DATE

DRAWING NO PE-V0-437-501-A509

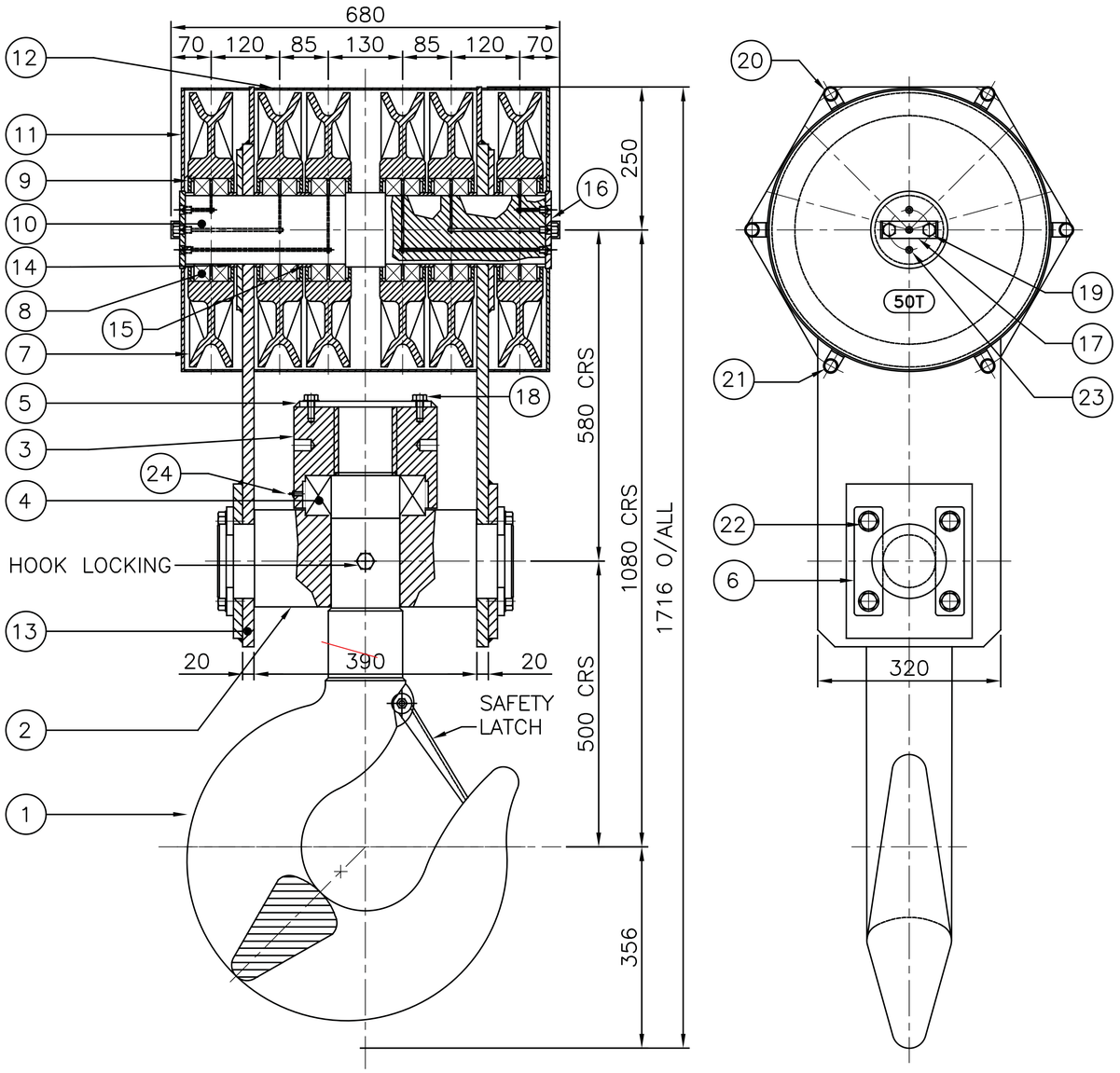
SHEET 2 OF 6

REV. 1

FOLD-01

SIZE-A3

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0



SR. NO.	DESCRIPTION	QTY	MATL	REMARK
24	1/8" GREASE NIPPLE	1		IS:4009
23	1/4" GREASE NIPPLE	6		IS:4009
22	BOLT M–20x40 LG. WITH SP. WASHER	4	STEEL	IS:1367–1980
21	BOLT M–12x25 LG. WITH SP. WASHER	4	STEEL	IS:1367–1980
20	BOLT M–12x35 LG. WITH SP. WASHER & NUT	8	STEEL	IS:1367–1980
19	BOLT M–12x40 LG. WITH SP. WASHER	8	STEEL	IS:1367–1980
18	BOLT M–12x35 LG. WITH SP. WASHER	4	STEEL	IS:1367–1980
17	LOCKING BEND PLATE 3mm.THK FOR PIN	2	M.S.	IS:2062–1992
16	END PLATE 10mm. THK	2	M.S.	IS:2062–1992
15	SPACER (ID=120,OD=130,THK.=25)	2	M.S.	IS:2062–1992
14	SPACER (ID=120,OD=130,THK.=15)	6	M.S.	IS:2062–1992
13	SUSPENSION PLATE 20mm.THK	2	M.S.	IS:2062–1992
12	PULLEY GUARD	1	M.S.	IS:2062–1992
11	PULLEY GUARD	2	M.S.	IS:2062–1992
10	PULLEY AXLE	1	55C8	IS:1875–1994
9	BEARING COVER	12	M.S.	IS:2062–1992
8	DEEP GROOVE BALL BEARING NO. 6024 (ID–120, OD–180, THK.–28)	12	–	SKF/FAG/TATA
7	ROPE PULLEY 400 ø (OD=480,THK.=80)	6	C.S.	IS:1030–1994
6	LOCKING PLATE 12mm.THK FOR CROSS HEAD	2	M.S.	IS:2062–1992
5	LOCKING PLATE 10mm.THK FOR HOOK NUT	1	M.S.	IS:2062–1992
4	THRUST BALL BEARING NO. 51324 (ID–120, OD–210,THK.–70)	1	–	
3	HOOK NUT	1	45C8	IS:1570(PART 2 /SEC 1)–1979
2	CROSS HEAD	1	20C8	IS:1570(PART 2 /SEC 1)–1979
1	50T. CAPACITY PLAIN SHANK HOOK (GRADE M AS PER IS:15560)	1	CLASS 3 IS:1875/1992	–

DUTY:–CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR

NOTE :–

1) ALL DIMENSIONS ARE IN MM.
2) SNATCH BLOCK TOTAL WEIGHT=500 KG.

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHEL — BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		05.07.19
	DESN	MKM		05.07.19
	CHD	MKM		05.07.19
	APPD	SMG		05.07.19

FAFECO — FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/116

TITLE
50T Aux. hoist hook block assembly
for 250/50/10T
Power House Crane with CT DSL details

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
					–	–	–	–	–

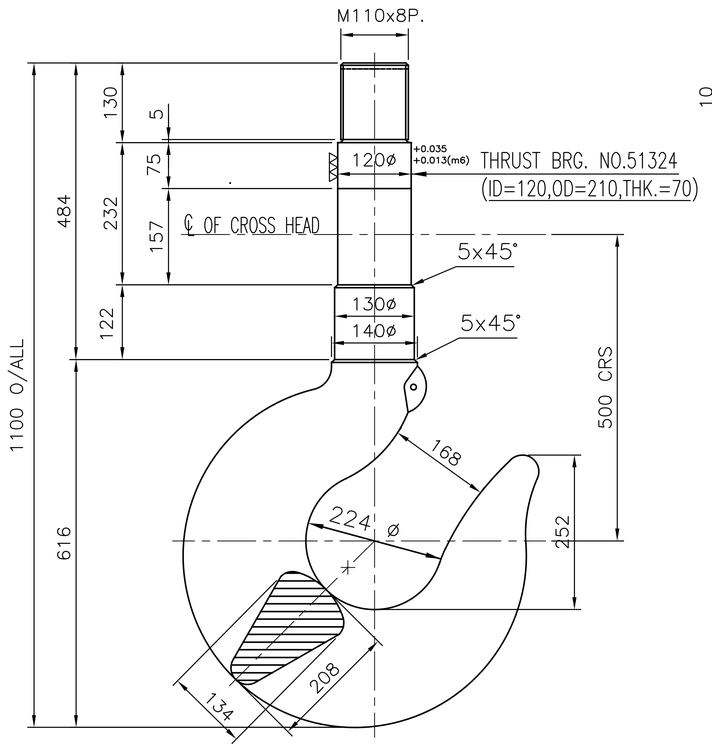
DEPT. | SCALE – 1:10
SIGN
DATE

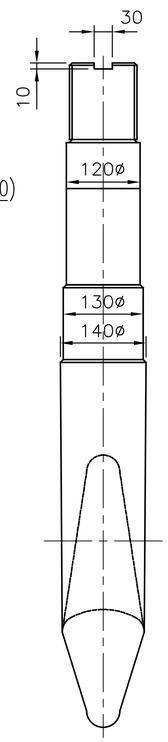
DRAWING NO
PE-V0-437-501-A509

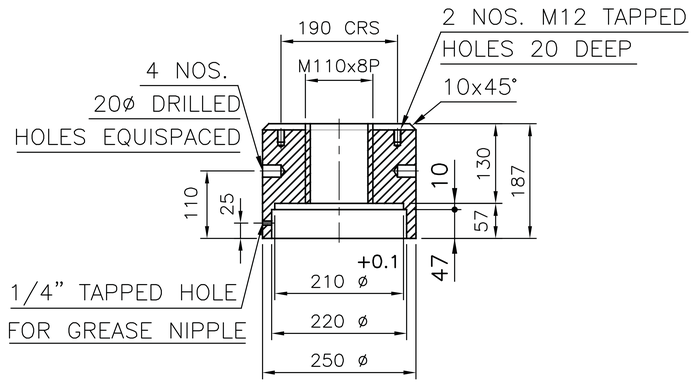
SHEET 3 OF 6 | REV. 1

SIZE–A16

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0



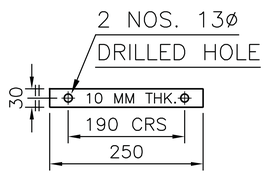




HOOK NUT

MATERIAL :– 45C8 OF IS:1570

WEIGHT =45.32 KGS.



LOCK PLATE

MATERIAL – M.S.

WEIGHT =0.540 KGS.

50T. CAPACITY PLAIN SHANK HOOK (GRADE–M AS PER IS:15560–2005)

MATERIAL – CLASS 3 OF IS:1875:1992

HEAT TREATMENT :– NORMALISED TREATMENT AS PER IS:15560–2005

NOTE:–

HOOK & NUT TO BE TESTED FOR PROOF LOAD OF 85T AS PER (IS:15560–2005)

TOLERANCE ON DIMENSIONS ARE AS PER (IS:15560–2005)

1) QTY. 1 NO. PER CRANE.
2) SAFETY LATCH ON HOOK IS PROVIDED.
3) SWIVELLING HOOK IS MOUNTED ON THRUST BEARING NO.–51324 AND PROTECTIVE SKIRT IS PROVIDED TO ENCLOSE THE BEARING.
4) TOTAL WEIGHT OF HOOK=210 KGS.~
5) LOCKING DEVICE ON SWIVELLING HOOK IS PROVIDED.

DUTY:–CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		06.07.19
	DESN	MKM		06.07.19
	CHD	MKM		06.07.19
	APPD	SMG		06.07.19

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/50TPH12400

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD
1	8.7.2019	KISHOR	MKM	MKM

TITLE

50T Aux. hoist hook with nut details for 250/50/10T Power House Crane with CT DSL details

DEPT.

SCALE – 1:10

SIGN

DATE

DRAWING NO
PE-V0-437-501-A509

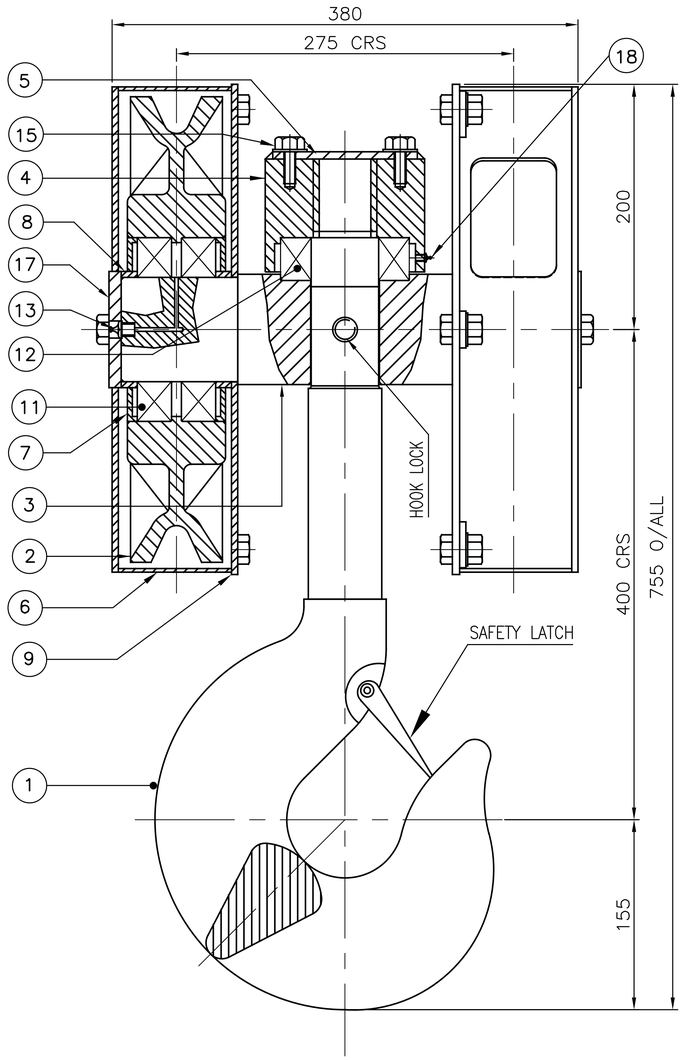
SHEET 4 OF 6

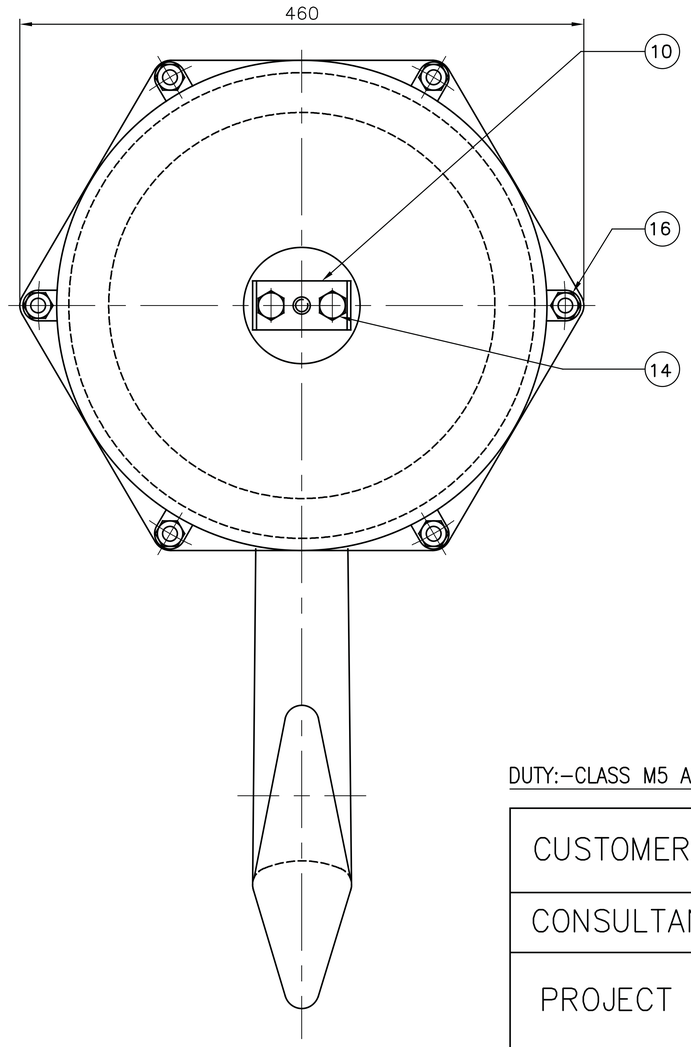
REV. 1

SIZE-A16

FOLD-01

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0





SR. NO.	DESCRIPTION	QTY	MATL	REMARK
18	6MM GREASE NIPPLE	1		IS:4009
17	END PLATE x 12 THK.	2	M.S.	IS:2062:1994
16	M12 x 22 LG. BOLTS WITH SP. WASHER	12	STEEL	IS:1367–1980
15	M12 x 26 LG. BOLTS WITH SP. WASHER	2	STEEL	IS:1367–1980
14	M16 x 22 LG. BOLTS WITH SP. WASHER	4	STEEL	IS:1367–1980
13	6MM GREASE NIPPLE	2		IS:4009
12	THRUST BEARING NO. 51311 (105,55,35)	1		SKF/FAG
11	BALL BEARING NO. 6217	4		SKF/FAG
10	LOCKING PLATE	2	M.S.	IS:2062–1994
9	PULLEY GUARD COVER PLATE	2	M.S.	IS:2062–1994
8	SPACER	4	M.S.	IS:2062–1994
7	BEARING COVER	4	M.S.	IS:2062–1994
6	PULLEY GUARD	2	M.S.	IS:2062–1994
5	LOCKING PLATE FOR NUT	1	M.S.	IS:2062–1994
4	HOOK NUT	1	45C8	IS:1875–1994
3	CROSS HEAD	1	20C8	IS:1875–1994
2	320 ROOT DIA ROPE PULLEY(OD=380,THK.=80)	2	CS(280–520W)	IS:1030–1994
1	10T. PLAIN SHANK HOOK(GRADE–M AS PER IS:15560)	1	CLASS 3 OF IS:1875–1992	

DUTY:–CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR

NOTE :–

1) ALL DIMENSIONS ARE IN MM.
2) SNATCH BLOCK TOTAL WEIGHT=300 KG.

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
					–	–	–	–	–

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		05.07.19
	DESN	MKM		05.07.19
	CHD	MKM		05.07.19
	APPD	SMG		05.07.19

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/196

TITLE

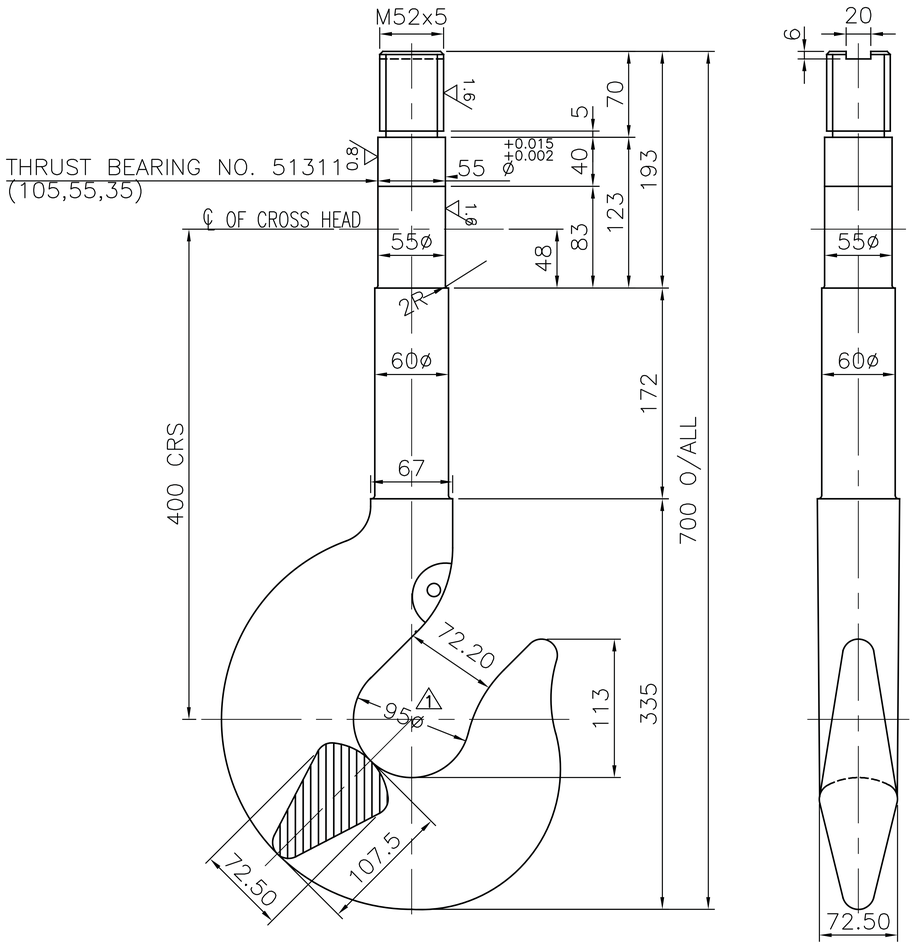
10T Mono rail hoist hook block assembly for 250/50/10T Power House Crane with CT DSL details

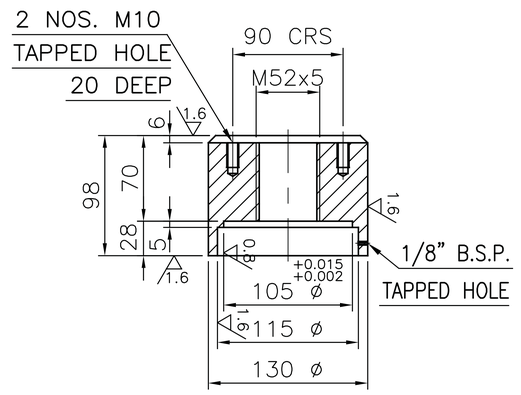
DEPT. SCALE – 1:5
SIGN
DATE

DRAWING NO
PE-V0-437-501-A509

SHEET 5 OF 6 REV. 1

SIZE-A3

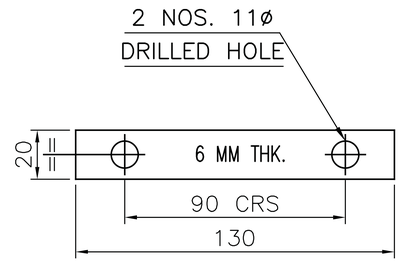




HOOK NUT

MATERIAL – 45C8 IS:1570(PART2/SEC I)1979

WEIGHT =6.75 KGS.



LOCK PLATE

MATERIAL – M.S.

WEIGHT =0.122 KGS.

10T. CAPACITY PLAIN SHANK HOOK (GRADE–M AS PER IS:15560–2005)

MATERIAL:–CLASS 3 OF IS:1875–1992

HEAT TREATMENT :– NORMALISED TREATMENT AS PER IS:15560–2005

NOTE:–

HOOK & NUT TO BE TESTED FOR PROOF LOAD OF 20T. AS PER (IS:15560–2005)

TOLERANCE ON DIMENSIONS ARE AS PER (IS:15560–2005)

1) QTY. 1 NO. PER CRANE.
2) SAFETY LATCH ON HOOK IS PROVIDED.
3) SWIVELLING HOOK IS MOUNTED ON THRUST BEARING NO.–51311 AND PROTECTIVE SKIRT IS PROVIDED TO ENCLOSE THE BEARING.
4) TOTAL WEIGHT OF HOOK=28.3 KGS.~
5) LOCKING DEVICE ON SWIVELLING HOOK IS PROVIDED.

DUTY:–CLASS M5 AS PER IS:3177–1999 REAFFIRMED 2006 & IS:807, INDOOR

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHEL — BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	KISHOR		05.07.19
	DESN	MKM		05.07.19
	CHD	MKM		05.07.19
	APPD	SMG		05.07.19

FAFECO — FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/10T4320

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD
1	8.7.2019	KISHOR	MKM	MKM

TITLE

10T Mono rail hoist hook details for 250/50/10T Power House Crane with CT DSL details

DEPT. SCALE – 1:5

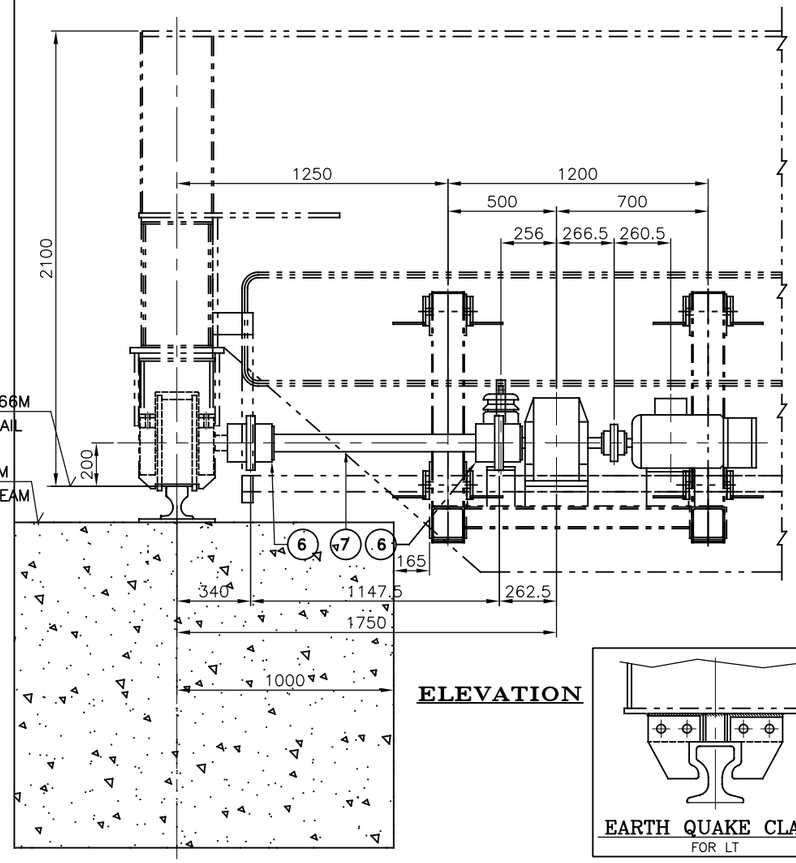
SIGN DATE

DRAWING NO
PE-V0-437-501-A509

SHEET 6 OF 6 REV. 1

SIZE-A3 6

FOLD-01



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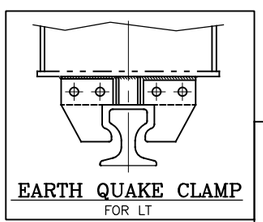

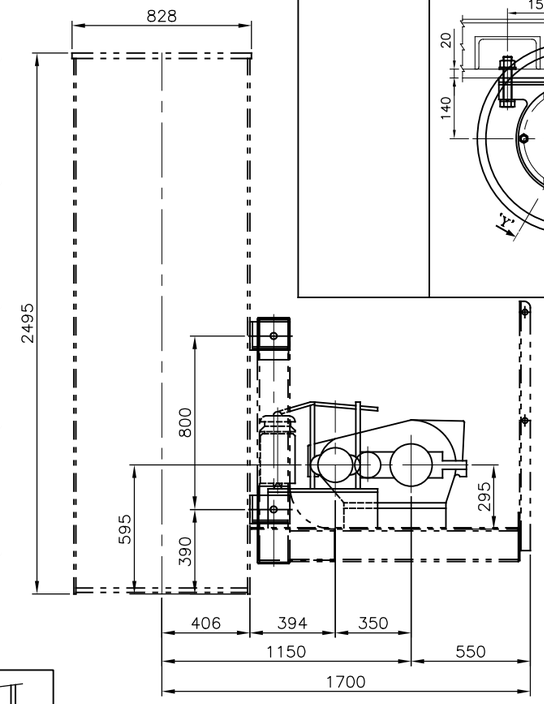

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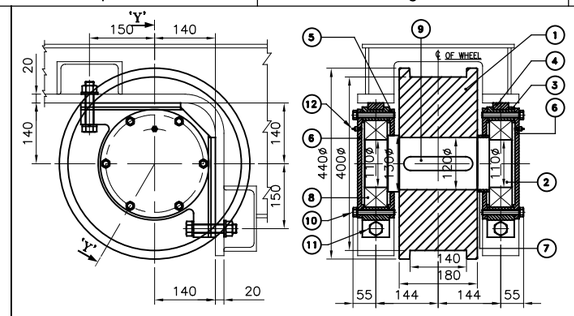


SECTION:–'Y'–'Y'

SECTION:–'X'–'X'

NO.	DESCRIPTION	QTY/PER LT WHEEL ASSLY.	MATL.	REMARK
12	1/2" BSP GREASE NIPPLE	2	STD	–
11	M20x95 BOLT WITH S.W.	4	CARBON STEEL 4.6	IS:1367–1994
10	M12x75 BOLT WITH S.W.	12	CARBON STEEL 4.6	IS:1367–1994
9	KEY 32x18x127 LG.	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
8	SPH. ROLLER BEARING NO.–22222	2	STD	(110/200/53)
7	SPACER	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
6	BEARING COVER	2	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
5	BEARING COVER	2	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
4	BEARING BLOCK SEAT	4	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
3	BEARING HOUSING	2	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
2	AXLE	1	C55Mn75/ En9	IS:1570
1	400ø WHEEL	1	C55Mn75	IS:1570

400ø IDEL WHEEL ASSEMBLY

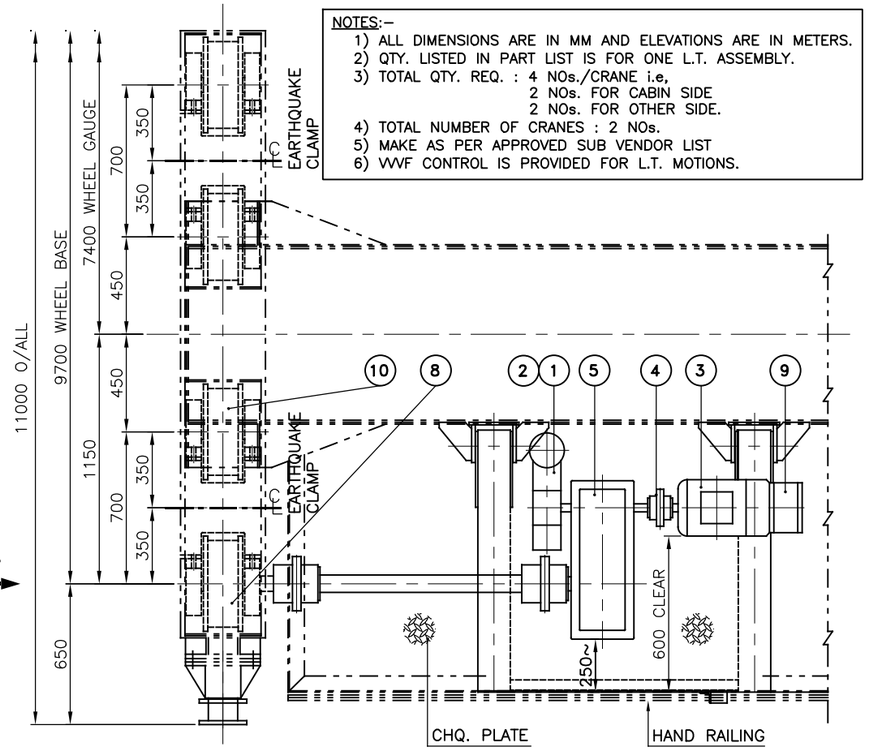
TREAD WIDTH = 130 mm
QTY. REQ. : 12 NOS./ CRANE
WEIGHT:– 234 KG/WHEEL ASSEMBLY

NO.	DESCRIPTION	QTY/PER LT WHEEL ASSLY.	MATL.	REMARK
14	1/2" BSP GREASE NIPPLE	2	STD	–
13	M20x95 BOLT WITH S.W.	4	CARBON STEEL 4.6	IS:1367–1994
12	M12x75 BOLT WITH S.W.	12	CARBON STEEL 4.6	IS:1367–1994
11	KEY 32x18x127 LG.	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
10	KEY 25x14x100 LG.	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
9	SPH. ROLLER BEARING NO.–22222	2	STD	(110/200/53)
8	SPACER	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
7	BEARING COVER	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
6	BEARING COVER	2	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
5	BEARING COVER	1	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
4	BEARING BLOCK SEAT	4	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
3	BEARING HOUSING	2	M.S.	IS:2062–2011 GR–E250 BR (100% KILLED)
2	LONG AXLE	1	C55Mn75/ En9	IS:1570
1	400ø WHEEL	1	C55Mn75	IS:1570

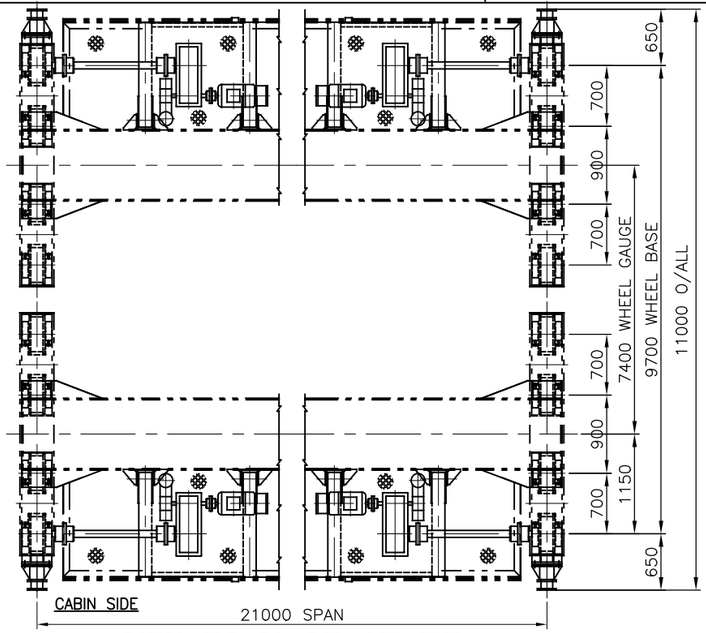
400ø RUNNER WHEEL ASSEMBLY

TREAD WIDTH = 130 mm
QTY. REQ. : 4 NOS./ CRANE
WEIGHT:– 246 KG/WHEEL ASSEMBLY

NOTES:–
1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2) QTY. LISTED IN PART LIST IS FOR ONE L.T. ASSEMBLY.
3) TOTAL QTY. REQ. : 4 NOs./CRANE i.e,
   2 NOs. FOR CABIN SIDE
   2 NOs. FOR OTHER SIDE.
4) TOTAL NUMBER OF CRANES : 2 NOs.
5) MAKE AS PER APPROVED SUB VENDOR LIST
6) VVVF CONTROL IS PROVIDED FOR L.T. MOTIONS.



PLAN



KEY PLAN OF CRANE

TOTAL WEIGHT OF 04 Nos. LT MACHINER ASSLY. – 1595 x 4 = 6380 Kg.~
TOTAL WEIGHT OF LT MACHINER ASSLY. – 1595 Kg.~ QTY.– 4 NOS./ CRANE

SR. NO.	DESCRIPTION	QTY PER ASSLY.	WEIGHT IN KG	MATL.	REMARK
10	400ø IDEL WHEEL ASSEMBLY with BRG. No 22222	3	702	–	–
9	DISK BRAKE FDW20 (BRAKING TORQUE–100 NM)	1	22	–	–
8	400ø RUNNER WHEEL ASSEMBLY with BRG. No 22222	1	246	–	–
7	FLOATING SHAFT 100ø x 1142 LG.	1	69.96	45C8	IS:1570(PART 2 /SEC 1)–1979
6	HALF GEARED HALF RIGID COUPLING AHG–104	2	86	45C8/55C8	–
5	GEAR BOX H350 CRS RATIO: 48.57:1	1	280	–	FAFECO
4	FULL GEAR COUPLING AFG–101	1	10	45C8/55C8	–
3	SC MOTOR 6.5Kw, 40% CDF,300ST/HR, SYNCHRONOUS RPM 1000 ENCLOSURE TEFC IP55, CLASS OF INSULATION F	1	155	–	–
2	BRAKE DRUM 160ø	1	12	45C8/55C8	IS:1570(PART 2 /SEC 1)–1979
1	EHT BRAKE 160ø (BRAKING TORQUE–9KG–M) (THRUSTER CAPACITY–18KG.)	1	12	–	–

MOTION	MAIN/CREEP SPEED(5%) M/MIN.
L.T.	25.0/1.25

NOTES FOR WHEEL ASSLY.:–
1) HARDNESS OF WHEEL IS TO BE IN RANGE OF 300–350 BHN
2) PORCESS OF HARDENING –VOLUME HARDENING
3) DIFFERENCE BETWEEN HARDNESS OF WHEEL AND RAIL=MIN 50BHN
4)ARRANGEMENT OF LUBRICATION=GREASE
5) RAIL SIZE – CR100 (HEIGHT 50XTOP WIDTH 100XBASE WIDTH 150)

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
0	18.06.2019	Suraj	MKM	SMG
1	27.07.2019	Suresh	MKM	SMG

JOB NO. 437
STATUS CONTRACT
DISTRIBUTION

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

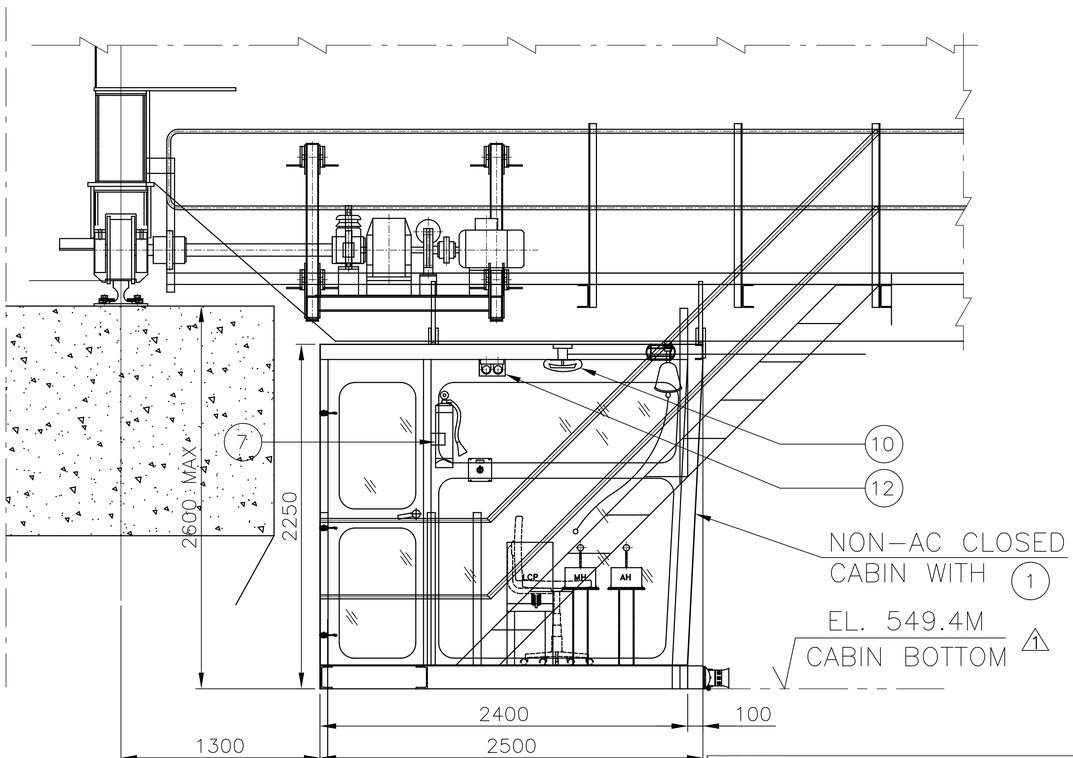
DEPT CODE		NAME	SIGN	DATE
	DRN	Suraj		17.07.19
	DESN	MKM		17.07.19
	CHD	MKM		17.07.19
	APPD	SMG		17.07.19

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/120

TITLE
Long travel Machinery Assembly with LT wheel assembly For 250/50/10T Power House Crane

DEPT. | SCALE – 1:20 | DRAWING NO PE-V0-437-501-A510
SIGN
DATE
SHEET 1 OF 1 | REV. 0
SIZE–A1

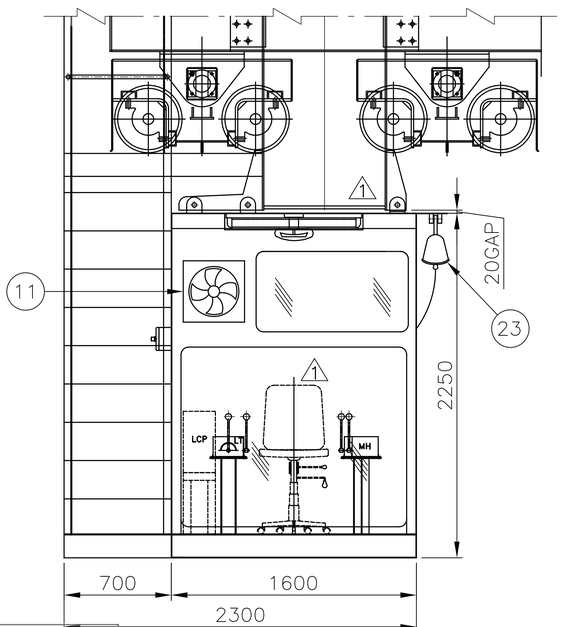


ELEVATION

PLAN

CRANE NO.–1

B



VIEW–'B'

NOTE:–

1. REFER G.A. DWG. NO.– PE–V0–437–501–A505
2. CRANE NO.–1 AS SHOWN AND CRANE NO.–2 IS OPPOSITE HAND
3. CABIN SHALL BE CLOSED TYPE.
4. CABIN SHOULD BE ADEQUETELY BRACED TO THE CRANE SO AS NOT TO SWAY, SWING OR SHAKE

SJVN Arun-3Power Development Company (P.) Ltd.
(A company promoted by SJVN Limited, joint venture of Govt. of India and Govt. of H.P)
Regd. No.: 111808/69/070

Accepted by Consultant	To be Issued to Contractor		
	Category: ACCEPTANCE (INFORMATION)		
☑Yes ☐No	Reviewed	Recommended	Accepted

Consultant:- SJVN LTD.

Recommended for Acceptance

SUB GROUP	SECTIONAL HEAD	HOD

GH1	1	ELECTRICAL HOOTER FOR LIFTING BEAM LEVEL DIFFERENCE	110V.	KHERA/REPUTED	
H1	1	ELECTRICAL HOOTER FOR LIFTING BEAM TILT	110V.	KHERA/REPUTED	
2I6	1	LIFTING BEAM RIGHT TILT TRIP INDICATING LAMP	110V AC LED LAMP, (BLUE)	SIEMENS	
2I5	1	LIFTING BEAM LEFT TILT TRIP INDICATING LAMP	110V AC LED LAMP, (AMBER)	SIEMENS	
2I4	1	LIFTING BEAM RIGHT TILT INDICATING LAMP	110V AC LED LAMP, (BLUE)	SIEMENS	
2I3	1	LIFTING BEAM LEFT TILT INDICATING LAMP	110V AC LED LAMP, (AMBER)	SIEMENS	
Device Tag	Quantity	Material Description	Technical Description	Make	Remark

LIFTING BEAM D.BOARD

7Pb2A	1	'ON' PUSH BUTTON	10A, 1NO (GREEN)	SIEMENS	
7Pb1A	1	'OFF' PUSH BUTTON	10A, 1NC (RED)	SIEMENS	
7I1A	1	MAIN CONTACTOR-2 'ON' INDICATING LAMP	110V AC LED LAMP, (RED)	SIEMENS	
7Pb0A	1	'EMOFF' PUSH BUTTON	10A, 1NC (MUSHROOMHEAD-RED)	SIEMENS	
SS6	1	SELECTOR SWITCH-OF DIRECTION-1 JOG & DIRECTION-2 JOG FOR MH, MICT SELECTION	10A, 3 POSITION, 2POLE, 1NO+1NC	SIEMENS/KAYCEE	
JHPb2	1	'JOG FOR HOIST BLOCK' PUSH BUTTON-2 (DIRECTION-2)	10A, 2NO+2NC (BLACK)	SIEMENS	
JHPb1	1	'JOG FOR HOIST BLOCK' PUSH BUTTON-1 (DIRECTION-1)	10A, 2NO+2NC (BLACK)	SIEMENS	
SS5	1	SELECTOR SWITCH-OF DIRECTION-1 JOG & DIRECTION-2 JOG FOR MH, AH, CT, LT SELECTION	10A, 5 POSITION, 2POLE, 1NO+1NC	SIEMENS/KAYCEE	
JCPb2	1	'JOG FOR CRANE' PUSH BUTTON-2 (DIRECTION-2)	10A, 2NO+2NC (BLACK)	SIEMENS	
JCPb1	1	'JOG FOR CRANE' PUSH BUTTON-1 (DIRECTION-1)	10A, 2NO+2NC (BLACK)	SIEMENS	
Device Tag	Quantity	Material Description	Technical Description	Make	Remark

JOG PUSH BOTTON+ HOIST BLOCK PUSH BUTTON BOARD

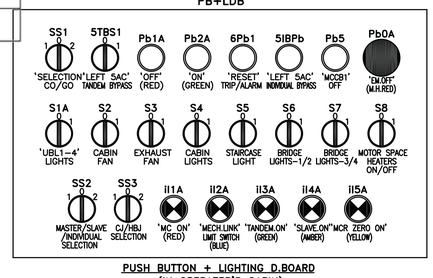
STBS1	1	'TANDEM/BYPASS' SELECTOR SWITCH FOR 'SACL' (LEFT) CRANE-1	10A, 2 POSITION, 2POLE, 1NO+1NC	SIEMENS	
SIBPb	1	'INDIVIDUAL-BYPASS' PUSH BUTTON FOR 'SACL' (LEFT) CRANE-1	10A, 1NO + 1NC (BLACK)	SIEMENS	
6Pb1	1	'RESET' PUSH BUTTON FOR TRIP/ALARM	10A, 1NO+1NC (BLUE)	SIEMENS	
S8	1	ON/OFF SWITCH FOR 'MOTOR SPACE HEATERS'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S7	1	ON/OFF SWITCH FOR 'BL3-4'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S6	1	ON/OFF SWITCH FOR 'BL1-2'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S5	1	ON/OFF SWITCH FOR 'SCL'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S4	1	ON/OFF SWITCH FOR 'CL'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S3	1	ON/OFF SWITCH FOR 'EB'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S2	1	ON/OFF SWITCH FOR 'CF'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
S1A	1	ON/OFF SWITCH FOR 'UBL1-4'	10A, 2 POSITION, 1NO+1NC	SIEMENS	
Pb5	1	'MCCB1' OFF PUSH BUTTON	10A, 1NO (BLACK)	SIEMENS	
Pb2A	1	'ON' PUSH BUTTON	10A, 1NO (GREEN)	SIEMENS	
Pb1A	1	'OFF' PUSH BUTTON	10A, 1NC (RED)	SIEMENS	
Pb0A	1	EMOFF' PUSH BUTTON	10A, 1NC (MUSHROOMHEAD-RED)	SIEMENS	
SS3	1	SELECTOR SWITCH FOR CRANE JOG & MONORAIL HOIST BLOCK JOG SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	
SS2	1	SELECTOR SWITCH FOR MASTER, INDIVIDUAL & TANDEM/SLAVE SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	
SS1	1	SELECTOR SWITCH FOR CABIN OPERATION & GROUND OPERATION SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	
II5A	1	'MCR ZERO ON' INDICATING LAMP	110V AC, LED LAMP, (YELLOW)	SIEMENS	
II4A	1	'SLAVE ON' INDICATING LAMP	110V AC, LED LAMP, (AMBER)	SIEMENS	
II3A	1	'TANDEM ON' INDICATING LAMP	110V AC, LED LAMP, (GREEN)	SIEMENS	
II2A	1	'MECH LINK LIMIT SWITCH' INDICATING LAMP	110V AC, LED LAMP, (BLUE)	SIEMENS	
II1A	1	'MAIN CONTACTOR-1 'ON' INDICATING LAMP	110V AC, LED LAMP, (RED)	SIEMENS	
Device Tag	Quantity	Material Description	Technical Description	Make	Remark

PUSH BOTTON+ LIGHTING D.BOARD

24	1	INSULATING MAT FOR CABIN	8MMTHK	REPUTED	
23	1	MANUALLY OPERATED GONG BELL (GB)	300 mm dia	REPUTED	
22	1	POWER SOCKET-PS6 (CIB-2)	240V., 5A.	PHILIPS/CROMPTION	
21	1	ELECTRICAL HOOTER FOR ANTI COLLISION DEVICE TRIP (SH-1)	110V AC	KHERA/REPUTED	
20	1	CONTROL KEY REMOVABLE OFF SWITCH (OKS1)	10A, 2 POSITION, 2NO+2NC, KEY ACTUATOR	SIEMENS/KAYCEE	
19	1	HAND LAMP SOCKET-HL2 (CIB-1)	24V., 5A.	PHILIPS/CROMPTION	
18	1	POWER SOCKET-PS5 (CIB-1)	240V., 5A.	PHILIPS/CROMPTION	
17	1	LOAD CELL PANEL WITH DISPLAY	SIZE - W-300 x H-400 x D-210	IPA/REPUTED	
16	1	LIFTING BEAM/D.BOARD	SIZE - W-400 x H-300 x D-150	RITTAL/BCH/REPUTED	
15	1	JOG PUSH BOTTON+ HOIST BLOCK PUSH BUTTON BOARD	SIZE - W-250 x H-250 x D-150	RITTAL/BCH/REPUTED	
14	1	PUSH BUTTON + LIGHTING DISTRIBUTION BOARD (PB+LDB)	SIZE - W-400 x H-300 x D-150	RITTAL/BCH/REPUTED	
13	1	STAIRCASE LIGHT (SCL)	240V., 40W., CFL	PHILIPS/CROMPTION	
12	1	CABIN LIGHTS-1 & 2 (CL1-2)	240V., 10W., TYPE: LED	PHILIPS/CROMPTION/DSS	
11	1	EXHAUST FAN (EF)	240V., 300 mm SWEEP, 40W	EMCO/ONI	
10	1	CABIN FAN (CF)	240V., 400 mm SWEEP, 40W	EMCO/ONI	
9	1	FOOT SWITCH FOR BELL (FS)	10A., 40W.	REPUTED	
8	1	ELECTRICAL BELL (EB)	110V.	KHERA/REPUTED	
7	1	FIRE EXTINGUISHER	TYPE: CO2, 4.5 kg	REPUTED	
6	1	LONG TRAVEL SPRING RETURN TYPE MYSTER CONTROLLER	STEP: 4, CAMS: 6, Amp: 10A	EMMYKA96UJSOC	
5	1	CROSS TRAVEL SPRING RETURN TYPE MYSTER CONTROLLER	STEP: 4, CAMS: 6, Amp: 10A	EMMYKA96UJSOC	
4	1	ALK HOIST SPRING RETURN TYPE MYSTER CONTROLLER	STEP: 5, CAMS: 6, Amp: 10A	EMMYKA96UJSOC	
3	1	MAIN HOIST SPRING RETURN TYPE MYSTER CONTROLLER	STEP: 5, CAMS: 6, Amp: 10A	EMMYKA96UJSOC	
2	1	OPERATOR'S CHAIR	REVOLVING TYPE	REPUTED	
1	1	OPEN TYPE CABIN	M.S.	FAFECO	IS:2062
Sr.No	Quantity	Material Description	Technical Description	Make	Remark

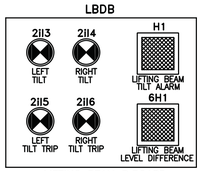
IN CABIN

PB+LDB



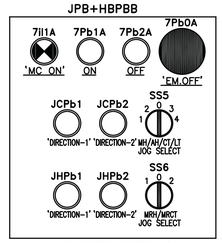
PUSH BUTTON + LIGHTING D.BOARD (IN OPERATER'S CABIN)

LBDB



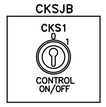
LIFTING BEAM D.BOARD (IN OPERATER'S CABIN)

JPB+HBPBB



JOG PUSH BUTTON + HOIST BLOCK PUSH BUTTON BOARD (IN OPERATER'S CABIN)

CKSJB



CONTROL KEY SWITCH JN.BOX–CKSJB (ON CABIN PLATFORM)

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
0	12.09.2019	DP	AG	SM

JOB NO.	437
STATUS	CONTRACT
DISTRIBUTION	

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)				
CONSULTANT	SJVN LTD.				
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)				
BHEL	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI	DEPT CODE	NAME	SIGN	DATE
		DRN	DP/IBV		12.09.19
		DESN	MKM / AG		12.09.19
		CHD	SM		12.09.19
		APPD	SM		12.09.19
FAFECO	FURNACE & FOUNDRY EQUIPMENT CO. CHANDIVALI FARM MUMBAI – 72	FAFECO Drawing no. OG-06/250-50-10Tx21M/181			
TITLE	Electrical equipment layout in cabin for 250/50/10T Power House crane				
		DEPT.	SCALE - 1:20	DRAWING NO	PE-V0-437-501-A516
		SIGN / DATE		SHEET- 1 OF 1	REV. 0

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV-0

SIZE-A1

एसजेवीएन अरूण-3 पॉवर डवलपमेंट कंपनी प्रा. लि.
SJVN Arun-3 Power Development Company Pvt. Ltd.
900 MW Arun-3 Hydro Power Project

Approved by Consultant	To be Issued to Contractor		
	Category: APPROVAL with COMMENTS		
☑Yes ☐No	Reviewed	Recommended	Approved

Consultant:- SJVN LTD.
Recommended for Approval with comments on 06.03.2020

SUB GROUP		SECTIONAL HEAD	HOD
Checked	Reviewed		

Bharat Heavy Electricals Limited
PPEI
Sector-16A
NOIDA
201 301
PEM/Mech. Aux.

Comments marked at page no. 3,5,7 of the document

Job No	437	Customer	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD.(SAPDC)
Status	Contract	Project	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)
Distribution		Consultant:	SJVN Ltd
TO		BHARAT HEAVY ELECTRICAL LTD POWER SECTOR-PROJECT ENGINEERING MANAGEMENT NOIDA	
NO			
REV No.	REV DATE		

	Name	Sign	Date
Prepared by	MKM		26.02.2020
Checked by	SG		26.02.2020
Approved By	SG		26.02.2020

DATA SHEET OF 250/50/10T POWER HOUES DOUBLE GIRDER CRANE WITH PAINTING DETAILS

FAFECO
FURNACE & FOUNDRY EQUIPMENT CO.

Document No:- PE-V0-437-501-A527

R0 : 14.01.2020	Page	12	Rev 1

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS

S.No.	Description	PH Crane 2x250/50 T	
1.	Capacity (in Tonnes)		
a)	Main lifting hoist	250T	
b)	Auxiliary hoist	50T	
c)	Mono rail hoist	10T	
2.	Span	21m	
3.	Duty class of cranes	Mechanism class: M5, Electrical services Class: M5 as per IS 3177:1999.	
a)	Hoist (Hoisting or lowering)	250 T	50 T
i)	Normal speed in m/min	1.0	5.0
ii)	Micro speed	0.05	0.25
b)	Trolley Travel	10.0	
c)	Bridge Travel	25.0	
5.	Acceleration in long travel Motion.	10 cm/sec2	
6.	Vertical Hook Reach/Travel of lifting hook.	29.5m	30.5m
7.	Main Hook Reaches (from canter line of LT rail)	U/ S	D/ S
a)	Crane 1 in mm	3050	2200
b)	Crane 2	2200	3200
8.	Nos. of wheel for		
a)	Bridge	16 nos.	
b)	Trolley	04 nos.	
9.	Minimum factor of safety for		
	i) Structure	1.0997 on permissible stress , please refer page 14 of structural calculation	
	ii) Rope	6	
10.	Number of motors for long travel	4	

Sr. No.	Description	PH Crane
1.	Name of the manufacturer	Furnace & Foundry Equipment Co
2.	Type and class of crane	Mechanism class :M5, Electrical services class :M5 as per IS 3177:1999, indoor duty, Double girder type
3.	Standard to which crane conforms	IS 3177:1999
4.	Effective span (centre to centre of runway rails)	21.0 m
5.	**Weight of crane**	
a)	Total weight of crane including electrical equipment & trolley.	115T
b)	Weight of each Bridge girder assembled and ready for erection	18.5
c)	Total weight of Trolley including electrical equipment	40T
d)	Weight of each end carriage (Trucks) as assembled ready erection.	3.4
6.	**Full load speed (Mtrs/Min) for**	
a)	Bridge travel	25
b)	Trolley cross travel	10
c)	Monorail travel	10
d)	Hook Hoisting/Lowering at	
i)	Full load	1
ii)	Half load	1
iii)	No load	1

iv)	10 T monorail hook	3	
7.	**Minimum possible travel of**	In mtrs	
a)	Bridge drive	0.05	
b)	Trolley drive	0.02	
c)	Monorail drive	0.02	
d)	Main lifting hoist	0.00041	
e)	Monorail hoist	0.00125	
8.	Distance from Machine hall floor to top of crane rail	31.66 m	
9.	**Minimum working clearance required:**		
a)	Between centre of crane rail and the nearest side obstruction	900m 750mm	
i)	Upstream side of Power House.	900 mm 750 mm	
ii)	Downstream side of Power House.	900 mm 750 mm	
b)	Between the top of crane and the lowest over-head obstruction	200 mm	
10.	**Terminal Position of**	Crane 1 m m	Crane 2 m m
a)	Main lifting hook from center of crane rails on the		
i)	Upstream side	3050	2200
ii)	Downstream side	2200	3200
b)	Monorail hook from the center edge of crane rail on the		
i)	Upstream side	5600	2800
ii)	Downstream side	2800	5600
c)	Main lifting hook from the inner edge of walls at the		
i)	Service bay end	5500	16700
ii)	Power house end (Beyond Unit No.6)	16700	5500
d)	Hook at maximum lift below top of crane rails of		
i)	Main hook	2166	2166
ii)	Monorail hook	3666	3666
11.	**Operator's Cabin**		
a)	Distance between center of crane rails to the cabin end wall nearer to the rails	1300	
b)	Cabin width at the base	2500	
c)	Base of cabin from top of crane rails	2766	

d)	Size of cabin (LxBxH)	2.5m x 1.6mx 2.25m	
12.	**Crane Bridge**		
a)	Type of main girders	Box type & 2 Nos.	
b)	Material	Material : E250, IS:2062 Gr.B	
c)	Details of construction	Length:21540mm, Width:828mm, Height:2495mm, Top thickness:25mm, Bottom thickness:20mm, Web thickness:10mm	
d)	Slenderness ratio	Not Required.	
i)	Main compression members	Girder = 43.14726 (Eq- 32)	
ii)	Bracing and secondary members	As per IS: 807 lesser than 240	
iii)	Ratio of unsupported lengths of the horizontal protection of any riveted tension members to the least radius of gyration.	NA	
iv)	Particulars of unit stresses assumed on various components	0.95723 < 1 for girder page No.- 13	
13	**End Truck**		
a)	Type and number	Customised-4 Nos.	
b)	Material	E250	
c)	Details of construction.	Welded Box construction	
d)	Wheels per truck	4 Nos.	
e)	Canter to canter distance of wheels	Refer GA of crane	
f)	Maximum load excluding impact on traveling Wheels	37.1399 T	
g)	Type of drive system	VFD Control	
14.	**Trolley**		
a)	Type	Fabricated	
b)	Material	E250,Grade BR as per IS 2062	
c)	Details of construction	Fusion welded	
d)	No. of wheels	4	
15.	**Wheels**	Truck	Trolley
a)	Type	Double flanged	
b)	Total Number	16	4
c)	No.of drive wheels	4	2
d)	Diameter in mm	630	400
e)	Width in mm	190	180
f)	Material/chemical composition	C 55 Mn 75 as per IS:1570	

g)	Type of bearings	Spherical Roller Bearings	
h)	Name of manufacturer	SKF/FAG	
16.	Rails	Mai n Runway	Trolley Runway
a)	Section	CR-100 as Per IS: 3443.	CR- 120 100 as per IS: 3443.
b)	Length	157.675 Mtrs	19.55 Mtrs
c)	Weight kg/meter	118	89
d)	Name of manufacturer	Jindal	
17.	Winding Drum	Main Hoist	Mono rail hoist
a)	Material and type of construction	For, fabricated rope drum - E250 as per IS 2062 & stress relieved as per IS 3177	
b)	Diameter in mm (At bottom of groove) and length (mm)	1000mm dia, 7000mm length	394mm dia, 2400_mm length
c)	Depth of grooves	11.4 mm	4.8 mm
d)	Pitch diameter of rope grooves	1041 mm 1038 mm	412mm 410 mm
e)	Thickness of drum bottom of grooves	30mm	14.5mm
f)	Number of grooves	154	127
g)	Allowable compressive Stress for hoist drums	1800 kg/cm2	1800 kg/cm2
h)	Name of manufacturer	FAFECO	
18.	Sheaves	Main Hoist	Mono rail hoist
a)	Material	CS GR - 280 - 520 IS: 1030	
b)	Groove diameter	800	320
c)	Number of rope sheaves	14	2
d)	Bearing arrangement	Ball Bearing	Ball Bearing
e)	Name of manufacturer	SKF / FAG	SKF / FAG
f)	Diameter of sheaves	800 mm	320 mm
g)	No .of pulleys	14	2
19.	Hoisting Ropes	PH crane Main Hoist	Mono rail Hoist PH
a)	Construction	6X36	6X36
b)	Diameter of rope	38	16
c)	Number of falls	16	4
d)	Minimum factor of safety	6	6
e)	Quality of steel / core	Steel Core	Steel Core
f)	Name of manufacturer	Usha Martin	

20.	**Crane hook and bottom blocks**	PH crane Main Hoist	Mono rail Hoist PH
a)	Type	Ramshorn	Shank type
b)	Lifting capacity	250T	10T
c)	Material	Class 2 IS: 1875	Class 3 IS: 1875

d)	Bearing arrangement	Thrust Bearing		Thrust Bearing			
e)	Name of manufacturer	SKF / FAG					
21	**Gears** (Give details for each type)						
a)	Type of drive	VFD / Helical					
b)	Material	Gear :En 19: BS-970 / Cast steel (42Cr Mo4)as per IS-2707, Pinion:En 24: BS-970, En9: BS-970, En 19: BS-970. Hardness is conforming to IS 3177. Gears shall be hardened, tempered & heat treated as per IS 4460.					
c)	Type of lubrication	Splash Lubrication					
d)	Type of enclosures	Fabricated					
e)	Name of manufacturer	Fafeco					
22.	**Make and Type of couplings**						
a)	Between motor and gear box	Flexible geared type, Allience					
b)	Between gear box and shaft	Flexible geared type, Fafeco					
23 (a)	**Motors (For Power House Crane)**						
	Particulars of Motor	Long Travel	Cross Travel	Main Hoist	Aux. hoist	HB-Hoist	HB- CT
a)	Number	4	2	1	1	1	1
b)	Type and manufacture	Squirrel Cage, Suitable for Inverter duty					
c)	Voltage, phase & frequency	415V ±10%, 3 ph, 50 Hz ± 5% Combined voltage & frequency variation - 10%					
d)	Rating in kW	6.5 KW	4 KW	58.9 KW	55 KW	6.5 KW	0.55kW
e)	Class of insulation	CLASS F					
f)	Rating in minutes of continuous operation	40%CDF					
g)	Speed in rpm	961	960	985	985	961	900
h)	Starting torque	160%	160%	210%	230%	160%	200%
i)	Break down torque (multiple of rated torque)	2.8	2.7	2.3	2.5	2.8	2.25
j)	Locked rotor current (multiple of rated current)	5.5	6	6	6	5.5	4
k)	Max. temperature rise	Motor temp rise will be 60 degree C at sinusoidal supply over ambient temp of 40 degree C.					
l)	Type of enclosures	TEFC	TEFC	TEFC	TEFC	TEFC	TEFC
m)	Frame Size	KM2BAX 132MLA6	KM2BAX 132SMB6	KHX+280SMC6	KHX+280SMC6	KM2BAX 132MLA6	KM2BAX 80MC6

PROJECT: 4X225 MW ARUN III HEP, NEPAL
PACKAGE: 2X250/50/10T DOUBLE GIRDER EOT CRANE
DOCUMENT NO: PE-V0-437-501-A527
DOCUMENT NAME: Data sheet of 250/50/10T Power House Crane with painting details

24	Brakes (For Power House Crane)						
	Particulars of brakes	Bridge travel	Trolley travel	Mono rail travel	Main hoist	Monorail hoist	Auxiliary Hoist
a)	Type of brakes used	EHT + DCEM (Double Brake Disk Type) +Electrical regenerative braking	EHT + DCEM (Double Brake Disk Type) +Electrical regenerative braking	DCEM (Double Brake Disk Type) +Electrical regenerative braking	EHT + DCEM (Double Brake Disk Type) +Electrical regenerative braking	DCEM (Double Brake Disk Type) +Electrical regenerative braking	EHT + DCEM (Double Brake Disk Type) +Electrical regenerative braking
b)	Total number of brakes provided	4 + 4	2 + 2	1	1 + 1	1	1 + 1
c)	Braking torque actually required in kg.m	8.40	4.8	0.3684	65.30	6.15	61.98
d)	Torque rating Kg. M	9 + 10.19	6 + 10.19	1.02	80 +101.93	10.19	80 +101.93
e)	Dynamic braking for lowering motion	14 ohms-42 A	24.5 ohms-17 A	100 ohms-2 A	42 ohms-118 A 4.2	24.5 Ohms-16A	8.1 ohms-82 A
f)	Name of manufacturer	EMM	EMM	Yesdee	EMM	EMM	EMM

25	Limit Switches (For Power House Crane)								
	Particulars	Main Hoist		Auxiliary Hoist		Mono Rail hoist		Mono rail CT	Long Travel	Cross Travel
		Lowering	Lifting	Lowering	Lifting	Lowering	Lifting			
a)	Number (contact)	Rotary (Auto Reset- 1 No. fixed + 1 loose supply) + Gravity (Manual reset for over travel)		Rotary (Auto Reset- 1 No. fixed + 1 loose supply) + Gravity (Manual reset for over travel)		Rotary (Auto Reset- 1 No.)		Two way Lever type-1 No.	One way Lever type /anti-collision-Total 2 Nos.	one-way lever type-Total 2 Nos.
b)	Type & size									
c)	Material of contact	silver cadmium Alloy								
d)	Current and voltage rating	10 Amps, 110 V								
e)	Name of manufacturer	EMM/Repute								

26	Controller and resistor (For Power House Crane)						
	Particulars	Main Hoist	Auxiliary Hoist	Monorail hoist	Mono rail CT	Long Travel	Cross Travel
a)	Type of controllers	Joystick	Joystick	Joystick	Joystick	Joystick	Joystick
b)	No. of steps	4	4	4	5	4	5
c)	Type of resistors	Punch Grid	Punch Grid	Punch Grid	Wire	Punch Grid	Punch Grid
d)	Continuous rating of resistors	118	82	16	2	42	17
e)	Ohmic Value	42 4.2	8.1	24.5	100	14	24.5
f)	Name of manufacturer	EMM	EMM	EMM	Yesdee	EMM	EMM

27	**Conductors/ Collectors (for PH crane)**		
	Particulars	Main Runway	Trolley Runway
a)	Type of conductors	PVC shrouded copper conductor bars	Copper EPR insulated Flexible Festoon
b)	size	model WC-400	Flexible Cable
c)	Current carrying capacity	400 Amps continuous rated	As per motion motor
d)	Voltage drop	2.18%	negligible
e)	Type of collectors	Double current collector	Cable
28	**Bearing**		
	Details for different bearings	For main hoist hook: 1.no. Spherical Roller Thrust Bearing For MH & AH Rope drum: 1 no. each Spherical Roller Bearing For hoist block hoist: 1 no. Ball thrust bearing, for Hoist rope drum: 1 no. Ball Bearing For crane CT: 16 nos. Spherical Roller Bearing crane LT: 32 nos. Spherical Roller Bearing For hoist CT: 8 nos. Ball roller bearing.	
29	**Power supply requirements**		
a)	Total load of one crane	104 KW	
b)	Voltage	415 V	
30	**Protective Panel**		
a)	Main conductor	Copper Cable	
i)	Type	XLPE	
ii)	Location	On crane platform	
iii)	Standard to which conforms	IS-3177	
iv)	Low voltage protection provided	Yes	
b)	Overload protection	Yes	
i)	Type	VFD/Thermal	
ii)	Location	Panel	
iii)	Range of settings	Differs as given in Approved Scheme	
c)	Emergency push button	Provided	
i)	Manufacturer	Siemens	
ii)	Location	Cabin/Pendnats/RRC	
31.	**Illumination**		
a)	Illumination in cabin		
i)	Manufacturer	Repute as per BOM of Approved Scheme	
ii)	Number and type of fixtures	2 Nos of 10W LED. , 2 Nos. 240V-5A-3 Pin Industrial Socket	
iii)	Voltage		
b)	Illumination of bridge		
i)	Manufacturer	Repute as per BOM of Approved Scheme	
ii)	Number and type of fixtures	**Over Bridge:** 4 Nos. of 40 watts each, 240V – 5A – 3 pin industrial socket **Under bridge:** 4 nos 1000W each HPSV lamps	
iii)	Voltage		
c)	Portable hand lamp with wiring furnished	Hand lamp socket outlets (3 pin, 5A, 24V) and power socket outlets (3 pin, 20A, 240V) are provided.	
d)	Supply transformer and all other accessories required included.	provided	
32.	Particular of safety devices	Anti Collision Device provided (Provided with bypass push button (preparation of tandem operation) and bypass switch (operation in tandem))	
33.	**Wiring**		
a)	Type and size of cables used for power wiring	Copper As per Cable Schedule, Min. 2.5 sqmm for Power.	
b)	Type and size of cables used for control and aux. circuit wiring	Control: Copper, Instrumentation: shielded Copper, Ethernet: CAT 5/6 As per Cable Schedule, Min 0.5 sq.mm for instrumentation and ethernet, 1.5 sq.mm for control	
c)	Method of wiring	Plastic channel in panels/Trays on crane	
34.	**Standards adopted for**		
a)	**Materials**		
i)	Structural steel	IS:2062-2006 reaffirmed 2011	
ii)	Steel plate	IS:2062-2006 reaffirmed 2011	

iii)	Cold finished steel	Sheet IS: 513
iv)	Cast steel	IS:1030
v)	Forged steel	IS: 1570
vi)	Cast iron	IS:210
vii)	Bronze	NA
viii)	Brass	NA
ix)	Bolts, nuts and stud	IS:1367, En8 BS:970
x)	Other miscellaneous items	IS:3177
b)	**Equipment**	
i)	Rope drum	IS:3177, IS:2062, ASTM A106
ii)	Sheaves	IS:3177, IS:1030
iii)	Hooks	IS:15560, IS:5749
iv)	Bearings	SKF / FAG
v)	Couplings	Alliance
vi)	Gears	BS:970, IS:2707
vii)	Shaft	BS:970, IS:1570
viii)	Wheels	C55Mn75
ix)	Wire ropes	IS:2262
x)	Keys and keyways	IS:2048
xi)	Motors	ABB-IS:375
xii)	Resistors	EMM
xiii)	Brakes	EMM/EMCO
xiv)	Switchgear	As per BOM of Approved scheme
35.	Minimum factor of safety for each major component	As per design selection
36.	Tools and accessories supplied	refer Annexure A
37	**Heaviest package for shipment**	
a)	Name	Crab
b)	Weight	25000 kg
c)	Dimension (l x b x h)	8.95x5.3x2.3 m
38.	**Largest package for shipment**	
a)	Name	Main Girder Parts
b)	Weight	10000
c)	Dimension (l x b x h)	9.5 x 1.2 x 2.6
	ADDITIONAL DATA	
39	**Slings**	6 pair of Slings as given below shall be provided: (1) 250T : 2 Nos, 88 Dia, 12 Mtr each, (2) 60T: 2 Nos, 44 Dia, 8 Mtr each, (3) 40T: 2 Nos, 36 Dia, 8 Mtr each, (4) 20T-> 1 Nos, 36 Dia, 8 Mtr each, (5) 10T-> 1 Nos, 26 Dia, 8 Mtr each, (6) 5T-> 1 Nos, 18 Dia, 8 Mtr each. The slings are suitable to use with hoist. Each sling is having rings at both ends. Sling rings are to be suitably proportioned to fit on the crane hook. For slings for load overload test: 2 Nos. each endless slings of 56 dia of 18 mtrs are provided. These slings are suitable to use with cradle
40	**Storage rack for the sling**	Provided
41	**Cradle for load test/overload test of crane**	Provided (1 number)
42	**End Stoppers Details**	Total Height:1256mm
		Bottom Width:350mm
		Top Width:350mm
		Material: E250 IS:2062 Gr:B,100% Killed
43	**Anti Collision Device**	Yes, Provided with bypass push button (preparation of tandem operation) and bypass switch (operation in tandem)

44	**Painting**	As per attached Painting Scheme Annexure II
45	**Whether tandem operation required**	Yes.
46	**Lifting beam, stand and sling for tandem operation**	Yes. Provided. One set of fabricated steel lifting beam stand: provided
a	Lifting Beam Capacity	410T(Including stator weight + Sling Weight)
b	Material of lifting beam	E250 IS:2062 Gr:B
47	**Mechanical coupler**	Provided
48	**Other requirement**	NA
a	Main Isolating Switch	Isolator for DSL Feed: 1 No.,400A, type: CSCS400DM4CO provided. Isolator for Hospital Bays: 2 Nos., 250A, type: 3KA8321-3UE00, one each for Service Bay side and Control Building Side.
b	Mechanical overload protection	Load Cell, Rope Tension Type for Main Hoist motion provided. Load cell along with display: provided, Digital display in front of each EOT crane shall be provided.
c	Emergency push button	Mushroom Head Pushbutton, 1NC, Red colour
d	Earthquake clamp: qty, rating/size	CT: 4 Nos., each of 772 Kg/Cm2 stress, size: 25mm X 60mm, LT: 8 Nos., each of 792 Kg/Cm2 stress, size: 25mm X 60mm
e	Type of control-VVF details	As listed above (3.21.0) for all motions.
f	Speed control	Through VVVF of 6 pulse design
g	Starting torque of VVVF	typically 150 % (adjustable by setting) with encoder feed back.
h	Starting current	Less than 150 % of rated torque.
i	Temperature	VVVF system capable of withstanding up to 50° C without derating
j	Rail Sweep:	Sweep: Provided at end carriage in LT and near wheels in CT.
49	**Fire Extinguisher**	
a	Type and Size	4.5 kg CO2 type
b	Location	One in cabin and Three on bridge.
50	**Ventilation**	1 No. Circulating Fan. 240V-400 mm Sweep

ANNEXURE I: list of tools and tackles

S. NO.	DESCRIPTION	Qty offfered	unit of measure ment
a)	Wrench, spanner having sockets. (6mm-32mm) with adjustable handle	1	SET
b)	Sliding bar for socket wrench. (Standard)	1	SET
c)	Torque wrench: (6mm - 32 mm) with extended rachet handle and T handle	1	No.
d)	Pen hammer		
d.1	1 lbs capacity	1	No.
d.2	2 lbs capacity	1	No.
e)	Allen key set: 2mm - 32 mm with flexible handle	1	SET
f)	Feeler gauge set (Standard)	1	SET
g)	Oil can size 1 pint cap along with a funnel for oil filling.	1	No.
h)	Fuse Puller	1	No.
i)	Panel indicating lamp puller	1	No.
j)	Hydraulically operated jack of capacity 60 tonnes.	1	No.
k)	Tool box with lock and double keys.	1	No.
l)	any other items is required for maintenance of cranes		

Note: One set of tool and tackles with O&M manual in the toolbox shall be supplied

ANNEXURE II: PAINTING SPECIFICATION

Painting Specification for Project ref: OG06 having 2 cranes in individual or tandem operation. Each crane is 250/50T+10TX21M span for ARUN-3 HYDRO ELECTRIC PROJECT-NEPAL-4X225MW.

1. Painting specification for steel structures: -

Surface preparation: De greasing and Mechanical cleaning with wire brush or blasting according to SIS 055900, Grade 2 ½.
For Girder, End carriage, Trolley and other misc.
Item Shade: Golden Yellow shade 356 as per IS 5

Primer: Zinc Silicate of approved brand. - 2 coat, DFT 60 µm per coat.
Intermediate: MIO Epoxy paint- 2 coat, DFT 90 µm per coat
Finish Coat : Polyurethane coating- 1 coats, DFT 30 µm per coat.
Total DFT : 330 µm

2. Painting specification for Indoor components such as motors, electrical parts etc.
As per original equipment manufacturer standard.

3. Gear Box:
Inside: All gear boxes will be covered with 2 coats of oil resistant paint.
Outside: as per table below.

Type of coating system	No. of Coat	DFT µ m per coat	Total DFT µ m
Primer Coat			
Epoxy Base Zinc Phosphate Primer	2	25	50
Finish Coat			
Epoxy base Paint	2	25	50
Overall minimum DFT µ m			100

4. Colour Shade: As per table below.

Sr. No.	Item Description	Colour Shade	Remarks
1	Crane Structure	Golden Yellow shade 356 as per IS-5.	Colour Band black
2	Trolley and Hook	Crimson shade 540 as per IS-5	
3	Motors	Light Grey shade 631 as per IS-5	
4	Control Panels	Light Grey (Powder coated) RAL 631 as per IS-5	
5	Gear Box	Light Blue (RAL : 5012) as per IS-5	

SJVN Arun-3Power Development Company (P.) Ltd.
(A company promoted by SJVN Limited, joint venture of Govt. of India and Govt. of H.P)
Regd. No.: 111808/69/070

Approved by Consultant	To be Issued to Contractor		
	Category: ***APPROVAL***		
☑Yes ☐No	Reviewed	Recommended	Approved

Consultant:- SJVN LTD.

Recommended for Approval

SUB GROUP			SECTIONAL HEAD	HOD
Checked		Reviewed		

Total 56 pages

Job No	437	Customer	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD.(SAPDC)				
Status	Contract	Project	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)				
Distribution		Consultant:	SJVN Ltd				
TO		BHARAT HEAVY ELECTRICAL LTD POWER SECTOR-PROJECT ENGINEERING MANAGEMENT NOIDA			Name	Sign	Date
NO				Prepared by	DP		05.07.19
REV No.	REV DATE			Checked by	SM		05.07.19
				Approved By	SM		05.07.19

DATASHEET OF MOTORS FOR 250/50/10T POWER HOUSE DOUBLE GIRDER EOT CRANE

FAFECO
FURNACE & FOUNDRY EQUIPMENT CO.

Document No:- PE-V0-437-501-A503

Page		Rev	3

PROJECT: 4X225 MW ARUN III
PACKAGE: 2X250/50/10T POWER HOUSE DOUBLE GIRDER EOT CRANES
DOCUMENT: DATA SHEET OF MOTORS FOR 250/50/10T POWER HOUSE CRANE
DOCUMENT NO.: PE-V0-437-501-A503, REV 03

INDEX

MOTOR DATASHEET FOR MAIN HOIST

OF 250/50/10T POWER HOUSE DOUBLE GIRDER CRANE

S. No.	Description	Data
A.	**General**	
1	Manufacturer & country of origin	ABB India
2	Motor type	Squirrel cage induction motor
3	Type of starting	VFD
4	Name of the equipment driven by motor & Quantity	Main Hoist motor of power house, 2nos
5	Maximum Power requirement of driven equipment	52.7KW
6	Rated speed of Driven Equipment	985 RPM (regulated by VFD and adjustable at site by VFD parameters)
7	Design ambient temperature	40 deg C
B.	**Design and Performance Data**	
1	Frame size & type designation	KHX+280SMC6
2	Type of duty	S4
3	Rated Voltage	415
4	Permissible variation for	
5	a Voltage	+10%,-10%
6	b Frequency	+3%,-3%
7	c) Combined voltage & frequency	10% (absolute sum)
8	Rated output at design ambient temp (by resistance method)	59 kw
9	Synchronous speed & Rated slip	985 RPM, 1.5% (R3)
10	Minimum permissible starting voltage	80%
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	Depends of VFD starting
13	b) At min starting voltage	Depends of VFD starting
14	Locked rotor current as percentage of FLC (including IS tolerance)	NA for VFD starting
15	Torque	
	a) Starting	210%
	b) Maximum	230%
16	Permissible temp rise at rated output over ambient temp & method	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 DegC (R2)
17	Noise level at 1.0 m (dB	85 db at 1m
18	Amplitude of vibration	2.8 mm/s
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	93.1% / 0.84
	c) At 75% load	93.1% / 0.8

S. No.	Description	Data
	c) At 50% Load	91.1%/0.71
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	Delta
2	Applicable Standard	IS 12615:2018
3	DOP of Enclosure	TEFC
4	Method of cooling	IC 411
5	Class of insulation	Class F
6	Main terminal box	
	a) Type	Stud type
	b) Power Cable details (Conductor, size, armour/unarmour)	Max 1R x 4C x 16 sqmm (One hole for cable entry, 2nd hole will be plugged) (R3)
	c) Cable Gland & lugs details (Size, type & material)	Fafeco Scope, Gland and lug size shall be suitable for Cable and motor terminal size.
	d) Permissible Fault level (kArms & duration in sec)	50kA for 0.25 sec
7	Space heater details (Voltage & watts)	1no 240V 50W
8	Flame proof motor details (if applicable)	NA
	a) Enclosure	NA
	b) suitability for hazardous area	NA
	i Zone	
	ii Group	
9	No. of Stator winding	6
10	Winding connection	Delta
11	Kind of rotor winding	Die cast Aluminum construction
12	Kind of bearings	Ball bearings
13	Direction of rotation when viewed from NDE	Bi directional
14	Paint Shade & type	Light grey 631 of IS 5
15	Net weight of motor	600 kg
16	Outline mounting drawing No (To be enclosed as annexure)	3GYN390188
D.	**Characteristic curves/ drawings**	
	a) Torque speed characteristic	Attached
	b) Thermal withstand characteristic	Attached
	c) Current vs time	Attached
	d) Speed vs time	Attached
	e) Load curve	Attached

ABB Motors and Generators	Technical Data Sheet			
	Project		Location	
Department/Author	Customer name		Customer ref.	**Application** Main Hoist motor of power house crane
Our ref.	Rev/Changed by	Date of issue	Saving ident	Pages
	A	**7/1/2019**	**untitled.xls**	**1(3)**

No.	Definition	Data	Unit	Remarks	
1	Product	***TEFC, 3-phase, squirrel cage induction motor***			
2	Product code	***HX+2 80S MC6-ADCIN***			
3	Type/Frame	***KHX+280SMC6***			
4	Mounting	***IM1001, B3(foot)***			
5	Rated output P_N / selected	***59KW / 60KW***			
6	Service factor	***1***			
7	Type of duty	***S4 duty 300 starts/Hr, 40% CDF***			
8	Rated voltage U_N	***415***	VD	+10, -10 %	
9	Rated frequency f_N	***50***	Hz	+3, -3 %	
10	Rated speed n_N	***985***	r/min		
11	Rated current I_N	***105***	A		
12	Quantity	***2***	Nos		
13	Starting current I_s/I_N	***6***			
14	Nominal torque T_N	***572***	Nm		
15	Locked rotor torque T_S/T_N	***2.1***			
16	Maximum torque T_{max}/T_N	***2.3***			
17	Min voltage for starting	***80% of rated voltage***			
18					
	Load characteristics	Load %	Current A	Efficiency %	Power factor
19		*100*	**105**	**93.1**	**0.84**
20		*75*	**82.7**	**93.1**	**0.8**
21		*50*	**63.5**	**91.1**	**0.71**
22					
23	Thermal withstand time hot	***19***	s		
24	Thermal withstand time cold	***37***	s		
25	Insulation class / Temperature class	***F / B***			
26	Ambient temperature	***40***	°C	***(R2)***	
27	Altitude	***1000***	m.a.s.l.		
28	Degree of protection	***IP55***			
29	Cooling system	***IC411***			
30	Bearing DE/NDE	***6316/C3 - 6315/C3***		Ball bearings (Regresable)	
31	Sound pressure level (LP dB(A) 1m)	***85***	dB(A)	at no-load	
32	Moment of inertia J = ¼ GD2	***2.025***	kg-m2		
33	Position of terminal box	***Top***			
34	Direction of rotation	***Bi-directional***			
35	Total weight of motor	***600***	kg		
36	Paint shade	***Light grey shade 631 of IS 5***			
37	Cable size	***Max 1R x 4C x 16 sqmm (One hole for cable entry, 2nd hole***		(R2)	
38	Conduit entry size	***2 nos. x 2" BSC***			
39	Method of starting	***VFD***			
40	S4 duty 300 starts/Hr, 40% CDF				
41	Equivalent S1 kw	***55 kw***			
42	IE2 efficiency at equivalent S1 kw	***93.10%***			
43	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C				
44					
45					
Ex-motors					
46					
47					
48					

Option	Variant Codes / Definition
49	VPI, Dual coated winding
50	Double shaft extension
51	Light gey 631 of IS 5
52	Space heater 1no 240V 50W
	Encoder mounting arrangement
	Only brake mounting arrangement
	EN 24 shaft

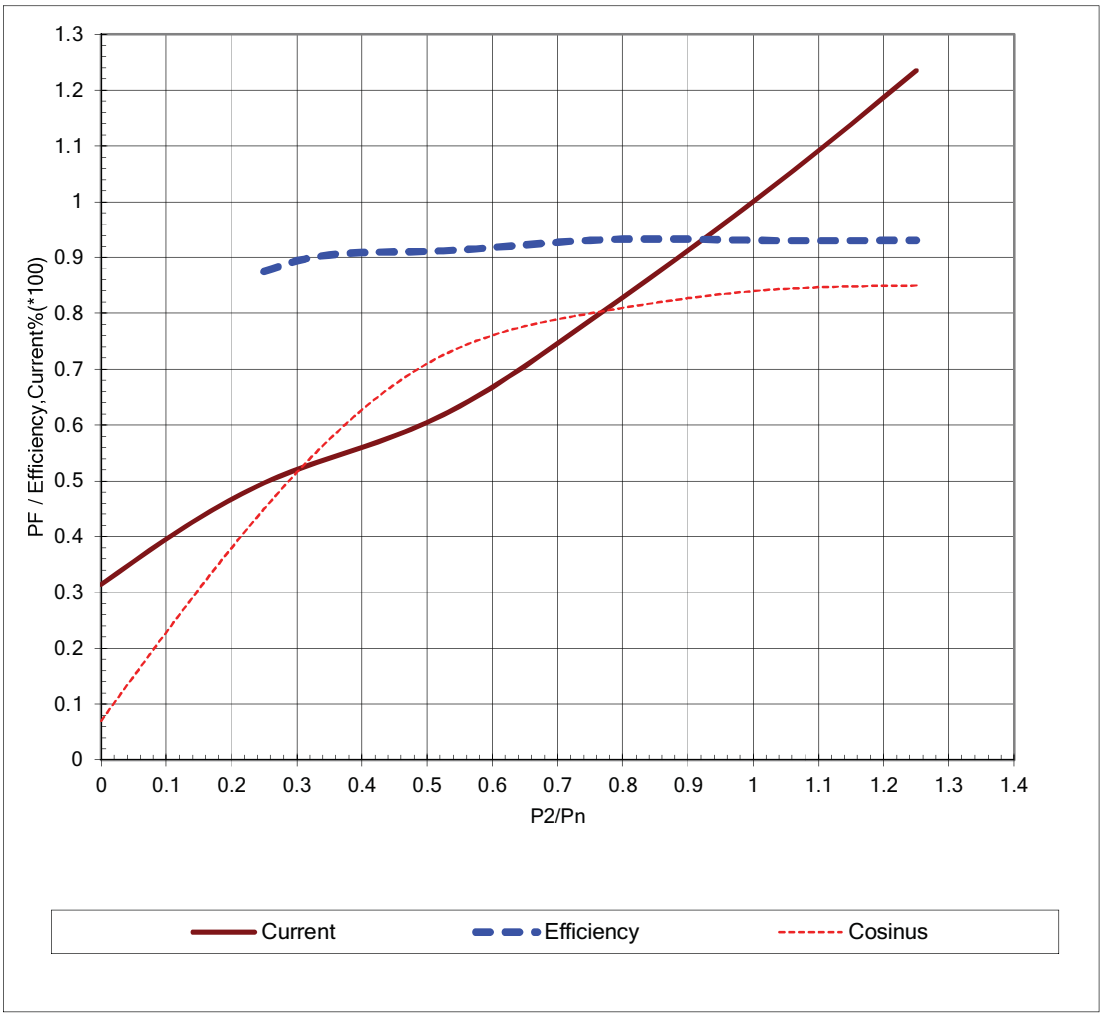
Remarks:

Applicable standards: IS 12615 2018

ABB Motors and Generators	Load Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00005
Our ref.	Rev/Changed by Date of issue A 7/1/2019	Saving ident untitled.xls	Pages 2(3)

Product	**TEFC, 3-phase, squirrel cage induction motor**
Type/Frame	**KHX+280SMC6**
Product code	**HX+2 80S MC6-ADCIN**
Rated output P_N	**59** kW
Type of duty	**S4 duty 300 starts/Hr, 40% CDF**

Voltage (V)	**415**	Current I_N (A)	**105**	Power factor at P_N	**0.84**
Frequency (Hz)	**50**	Speed (r/min)	**985**	Efficiency (%) at P_N	**93.1**

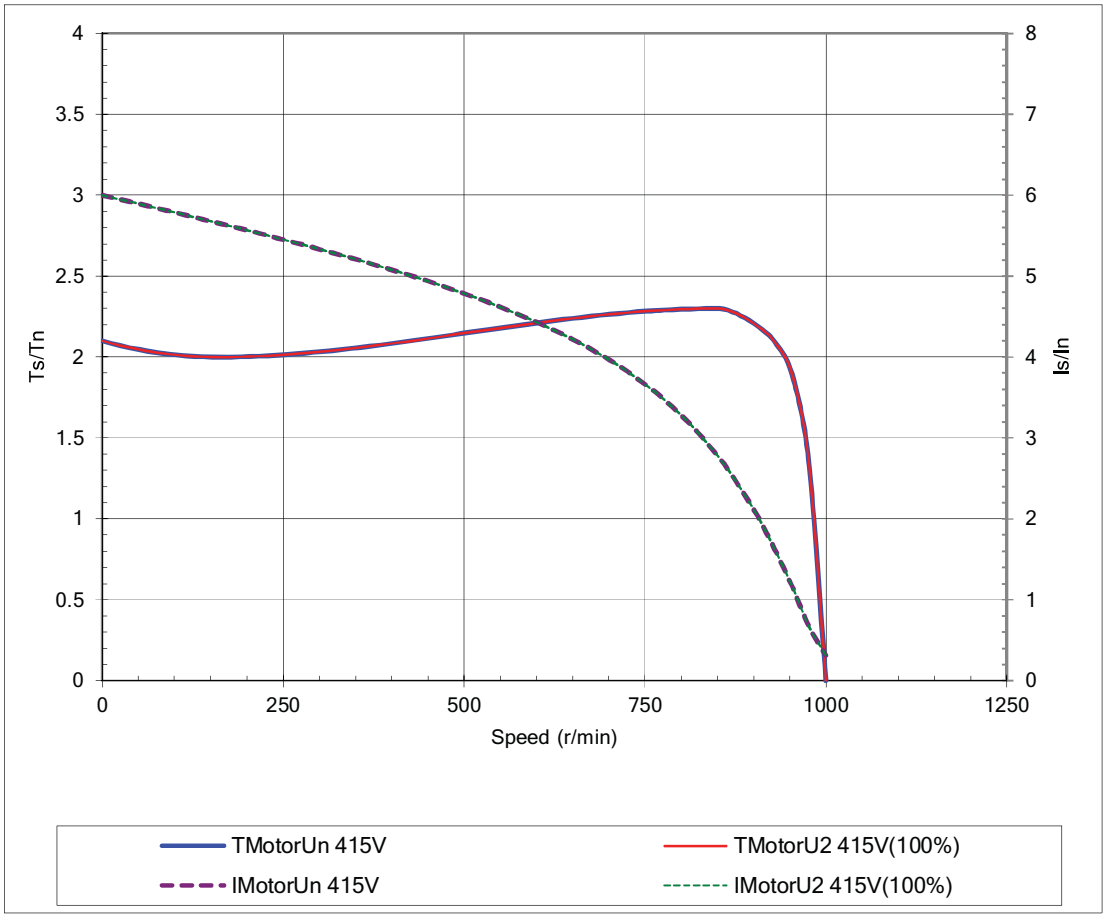


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Starting Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00005
Our ref.	Rev/Changed b Date of issue	Saving ident	Pages
	A 7/1/2019	untitled.xls	3(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor			
Type/Frame	KHX+280SMC6			
Product code	HX+2 80S MC6-ADCIN	Frequency (Hz)	50	
Rated output P_N	59 kW	Rated current I_N	105	A
Type of duty	S4 duty 300 starts/Hr, 40% CDF			

J_{motor} (kgm2)	2	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*2.1*	T_{start}/T_N	*2.1*
Speed (r/min)	985	Starting time (s)	*0.2*	Starting time (s)	
T_N (Nm)	572	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*6*	I_s/I_n	*6*
		T_{max}/T_n	*2.3*	T_{max}/T_n	*2.3*

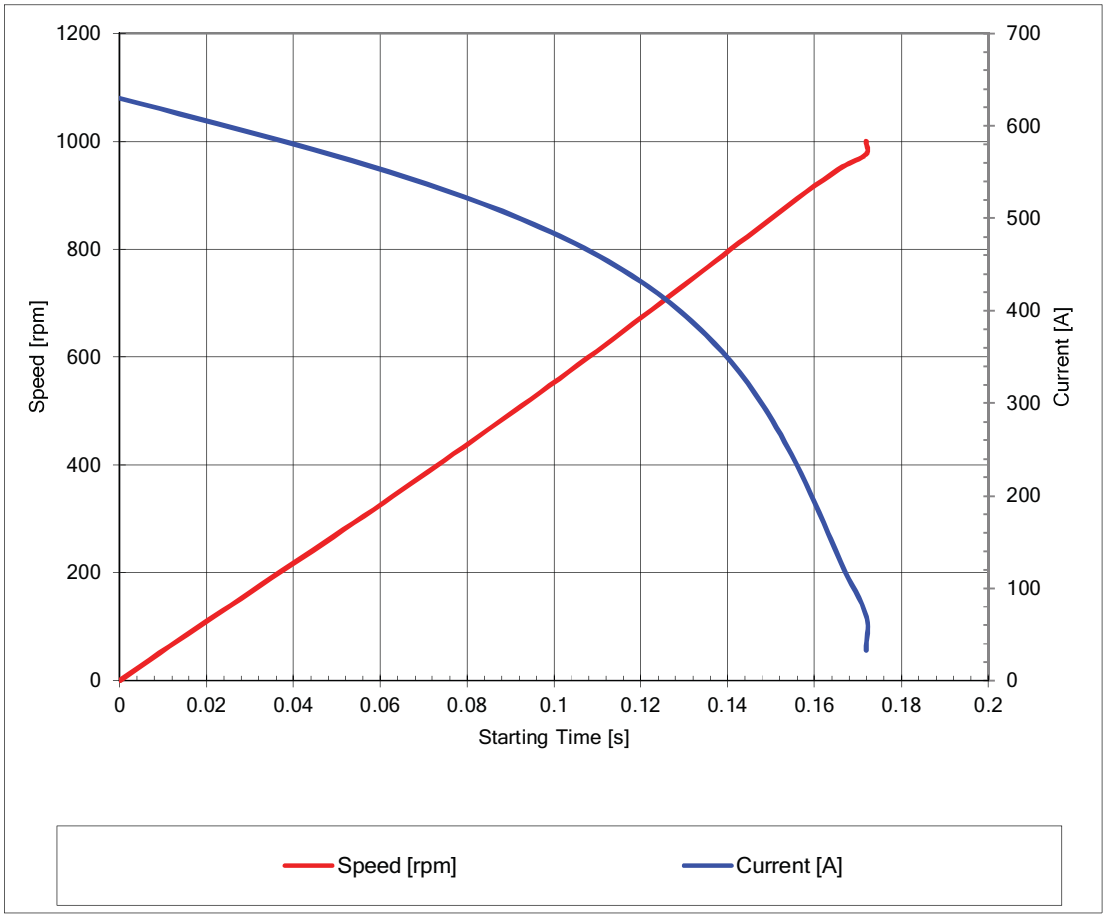


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Current & Speed Vs Time		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name **1.00005**
Our ref.	Rev/Changed b Date of issue	Saving ident	Pages
	A **7/1/2019**	**untitled.xls**	**4(3)**

Type of product	**TEFC, 3-phase, squirrel cage induction motor**			
Type/Frame	**KHX+280SMC6**			
Product code	**HX+2 80S MC6-ADCIN**		Frequency (Hz)	**50**
Rated output P_N	**59** kW		Rated current I_N	**105** A
Type of duty	**S4 duty 300 starts/Hr, 40% CDF**			

J_{motor} (kgm2)	**2**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***2.1***	T_{start}/T_N	***2.1***
Speed (r/min)	**985**	Starting time (s)	***0.2***	Starting time (s)	
T_N (Nm)	**572**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***6***	I_s/I_n	***6***
		T_{max}/T_n	***2.3***	T_{max}/T_n	***2.3***

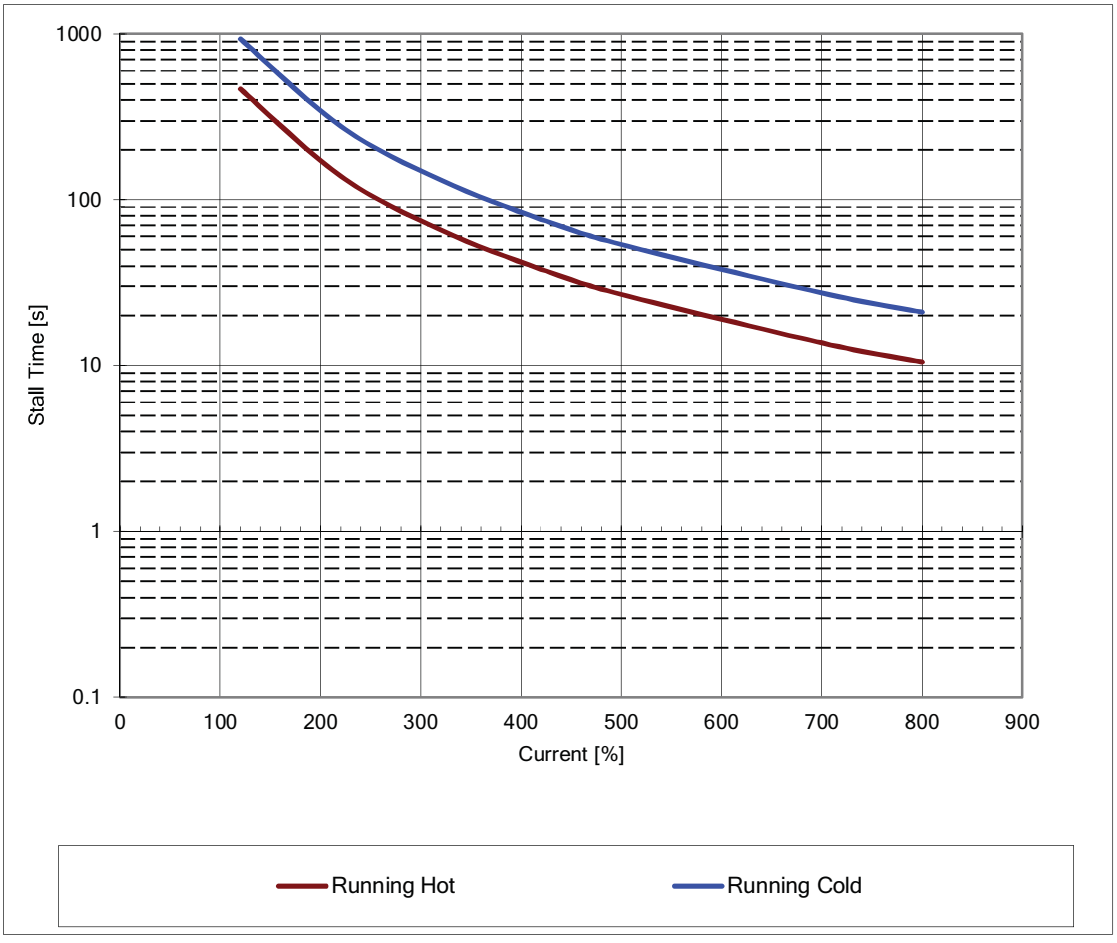


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Thermal Withstand Curve		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name **1.00005**
Our ref.	Rev/Changed b: Date of issue **A** **7/1/2019**	Saving ident **untitled.xls**	Pages **5(3)**

Type of product	**TEFC, 3-phase, squirrel cage induction motor**			
Type/Frame	**KHX+280SMC6**			
Product code	**HX+2 80S MC6-ADCIN**	Frequency (Hz)	**50**	
Rated output P_N	**59** kW	Rated current I_N	**105**	A
Type of duty	**S4 duty 300 starts/Hr, 40% CDF**			

J_{motor} (kgm2)	**2**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***2.1***	T_{start}/T_N	***2.1***
Speed (r/min)	**985**	Withstand cold(s)	***37***	Withstand hot (s)	***19***
T_N (Nm)	**572**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***6***	I_s/I_n	***6***
		T_{max}/T_n	***2.3***	T_{max}/T_n	***2.3***

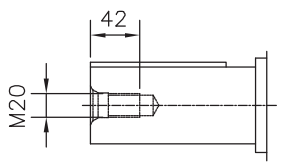


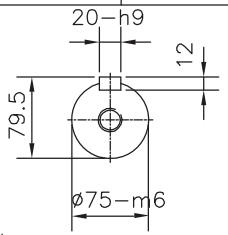
Applicable standards: IS 12615 2018 28.7.2015

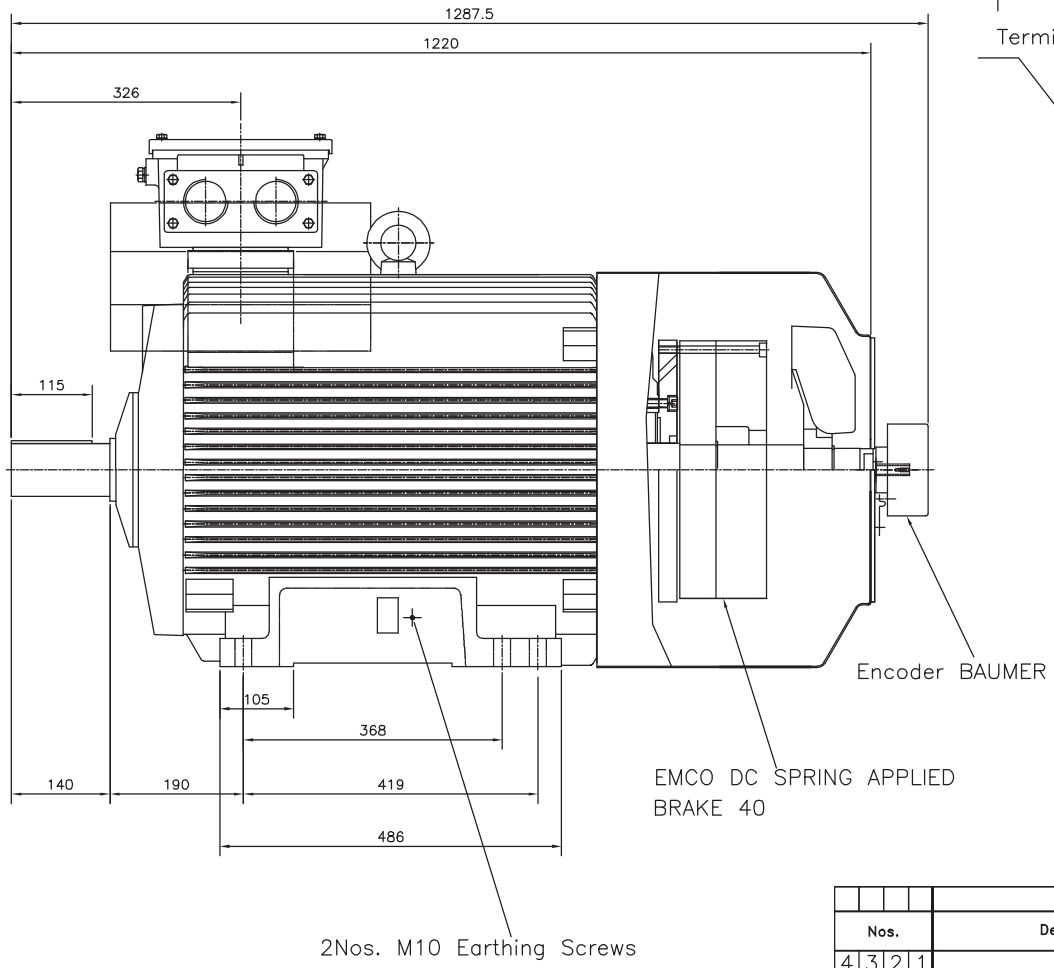
Drawing No.	Rev.
3GYN 390188	

Rev.	Zone	Revision	Sign.

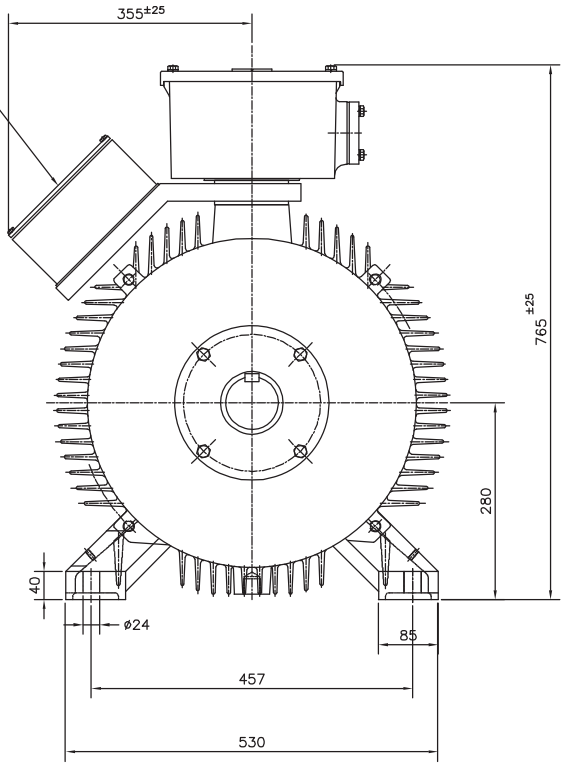
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED. | DO NOT SCALE | PLEASE ASK, IF IN DOUBT







Terminal Box Accessories



Note: Only mounting provision for brake and encoder EIL580.

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks
4 3 2 1						

Responsible Department ATEMLR
Tolerance acc. to unless otherwise stated.
Scale 1:1 Proj.

Title: Dimension Drawing

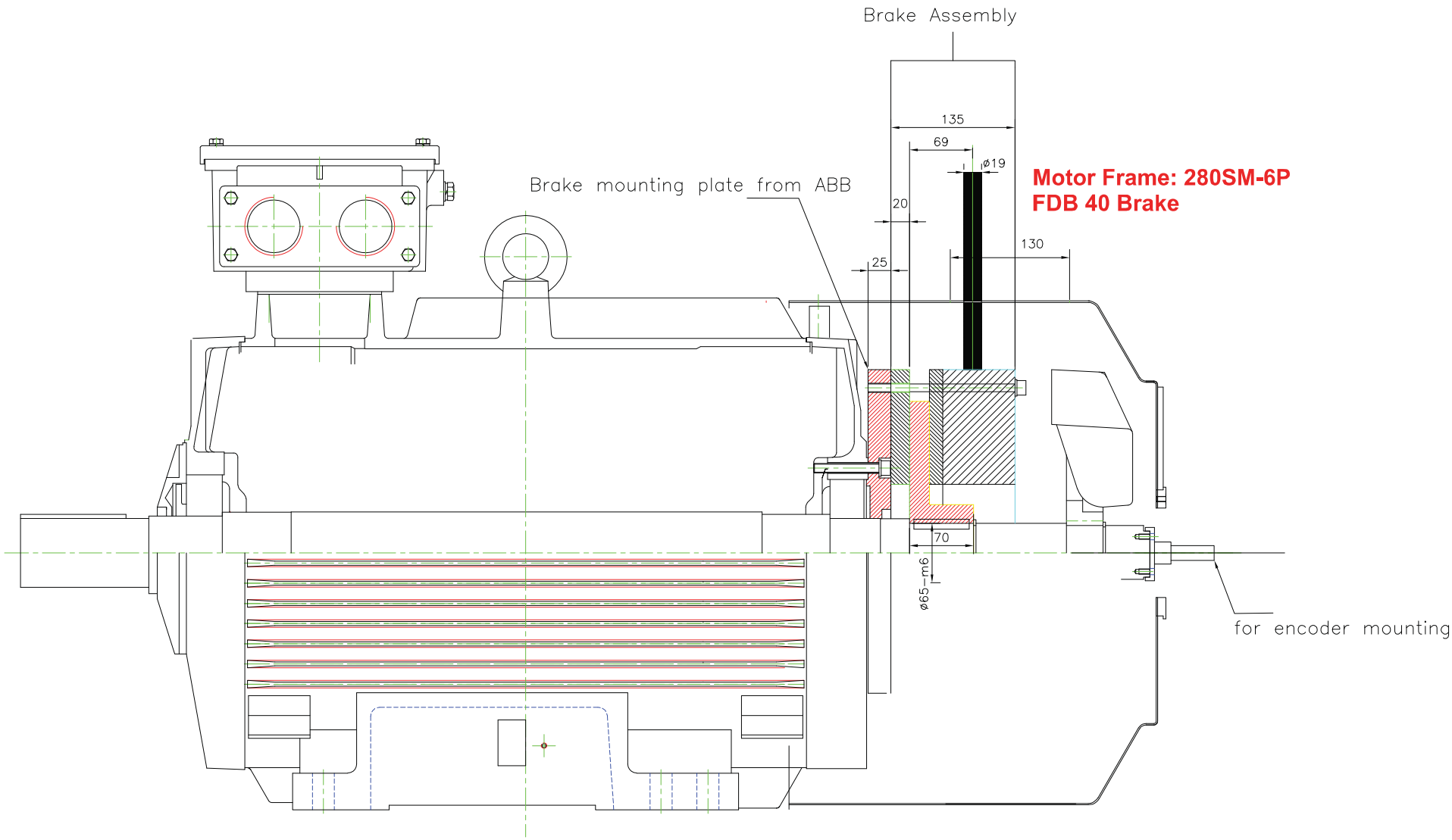
Used on HX+280SM 4..6P (Brake emco 40+ Hollow Tacho+Acc)

ABB Ltd.
Faridabad – 121 001

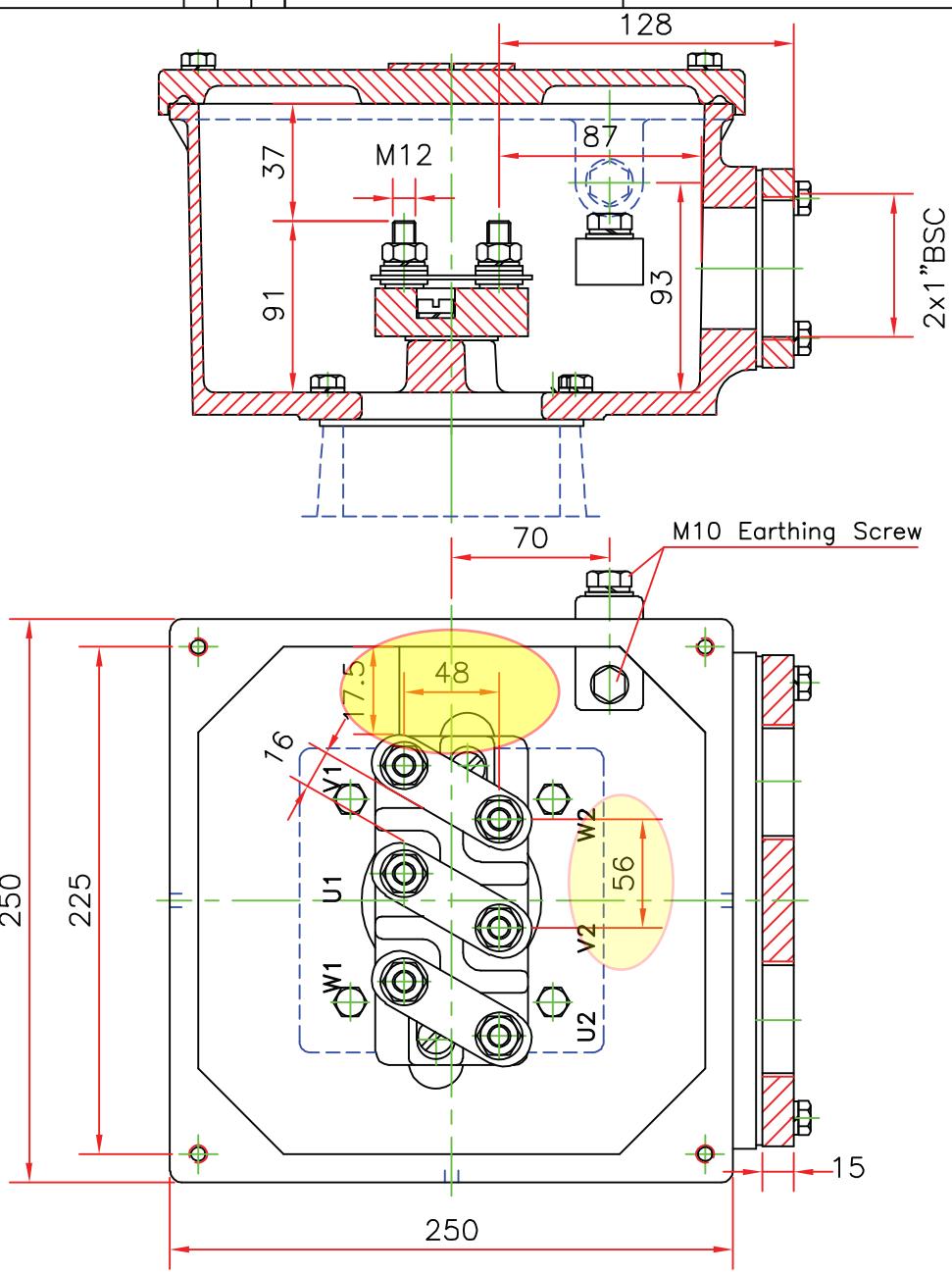
Drawn 2k19.07.08 SBU
Checked
Approved
Superseded by

Drawing No. 3GYN 390188 Rev.
Supersedes

THIS IS PART OF TECHNICAL SPECIFICATION RE-TS-137-501-A001A REV 0


Brake Assembly
135
69
ø19
Motor Frame: 280SM-6P
FDB 40 Brake
Brake mounting plate from ABB
20
130
25
70
ø65-m6
for encoder mounting

Drawing No.	Rev.	ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3GYN 490777	A	DO NOT SCALE / PLEASE ASK, IF IN DOUBT



* Degree of protection:–IP55
* Main Terminal box short circuit capacity shall be suitable for 50KA for 0.25 second.
* Terminal box shall be capable of turning 360 deg in steps of 90 deg
* Terminal box shall be suitable for termination of cable 1Rx4Cx16 Sq.mm XLPE,AL/Cu Cable with OD:21.0MM
* TWO ENTRY SHALL BE PROVIDED & ONE WILL BE PLUGGED

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks
3 2 1	Responsible Department ATEMLR					
	Tolerance acc. to unless otherwise stated.					
	Scale / Proj.					

Title: Terminal Box Dimension Drawing

Used on HX 280

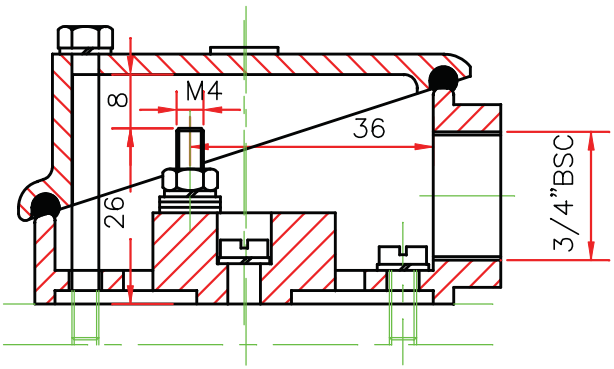
ABB Ltd.
Faridabad – 121 001

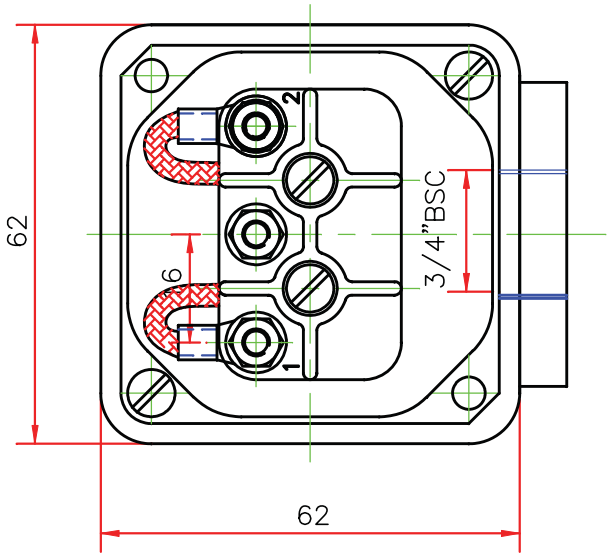
Drawn	2k3.02.03 MG	Drawing No.	Rev.
Checked		3GYN 490777	A
Approved			
Superseded by		Supersedes	13

Rev.	Zone	Revision	Sign.
A		Inside earthing Shown	BRJ
B	D		
C		Revision	
	Zone		
	E		
	Rev.		
	Sign.		
	Zone	Revision	
	Rev.		
	Sign.		

E
D
C
B
A 2k11.08.24

Drawing No.	Rev.	ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3GYN 453110		DO NOT SCALE / PLEASE ASK, IF IN DOUBT

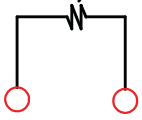




Connection Diagram

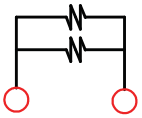
For Space heater

1 x 240V, 50 watt



280frame

2 x 240V, 50 watt



315 and above

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks

Responsible Department IMOR

Tolerance acc. to unless otherwise stated.

Scale / Proj.

Title: Terminal Box Dimension Drawing

Used on Terminal Box for Space Heater

ABB Ltd.
Faridabad – 121 001

Drawn	981216	GDM	Drawing No.	Rev.
Checked			3GYN 453110	
Approved				
Superseded by			Supersedes	

14

MOTOR DATASHEET FOR AUXILLIARY HOIST

OF 250/50/10T POWER HOUSE DOUBLE GIRDER CRANE

S. No.	Description	Data
A.	**General**	
1	Manufacturer & country of origin	ABB India
2	Motor type	Squirrel cage induction motor
3	Type of starting	VFD
4	Name of the equipment driven by motor & Quantity	Aux Hoist motor of power house, 2nos
5	Maximum Power requirement of driven equipment	48.7KW
6	Rated speed of Driven Equipment	985 RPM (regulated by VFD and adjustable at site by VFD parameters)
7	Design ambient temperature	40 deg C
B.	**Design and Performance Data**	
1	Frame size & type designation	KHX+280SMC6
2	Type of duty	S4
3	Rated Voltage	415
4	Permissible variation for	
5	a Voltage	+10%,-10%
6	b Frequency	+3%,-3%
7	c) Combined voltage & frequency	10% (absolute sum)
8	Rated output at design ambient temp (by resistance method)	55kw
9	Synchronous speed & Rated slip	985 RPM, 1.5% (R3)
10	Minimum permissible starting voltage	80%
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	Depends of VFD starting
13	b) At min starting voltage	Depends of VFD starting
14	Locked rotor current as percentage of FLC (including IS tolerance)	NA for VFD starting
15	Torque	
	a) Starting	230%
	b) Maximum	250%
16	Permissible temp rise at rated output over ambient temp & method	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 DegC (R2)
17	Noise level at 1.0 m (dB	85 db at 1m
18	Amplitude of vibration	2.8 mm/s
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	93.1% / 0.84
	c) At 75% load	93.1% / 0.8

S. No.	Description	Data to be filled by successful bidder
	c) At 50% Load	91.1%/0.71
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	Delta
2	Applicable Standard	IS 12615:2018
3	DOP of Enclosure	TEFC
4	Method of cooling	IC 411
5	Class of insulation	Class F
6	Main terminal box	
	a) Type	Stud type
	b) Power Cable details (Conductor, size, armour/unarmour)	Max 1R x 4C x 16 sqmm (One hole for cable entry, 2nd hole will be plugged) (R3)
	c) Cable Gland & lugs details (Size, type & material)	Fafeco Scope, Gland and lug size shall be suitable for Cable and motor terminal size.
	d) Permissible Fault level (kArms & duration in sec)	50kA for 0.25 sec
7	Space heater details (Voltage & watts)	1n0 240V 50W
8	Flame proof motor details (if applicable)	NA
	a) Enclosure	NA
	b) suitability for hazardous area	NA
	i Zone	
	ii Group	
9	No. of Stator winding	6
10	Winding connection	Delta
11	Kind of rotor winding	Die cast Aluminum construction
12	Kind of bearings	Ball bearings
13	Direction of rotation when viewed from NDE	Bi directional
14	Paint Shade & type	Light gey 631 of IS 5
15	Net weight of motor	600 kg
16	Outline mounting drawing No (To be enclosed as annexure)	3GYN390188
D.	**Characteristic curves/ drawings**	
	a) Torque speed characteristic	Attached
	b) Thermal withstand characteristic	Attached
	c) Current vs time	Attached
	d) Speed vs time	Attached
	e) Load curve	Attached

ABB Motors and Generators	Technical Data Sheet			
	Project		Location	
Department/Author	Customer name		Customer ref.	Application house crane
Our ref.	Rev/Changed by A	Date of issue 01-07-2019	Saving ident untitled.xls	Pages 1(3)

No.	Definition	Data	Unit	Remarks	
1	Product	***TEFC, 3-phase, squirrel cage induction motor***			
2	Product code	***HX+2 80S MC6-ADCIN***			
3	Type/Frame	***KHX+280SMC6***			
4	Mounting	***IM1001, B3(foot)***			
5	Rated output P_N / SLECTED	***55KW / 60KW***			
6	Service factor	***1***			
7	Type of duty	***S4 duty 300 starts/Hr, 40% CDF***			
8	Rated voltage U_N	***415***	VD	+10, -10 %	
9	Rated frequency f_N	***50***	Hz	+3, -3 %	
10	Rated speed n_N	***985***	r/min		
11	Rated current I_N	***97.8***	A		
12	Quantity	***2***	Nos		
13	Starting current I_s/I_N	***6***			
14	Nominal torque T_N	***533***	Nm		
15	Locked rotor torque T_S/T_N	***2.3***			
16	Maximum torque T_{max}/T_N	***2.5***			
17	Min voltage for starting	***80% of rated voltage***			
18					
	Load characteristics	Load %	Current A	Efficiency %	Power factor
19		*100*	**97.8**	**93.1**	**0.84**
20		*75*	**77.1**	**93.1**	**0.8**
21		*50*	**59.2**	**91.1**	**0.71**
22					
23	Thermal withstand time hot	***20***	s		
24	Thermal withstand time cold	***40***	s		
25	Insulation class / Temperature class	***F / B***			
26	Ambient temperature	***40***	°C	***(R3)***	
27	Altitude	***1000***	m.a.s.l.		
28	Degree of protection	***IP55***			
29	Cooling system	***IC411***			
30	Bearing DE/NDE	***6316/C3 - 6315/C3***		Ball bearings (Regresable)	
31	Sound pressure level (LP dB(A) 1m)	***85***	dB(A)	at no-load	
32	Moment of inertia J = ¼ GD2	***2.025***	kg-m2		
33	Position of terminal box	***Top***			
34	Direction of rotation	***Bi-directional***			
35	Total weight of motor	***600***	kg		
36	Paint shade	***Light grey shade 631 of IS 5***			
37	Cable size	***Max 1R x 4C x 16 sqmm (One hole for cable entry, 2nd hole will be plugged) (R3)***		(R3)	
38	Conduit entry size	***2 nos. x 2" BSC***			
39	Method of starting	***VFD***			
40	S4 duty 300 starts/Hr, 40% CDF				
41	Equivalent S1 kw	***55 kw***			
42	IE2 efficiency at equivalent S1 kw	***93.10%***			
43	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C				
44					
45					
Ex-motors					
46					
47					
48					

Option	Variant Codes / Definition
49	VPI, Dual coated winding
50	Double shaft extension
51	Light gey 631 of IS 5
52	Space heater 1no 240V 50W
	Encoder mounting arrangement
	Only brake mounting arrangement
	EN 24 shaft

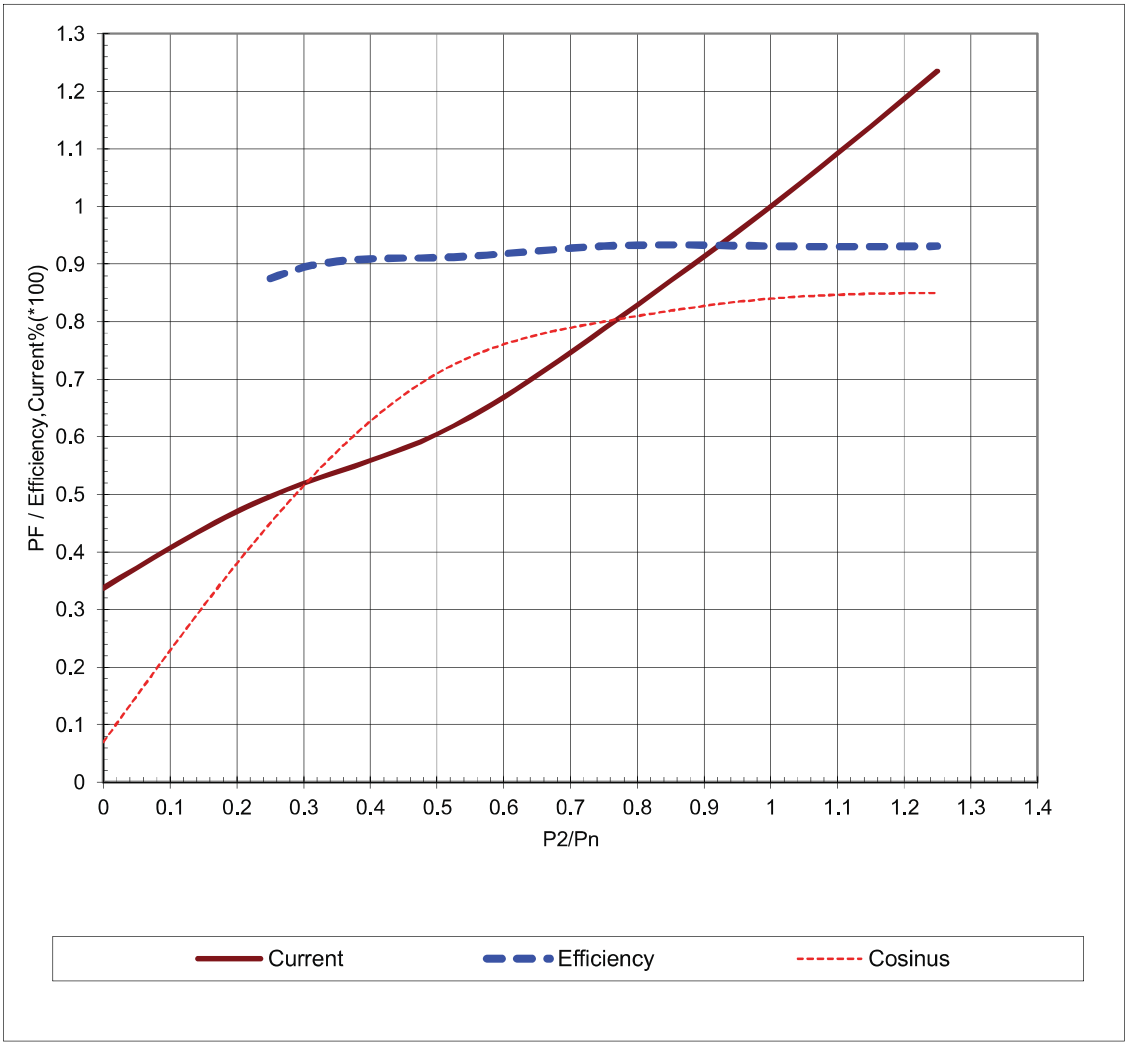
Remarks:

Applicable standards: IS 12615 2018

ABB Motors and Generators	Load Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00004
Our ref.	Rev/Changed by: A	Date of issue: 01-07-2019	Saving ident: untitled.xls / Pages: 2(3)

Product	TEFC, 3-phase, squirrel cage induction motor		
Type/Frame	KHX+280SMC6		
Product code	HX+2 80S MC6-ADCIN		
Rated output P_N	55 kW		
Type of duty	S4 duty 300 starts/Hr, 40% CDF		

Voltage (V)	415	Current I_N (A)	97.8	Power factor at P_N	0.84
Frequency (Hz)	50	Speed (r/min)	985	Efficiency (%) at P_N	93.1

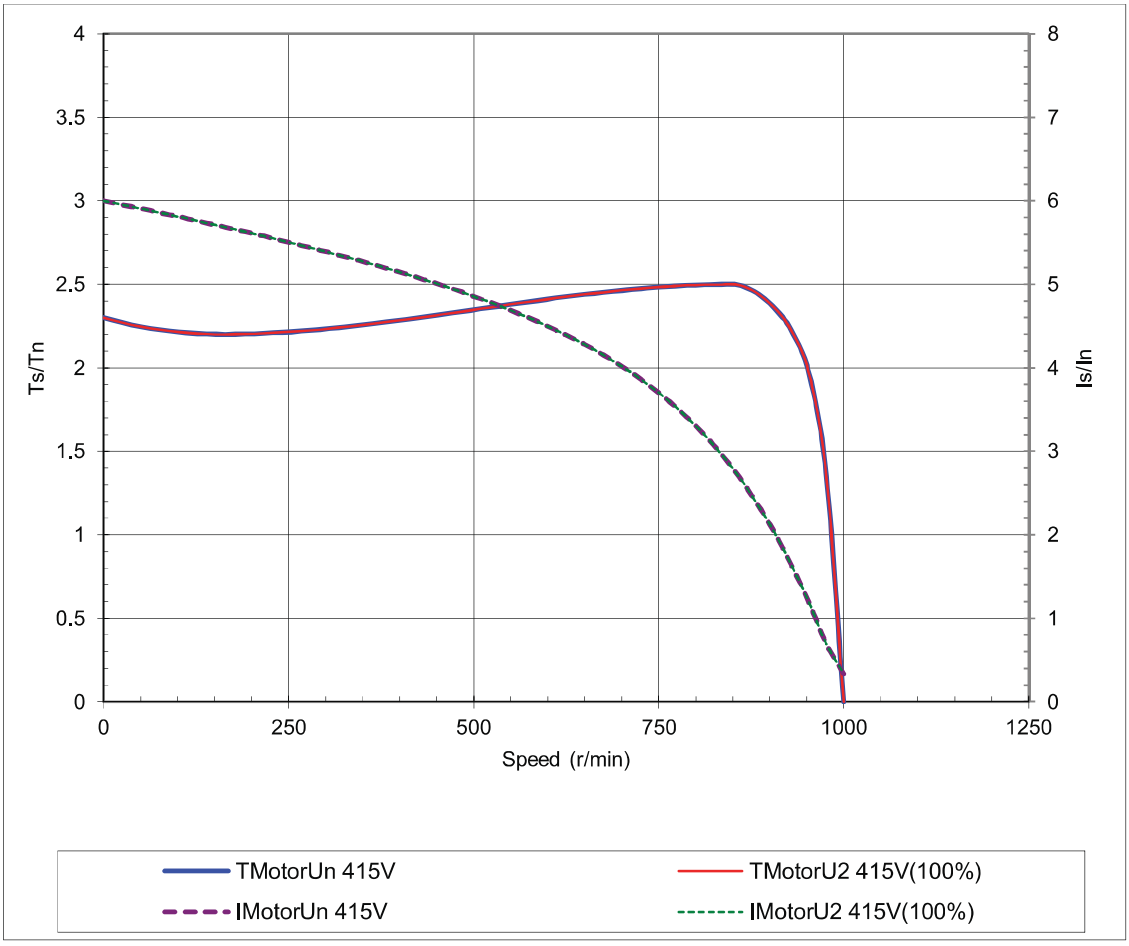


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Starting Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00004
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 3(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KHX+280SMC6				
Product code	HX+2 80S MC6-ADCIN		Frequency (Hz)	50	
Rated output P_N	55	kW	Rated current I_N	97.8	A
Type of duty	S4 duty 300 starts/Hr, 40% CDF				

J_{motor} (kgm2)	2	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*2.3*	T_{start}/T_N	*2.3*
Speed (r/min)	985	Starting time (s)	*0.2*	Starting time (s)	
T_N (Nm)	533	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*6*	I_s/I_n	*6*
		T_{max}/T_n	*2.5*	T_{max}/T_n	*2.5*

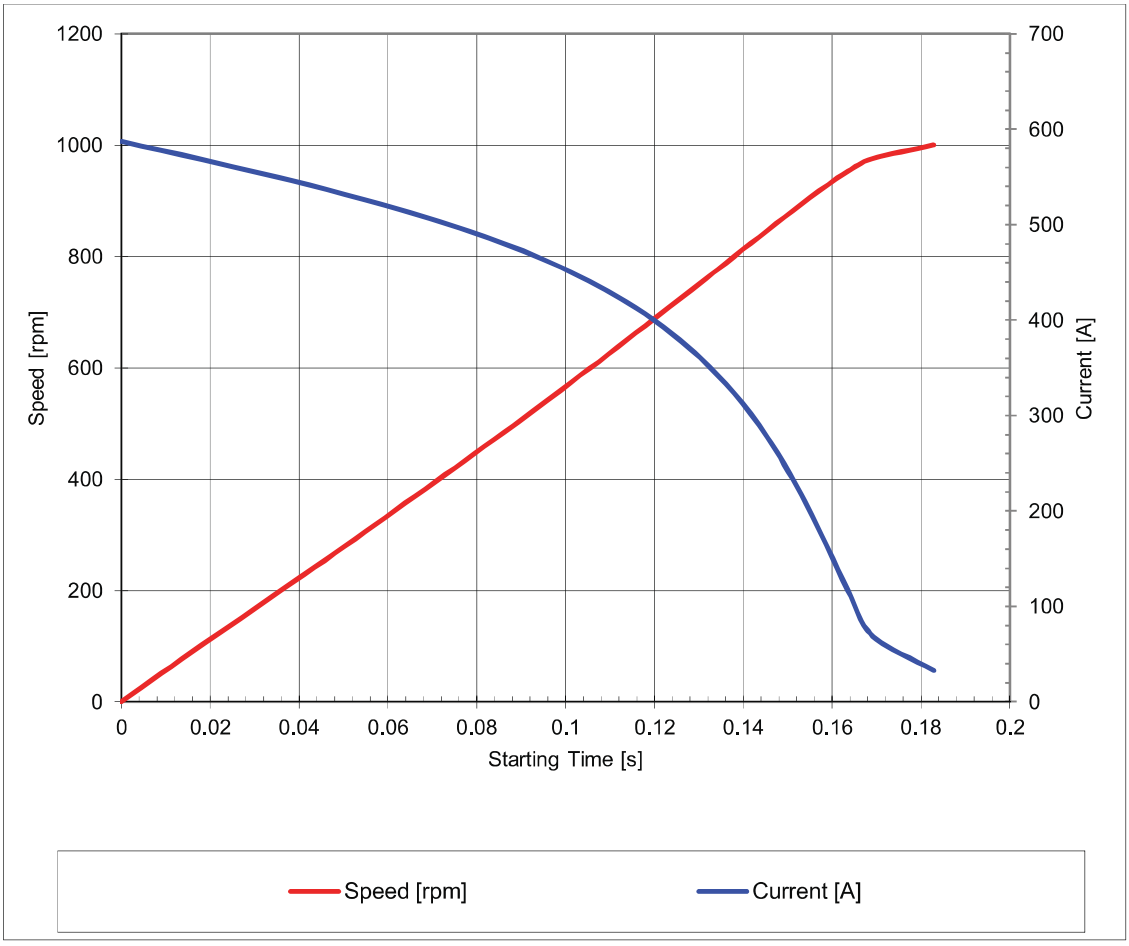


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Current & Speed Vs Time		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00004
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 4(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KHX+280SMC6				
Product code	HX+2 80S MC6-ADCIN		Frequency (Hz)	50	
Rated output P_N	55	kW	Rated current I_N	97.8	A
Type of duty	S4 duty 300 starts/Hr, 40% CDF				

J_{motor} (kgm2)	2	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*2.3*	T_{start}/T_N	*2.3*
Speed (r/min)	985	Starting time (s)	*0.2*	Starting time (s)	
T_N (Nm)	533	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*6*	I_s/I_n	*6*
		T_{max}/T_n	*2.5*	T_{max}/T_n	*2.5*

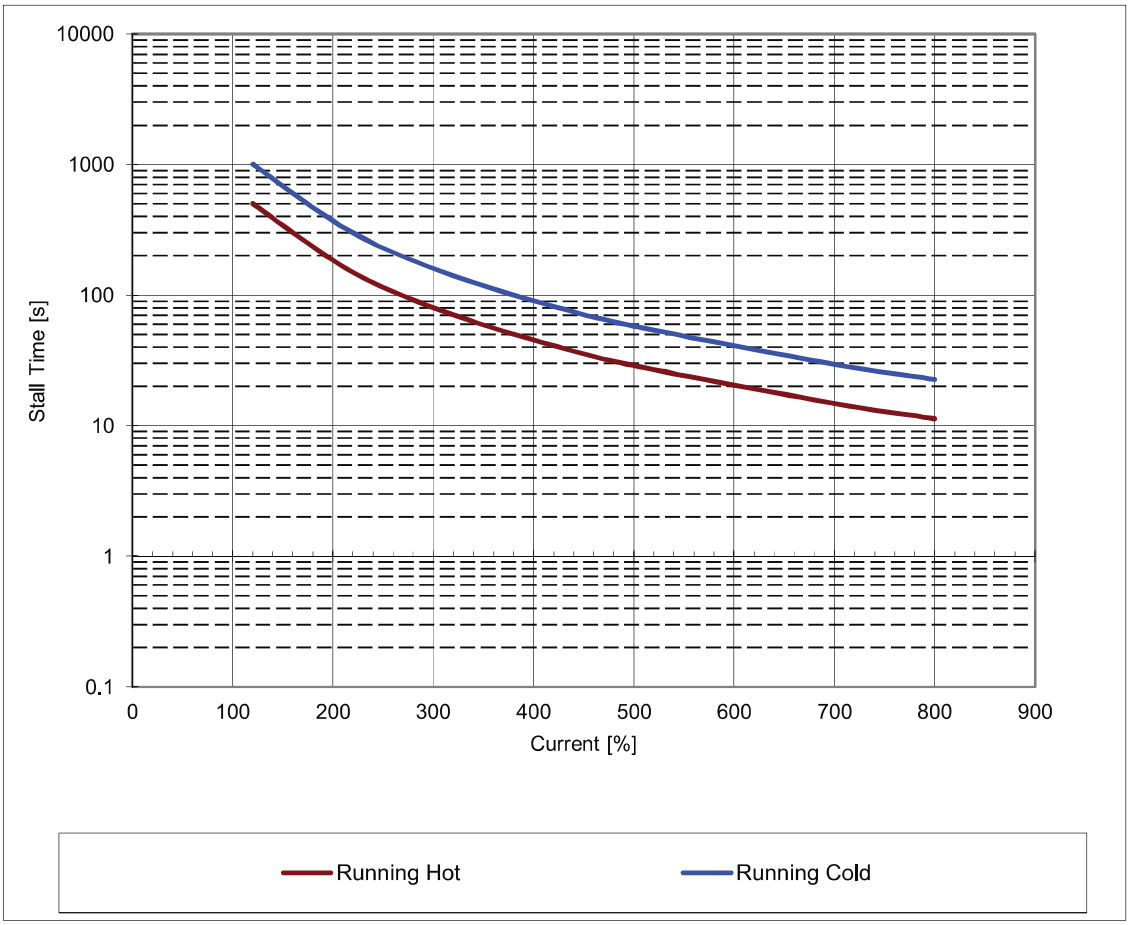


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Thermal Withstand Curve		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00004
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 5(3)

Type of product	**TEFC, 3-phase, squirrel cage induction motor**				
Type/Frame	**KHX+280SMC6**				
Product code	**HX+2 80S MC6-ADCIN**		Frequency (Hz)	**50**	
Rated output P_N	**55**	kW	Rated current I_N	**97.8**	A
Type of duty	**S4 duty 300 starts/Hr, 40% CDF**				

J_{motor} (kgm2)	**2**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***2.3***	T_{start}/T_N	***2.3***
Speed (r/min)	**985**	Withstand cold(s)	***40***	Withstand hot (s)	***20***
T_N (Nm)	**533**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***6***	I_s/I_n	***6***
		T_{max}/T_n	***2.5***	T_{max}/T_n	***2.5***

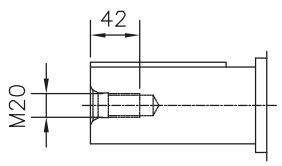


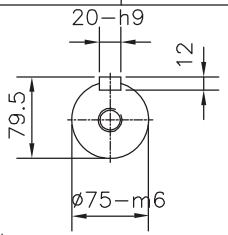
Applicable standards: IS 12615 2018 28.7.2015

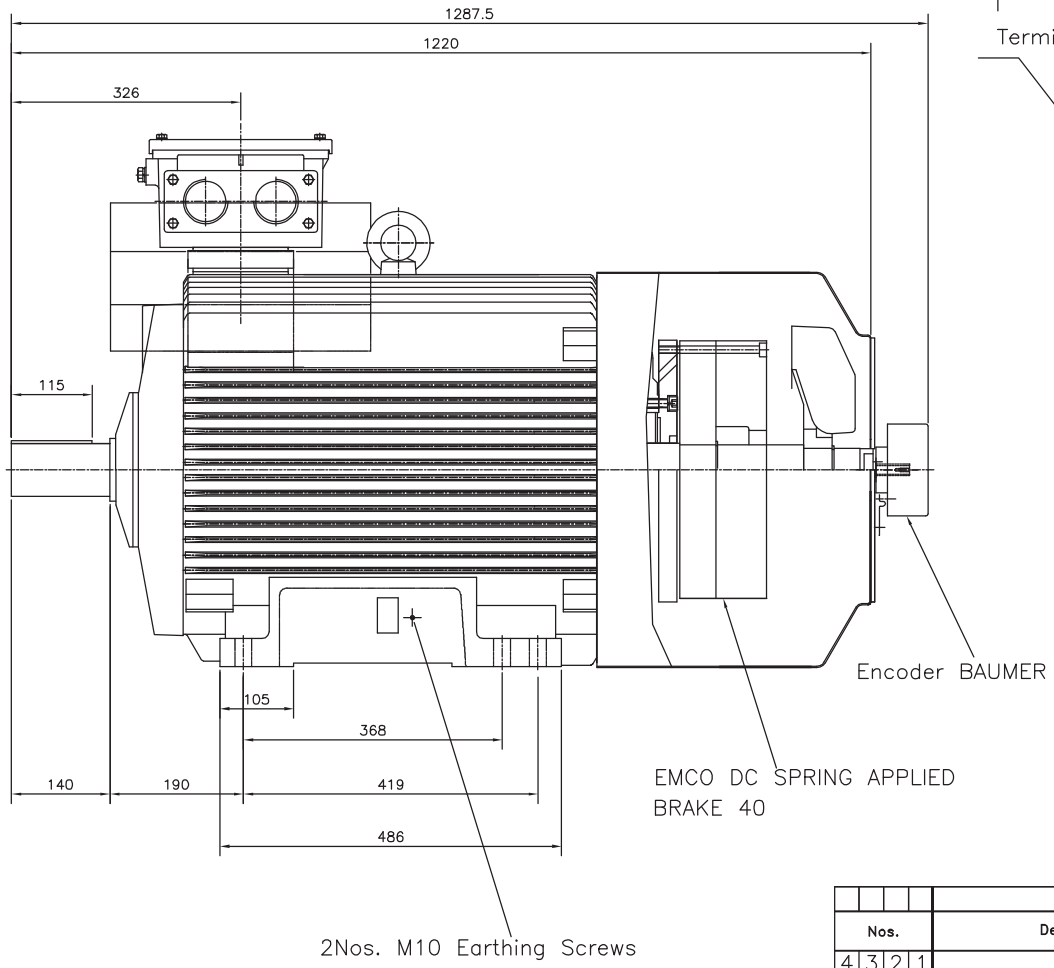
Drawing No.	Rev.
3GYN 390188	

Rev.	Zone	Revision	Sign.

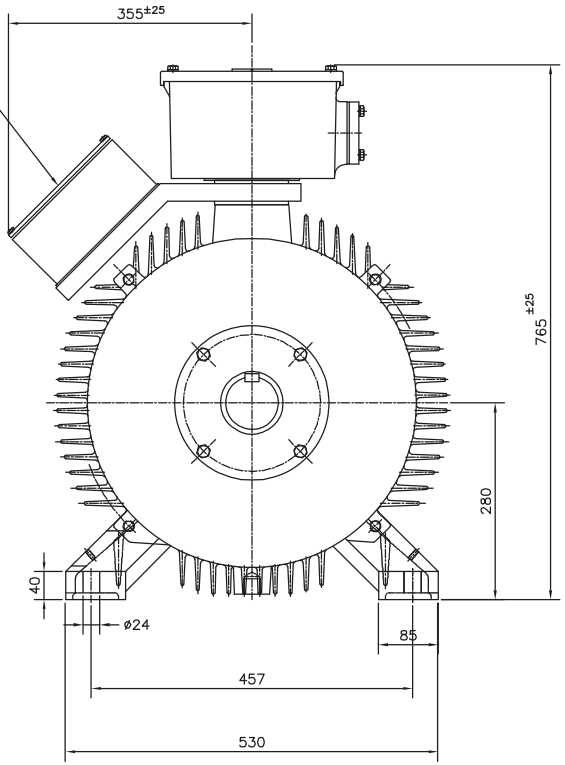
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED. | DO NOT SCALE | PLEASE ASK, IF IN DOUBT







Terminal Box Accessories



Note: Only mounting provision for brake and encoder EIL580.

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks
4 3 2 1						

Responsible Department ATEMLR
Tolerance acc. to unless otherwise stated.
Scale 1:1 Proj.

Title: Dimension Drawing

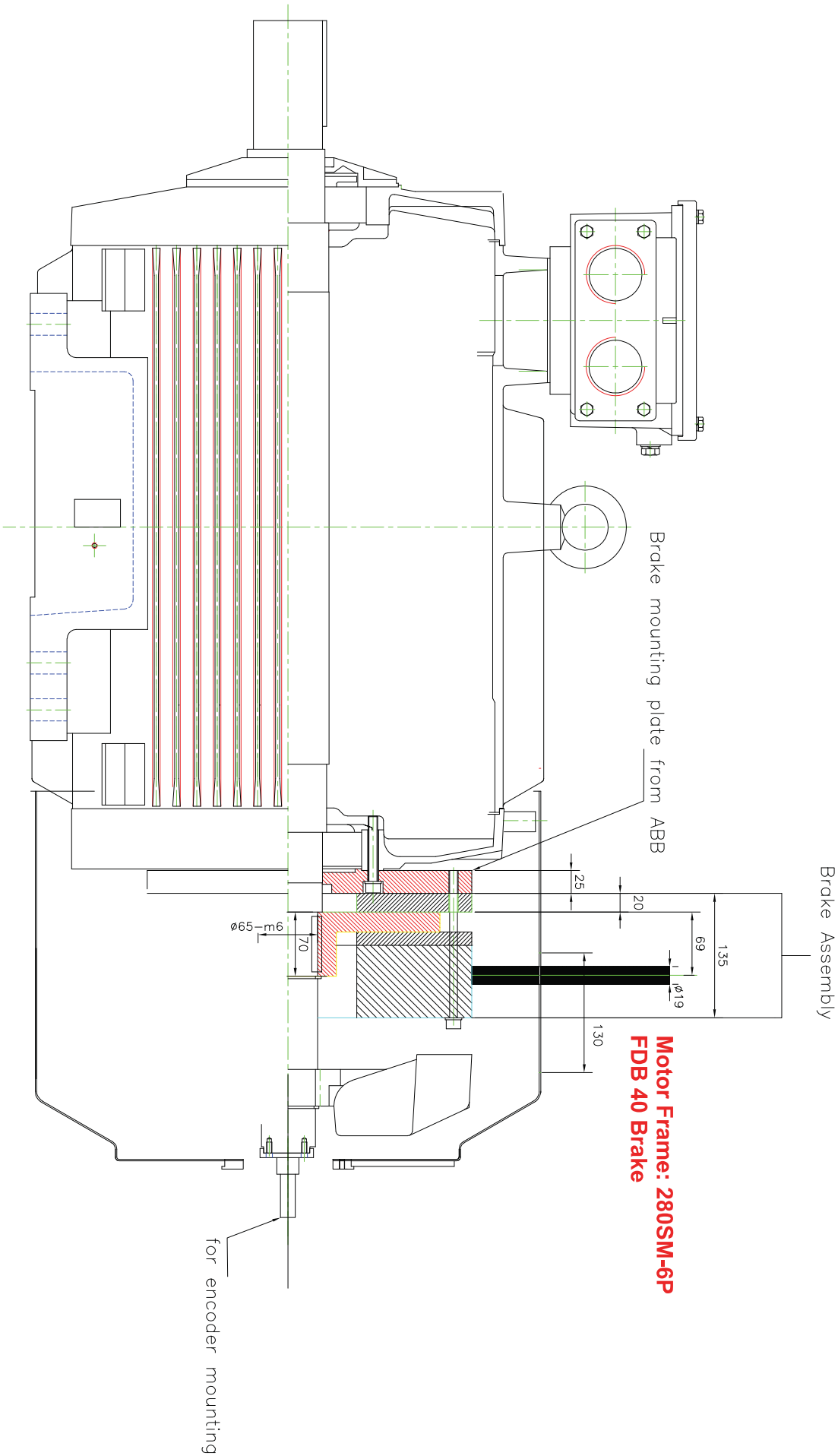
Used on HX+280SM 4..6P (Brake emco 40+ Hollow Tacho+Acc)

ABB Ltd.
Faridabad – 121 001

Drawn 2k19.07.08 SBU
Checked
Approved
Superseded by

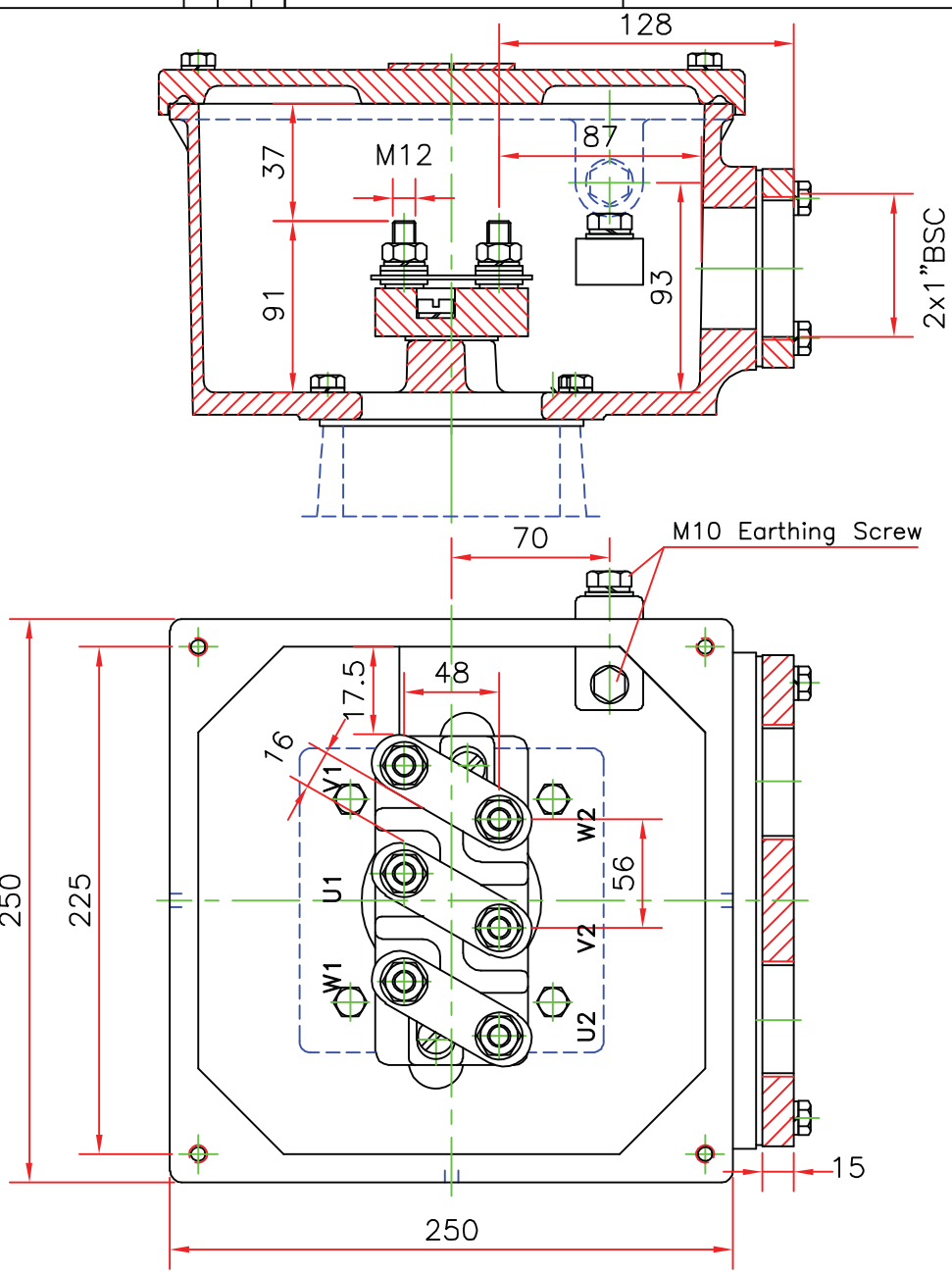
Drawing No. 3GYN 390188 Rev.
Supersedes

THIS IS PART OF TECHNICAL SPECIFICATION RE-TS-137-501-A001A REV 0



Motor Frame: 280SM-6P
FDB 40 Brake

Drawing No.	Rev.	ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3GYN 490777	A	DO NOT SCALE / PLEASE ASK, IF IN DOUBT



* Degree of protection:–IP55
* Main Terminal box short circuit capacity shall be suitable for 50KA for 0.25 second.
* Terminal box shall be capable of turning 360 deg in steps of 90 deg
* Terminal box shall be suitable for termination of cable 1Rx4Cx16 Sq.mm XLPE,AL/Cu Cable with OD:21.0MM
* TWO ENTRY SHALL BE PROVIDED & ONE WILL BE PLUGGED

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks
3 2 1	Responsible Department ATEMLR					
	Tolerance acc. to unless otherwise stated.					
	Scale / Proj.					

Title: Terminal Box Dimension Drawing

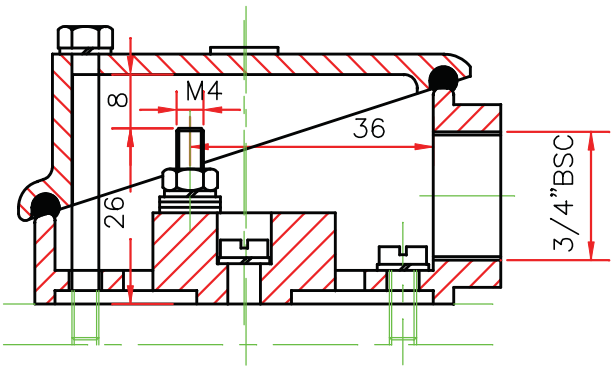
Used on HX 280

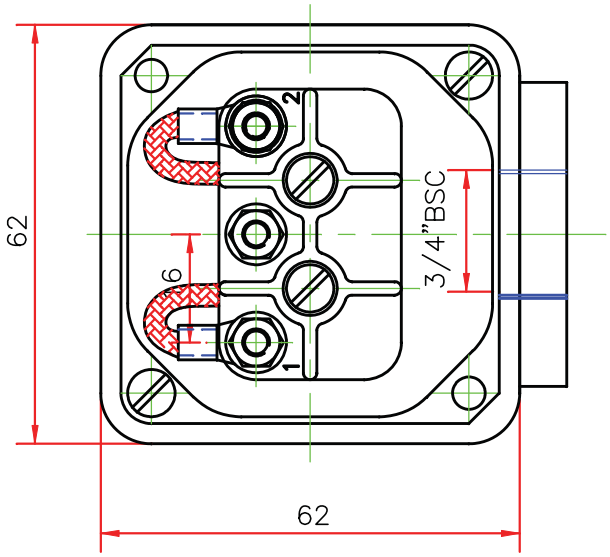
ABB Ltd.
Faridabad – 121 001

Drawn	2k3.02.03 MG	Drawing No.	Rev.
Checked		3GYN 490777	A
Approved			
Superseded by		Supersedes	25

Revision history: A 2k11.08.24 (Inside earthing Shown); B BRJ; C; D; E

Drawing No.	Rev.	ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3GYN 453110		DO NOT SCALE / PLEASE ASK, IF IN DOUBT

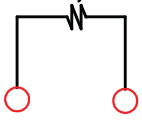




Connection Diagram

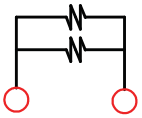
For Space heater

1 x 240V, 50 watt



280frame

2 x 240V, 50 watt



315 and above

Nos.	Description	Item	Material Specification	Weight (kg)	Drawing No. / Specification	Remarks

Responsible Department IMOR

Tolerance acc. to unless otherwise stated.

Scale / Proj.

Title: Terminal Box Dimension Drawing

Used on: Terminal Box for Space Heater

ABB Ltd.
Faridabad – 121 001

Drawn	981216	GDM	Drawing No.	Rev.
Checked			3GYN 453110	
Approved				
Superseded by			Supersedes	

MOTOR DATASHEET FOR CROSS TRAVEL

OF 250/50/10T POWER HOUSE DOUBLE GIRDER CRANE

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	ABB India
2	Motor type	Squirrel cage induction motor
3	Type of starting	VFD
4	Name of the equipment driven by motor & Quantity	Cross travel motor of power house crane, 2nos
5	Maximum Power requirement of driven equipment	3.2KW
6	Rated speed of Driven Equipment	960 RPM (regulated by VFD and adjustable at site by VFD
7	Design ambient temperature	40 deg C
B.	**Design and Performance Data**	
1	Frame size & type designation	KM2BAX 132SMB 6
2	Type of duty	S4
3	Rated Voltage	415
4	Permissible variation for	
5	a Voltage	+10%,-10%
6	b Frequency	+3%,-3%
7	c) Combined voltage & frequency	10% (absolute sum)
8	Rated output at design ambient temp (by resistance method)	4 kw
9	Synchronous speed & Rated slip	960 RPM, 4%
10	Minimum permissible starting voltage	80%
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	Depends of VFD starting
13	b) At min starting voltage	Depends of VFD starting
14	Locked rotor current as percentage of FLC (including IS tolerance)	NA for VFD starting
15	Torque	
	a) Starting	160%
	b) Maximum	270%
16	Permissible temp rise at rated output over ambient temp & method	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C ambient
17	Noise level at 1.0 m (dB	85 db at 1m
18	Amplitude of vibration	2.8 mm/s
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	86% / 0.64
	c) At 75% load	86.5% / 0.56

S. No.	Description	Data to be filled by successful bidder
	c) At 50% Load	85.5% / 0.43
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	Delta
2	Applicable Standard	IS 12615:2018
3	DOP of Enclosure	TEFC
4	Method of cooling	IC 411
5	Class of insulation	Class F
6	Main terminal box	
	a) Type	Stud type
	b) Power Cable details (Conductor, size, armour/unarmour)	4C x 2.5 sqmm (One hole pluged and other utilize for cable entry)
	c) Cable Gland & lugs details (Size, type & material)	Fafeco Scope, Gland and lug size shall be suitable for Cable and motor terminal size.
	d) Permissible Fault level (kArms & duration in sec)	50kA for 0.25 sec
7	Space heater details (Voltage & watts)	NA
8	Flame proof motor details (if applicable)	NA
	a) Enclosure	NA
	b) suitability for hazardous area	NA
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	6
10	Winding connection	Delta
11	Kind of rotor winding	Die cast Aluminum construction
12	Kind of bearings	Ball bearings
13	Direction of rotation when viewed from NDE	Bi directional
14	Paint Shade & type	Light grey 631 of IS 5
15	Net weight of motor	72
16	Outline mounting drawing No (To be enclosed as annexure)	3GZ500013-178
D.	**Characteristic curves/ drawings**	
	a) Torque speed characteristic	Attached
	b) Thermal withstand characteristic	Attached
	c) Current vs time	Attached
	d) Speed vs time	Attached

ABB Motors and Generators	Technical Data Sheet		
	Project	Location	
Department/Author	Customer name	Customer ref.	**Application** **power house crane**
Our ref.	Rev/Changed by **A**	Date of issue **01-07-2019**	Saving ident **untitled.xls**	Pages **1(3)**

No.	Definition	Data	Unit	Remarks	
1	Product	***TEFC, 3-phase, squirrel cage induction motor***			
2	Product code	***3GBA 133 220-ADDIN***			
3	Type/Frame	***KM2BAX 132SMB 6***			
4	Mounting	***IM1001, B3(foot)***			
5	Rated output P_N	***4***	kW		
6	Service factor	***1***			
7	Type of duty	***S4 duty 300 starts/Hr 40% CDF***			
8	Rated voltage U_N	***415***	VD	+10, -10 %	
9	Rated frequency f_N	***50***	Hz	+3, -3 %	
10	Rated speed n_N	***960***	r/min		
11	Rated current I_N	***10.1***	A		
12	Quantity	***2***	Nos		
13	Starting current I_s/I_N	***6***			
14	Nominal torque T_N	***40***	Nm		
15	Locked rotor torque T_S/T_N	***1.6***			
16	Maximum torque T_{max}/T_N	***2.7***			
17	Min voltage for starting	***80% of rated voltage***			
18					
	Load characteristics	Load %	Current A	Efficiency %	Power factor
19	PLL determined from residual loss	*100*	**10.1**	**86**	**0.64**
20		*75*	**8.6**	**86.5**	**0.56**
21		*50*	**7.6**	**85.5**	**0.43**
22					
23	Thermal withstand time hot	***12***	s		
24	Thermal withstand time cold	***24***	s		
25	Insulation class / Temperature class	***F / B***			
26	Ambient temperature	***40***	°C		
27	Altitude	***1000***	m.a.s.l.		
28	Degree of protection	***IP55***			
29	Cooling system	***IC411***			
30	Bearing DE/NDE	***6208-2Z/C3 - 6208-2Z/C3***		Ball bearings (sealed)	
31	Sound pressure level (LP dB(A) 1m)	***67***	dB(A)	at no-load	
32	Moment of inertia J = ¼ GD2	***0.0354***	kg-m2		
33	Position of terminal box	***Top***			
34	Direction of rotation	***Bi-directional***			
35	Total weight of motor	***72***	kg		
36	Paint shade	***Light gey 631 of IS 5***			
37	Cable size	***4C x 2.5 sqmm (One hole pluged and other utilize for cable entry)***			
38	Conduit entry size	***2 nos x M32***			
39	Method of starting	***VFD***			
40	S4 duty 300 starts/Hr, 40% CDF				
41	Equivalent S1 kw	***3.7 kw***			
42	IE2 efficiency at equivalent S1 kw	***84.3%***			
43	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C				
44					
45					
Ex-motors					
46					
47					
48					

Option	Variant Codes / Definition
49	VPI
50	Double shaft extension
51	Light gey 631 of IS 5
52	Encoder mounting arrangement
	Only brake provision
	EN 24 shaft

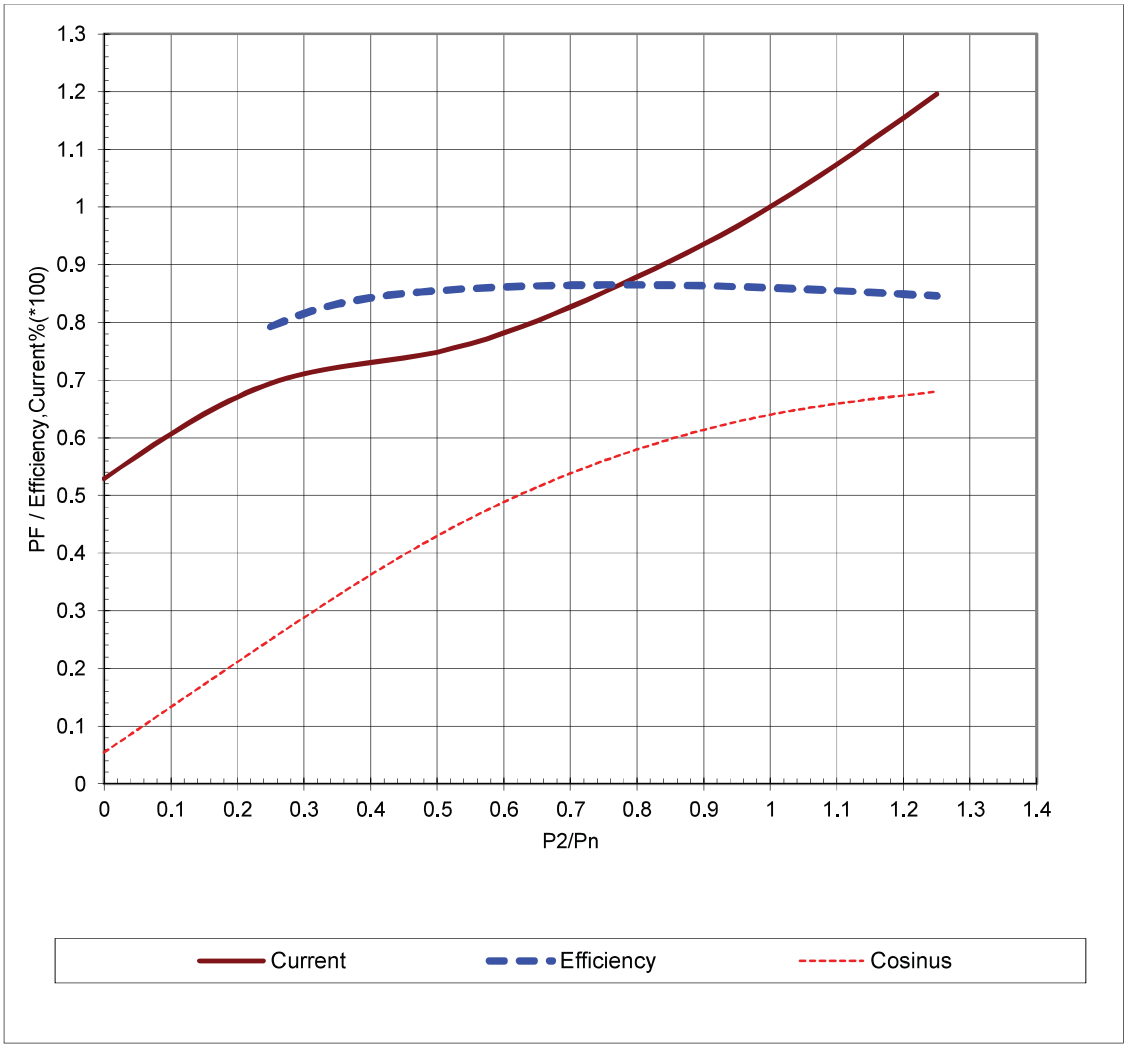
Remarks:

Applicable standards: IS 12615 2018

ABB Motors and Generators	Load Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00002
Our ref.	Rev/Changed by: A	Date of issue: 01-07-2019	Saving ident: untitled.xls / Pages: 2(3)

Product	TEFC, 3-phase, squirrel cage induction motor		
Type/Frame	KM2BAX 132SMB 6		
Product code	3GBA 133 220-ADDIN		
Rated output P_N	4 kW		
Type of duty	S4 duty 300 starts/Hr 40% CDF		

Voltage (V)	415	Current I_N (A)	10.1	Power factor at P_N	0.64
Frequency (Hz)	50	Speed (r/min)	960	Efficiency (%) at P_N	86

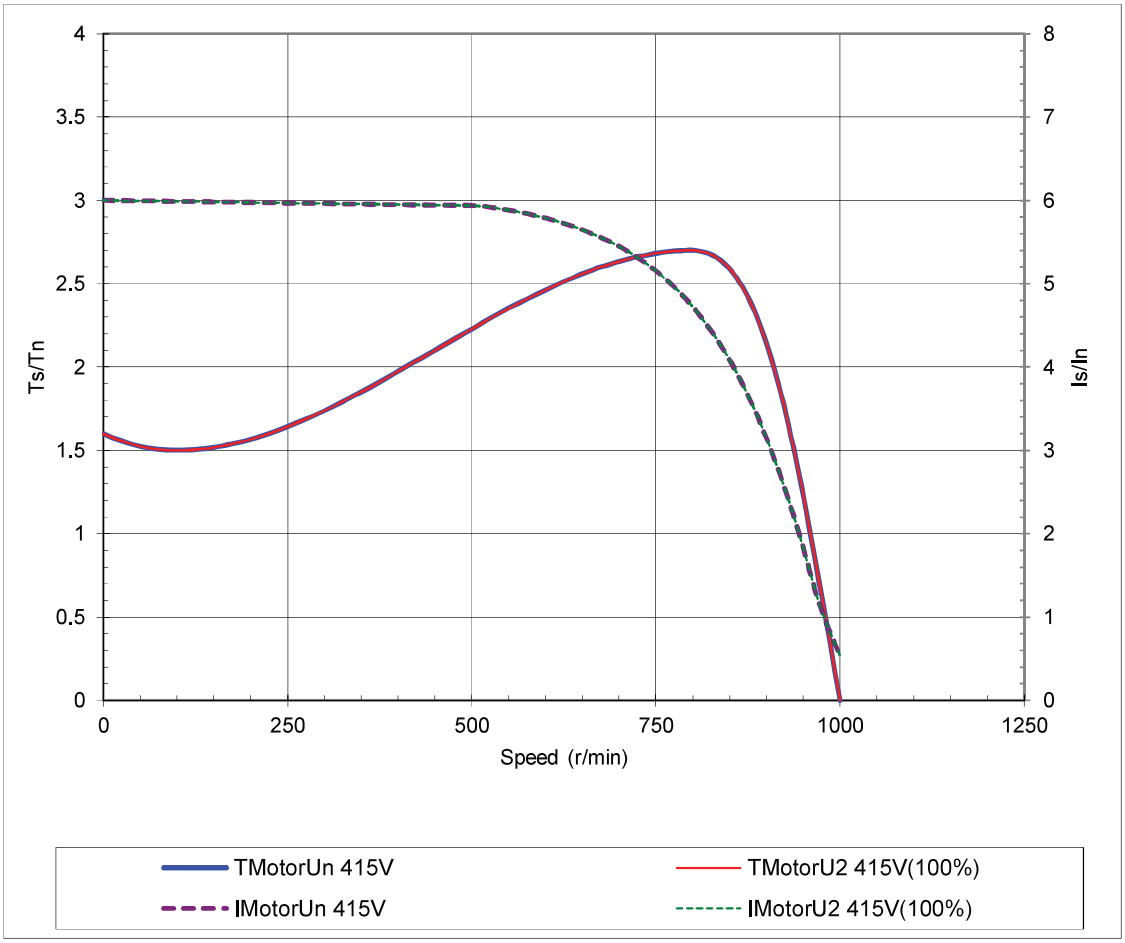


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Starting Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00002
Our ref.	Rev/Changed by Date of issue	Saving ident	Pages
	A 01-07-2019	untitled.xls	3(3)

Type of product	**TEFC, 3-phase, squirrel cage induction motor**				
Type/Frame	**KM2BAX 132SMB 6**				
Product code	**3GBA 133 220-ADDIN**		Frequency (Hz)	**50**	
Rated output P_N	**4**	kW	Rated current I_N	**10.1**	A
Type of duty	**S4 duty 300 starts/Hr 40% CDF**				

J_{motor} (kgm2)	**0.0354**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***1.6***	T_{start}/T_N	***1.6***
Speed (r/min)	**960**	Starting time (s)		Starting time (s)	
T_N (Nm)	**40**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***6***	I_s/I_n	***6***
		T_{max}/T_n	***2.7***	T_{max}/T_n	***2.7***

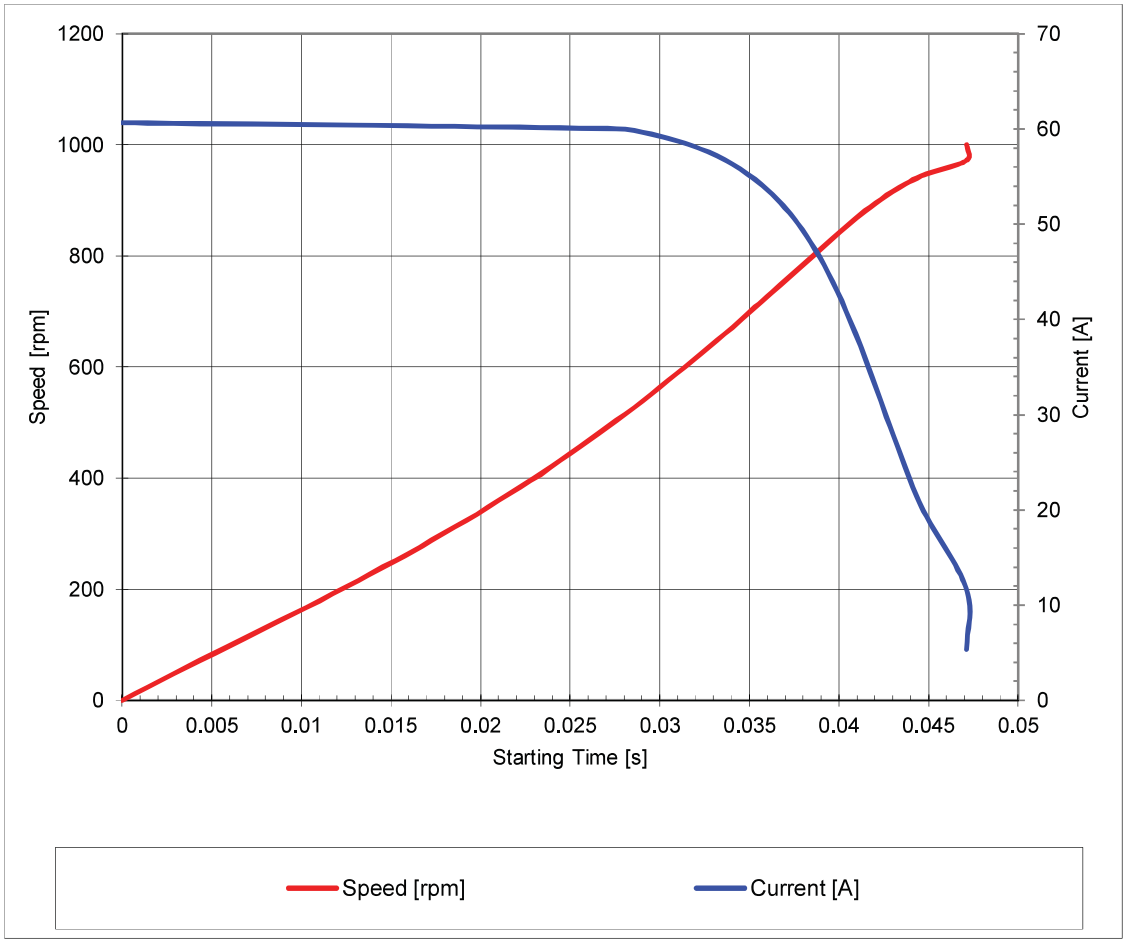


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Current & Speed Vs Time		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00002
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 4(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KM2BAX 132SMB 6				
Product code	3GBA 133 220-ADDIN		Frequency (Hz)	50	
Rated output P_N	4	kW	Rated current I_N	10.1	A
Type of duty	S4 duty 300 starts/Hr 40% CDF				

J_{motor} (kgm2)	0.0354	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*1.6*	T_{start}/T_N	*1.6*
Speed (r/min)	960	Starting time (s)		Starting time (s)	
T_N (Nm)	40	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*6*	I_s/I_n	*6*
		T_{max}/T_n	*2.7*	T_{max}/T_n	*2.7*

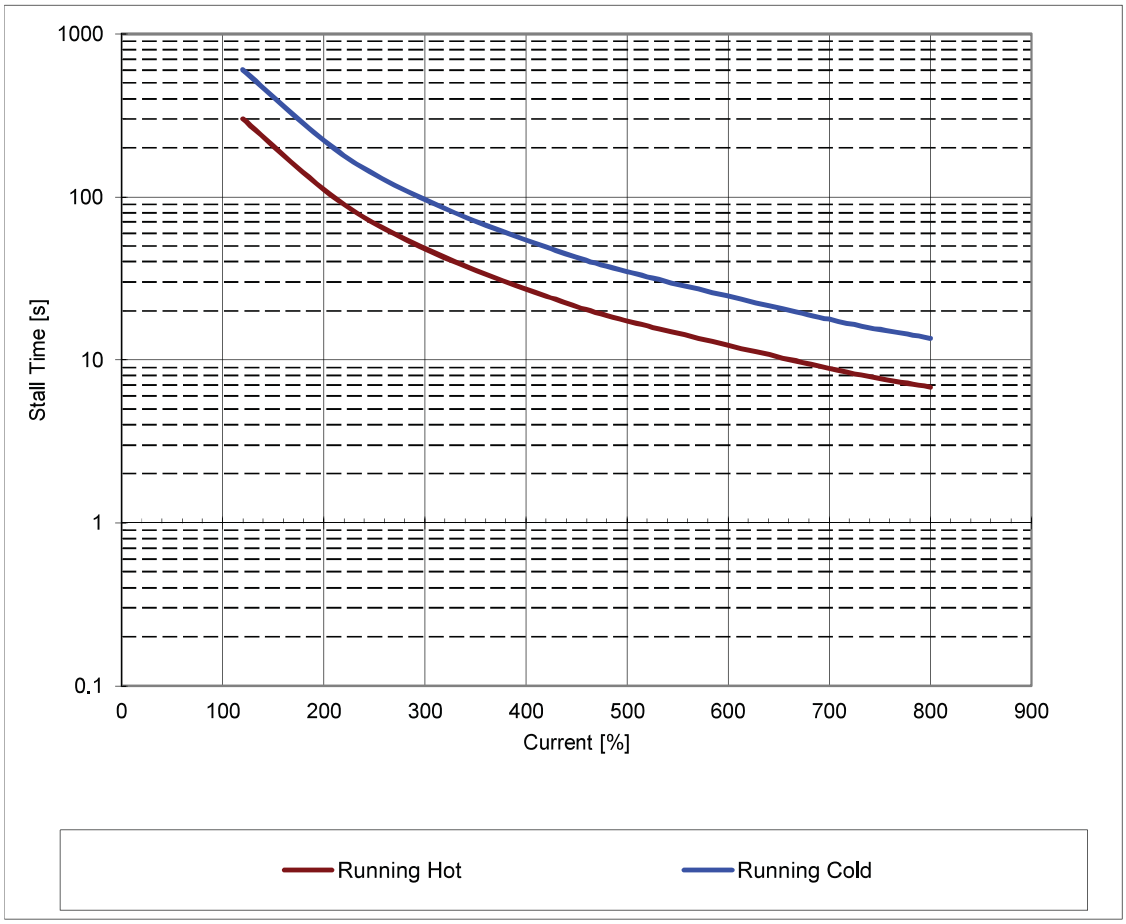


Applicable standards: IS 12615 2018 28.7.2015

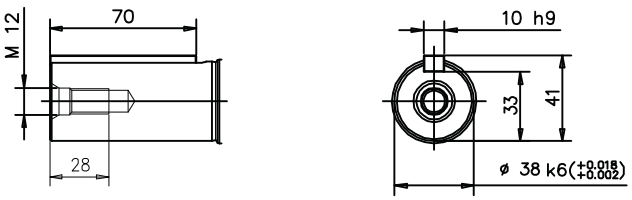
ABB Motors and Generators	Thermal Withstand Curve		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00002
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 5(3)

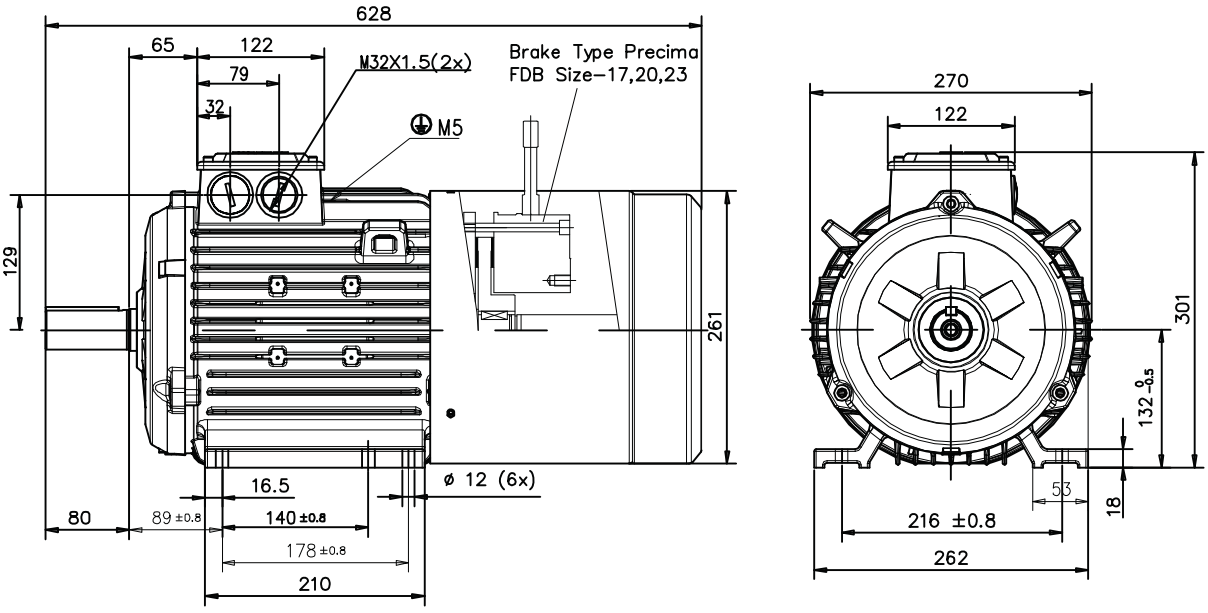
Type of product	**TEFC, 3-phase, squirrel cage induction motor**				
Type/Frame	**KM2BAX 132SMB 6**				
Product code	**3GBA 133 220-ADDIN**		Frequency (Hz)	**50**	
Rated output P_N	**4**	kW	Rated current I_N	**10.1**	A
Type of duty	**S4 duty 300 starts/Hr 40% CDF**				

J_{motor} (kgm2)	**0.0354**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***1.6***	T_{start}/T_N	***1.6***
Speed (r/min)	**960**	Withstand cold(s)	***24***	Withstand hot (s)	***12***
T_N (Nm)	**40**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***6***	I_s/I_n	***6***
		T_{max}/T_n	***2.7***	T_{max}/T_n	***2.7***



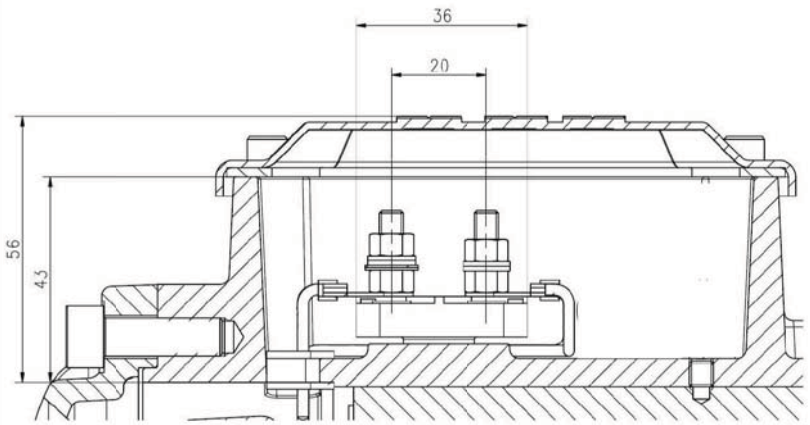
Applicable standards: IS 12615 2018 28.7.2015

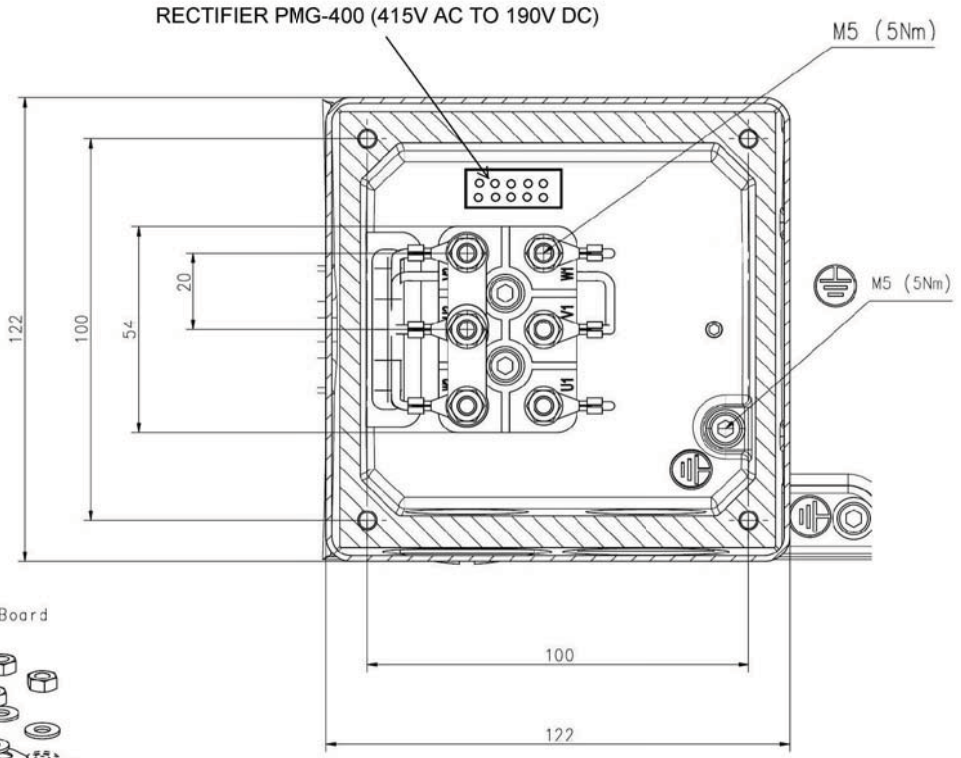




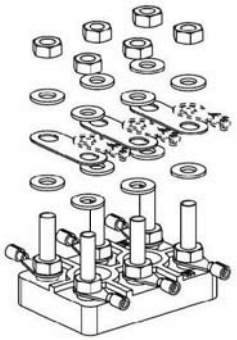
*MOTOR WITH BRAKE FDB-20 (BORE DIA=35MM).
*BREAKING TORQUE 100Nm & SEAFTY FACTOR 1.53

Motor Dimension Print	Motor Type : M2BAX 132SM 2-8P	Document Nº : 3GZH500013-88
Description : Motor foot mounted IM1001 (with Brake FDB 17,20,23)		
Unit : ABB, LV Motors, India Date : 2018-06-04	Issued by : DANISH Approved by : DKS	Replaces : Replaced by :
ABB India Ltd.	Customer Reference :	ABB

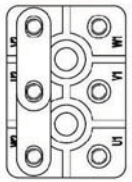




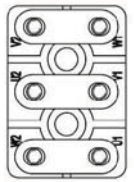
Terminal Board

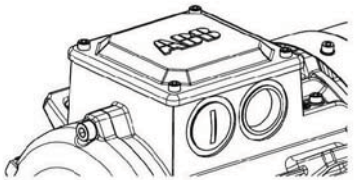


Y-connection



D-connection





Comment: 1/1	**Dimension Print**	Motor Type: M2BAX 100-132	Document No: 3GZH500010-3
	Description: Terminal box		
	Unit: Motors	Issued by: MGB	Replaces:
	Date: 05.19.2014	Approved by: SAA	Replaced by:
	ABB Ltd.	Customer Reference:	ABB

MOTOR DATASHEET FOR LONG TRAVEL OF 250/50/10T POWER HOUSE DOUBLE GIRDER CRANE

AND

MOTOR DATASHEET OF HOIST OF 10T ELECTRIC HOIST OF CRANE

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	ABB India
2	Motor type	Squirrel cage induction motor
3	Type of starting	VFD
4	Name of the equipment driven by motor & Quantity	Long Travel motor of Power House Crane and hoist motor of 10T Electric Hoist, 10 nos
5	Maximum Power requirement of driven equipment	5.6KW
6	Rated speed of Driven Equipment	961 RPM (regulated by VFD and adjustable at site by VFD parameters)
7	Design ambient temperature	40 deg C
B.	**Design and Performance Data**	
1	Frame size & type designation	KM2BAX 132MLA 6
2	Type of duty	S4
3	Rated Voltage	415
4	Permissible variation for	
5	a Voltage	+10%,-10%
6	b Frequency	+3%,-3%
7	c) Combined voltage & frequency	10% (absolute sum)
8	Rated output at design ambient temp (by resistance method)	6.5kw
9	Synchronous speed & Rated slip	961 RPM, 3.9%
10	Minimum permissible starting voltage	80%
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	Depends of VFD starting
13	b) At min starting voltage	Depends of VFD starting
14	Locked rotor current as percentage of FLC (including IS tolerance)	NA for VFD starting
15	Torque	
	a) Starting	160%
	b) Maximum	280%
16	Permissible temp rise at rated output over ambient temp & method	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C ambient
17	Noise level at 1.0 m (dB	85 db at 1m
18	Amplitude of vibration	2.8 mm/s
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	87.7% / 0.68
	c) At 75% load	88% / 0.61

S. No.	Description	Data to be filled by successful bidder
	c) At 50% Load	87% / 0.49
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	Delta
2	Applicable Standard	IS 12615:2018
3	DOP of Enclosure	TEFC
4	Method of cooling	IC 411
5	Class of insulation	Class F
6	Main terminal box	
	a) Type	Stud type
	b) Power Cable details (Conductor, size, armour/unarmour)	4C x 2.5 sqmm (One hole pluged and other utilize for cable entry)
	c) Cable Gland & lugs details (Size, type & material)	Fafeco Scope, Gland and lug size shall be suitable for Cable and motor terminal size.
	d) Permissible Fault level (kArms & duration in sec)	50kA for 0.25 sec
7	Space heater details (Voltage & watts)	NA
8	Flame proof motor details (if applicable)	NA
	a) Enclosure	NA
	b) suitability for hazardous area	NA
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	6
10	Winding connection	Delta
11	Kind of rotor winding	Die cast Aluminum construction
12	Kind of bearings	Ball bearings
13	Direction of rotation when viewed from NDE	Bi directional
14	Paint Shade & type	Light grey 631 of IS 5
15	Net weight of motor	97
16	Outline mounting drawing No (To be enclosed as annexure)	3GZH500013-179
D.	**Characteristic curves/ drawings**	
	a) Torque speed characteristic	Attached
	b) Thermal withstand characteristic	Attached
	c) Current vs time	Attached
	d) Speed vs time	Attached

	e) Load Curve	Attached

ABB Motors and Generators	Technical Data Sheet		
	Project	Location	
Department/Author	Customer name	Customer ref.	**Application** Long Trael motor of Power House Crane and hoist motor of 10T Electric Hoist
Our ref.	Rev/Changed by: **A**	Date of issue: **01-07-2019**	Saving ident: **untitled.xls**
			Pages: **1(3)**

No.	Definition	Data	Unit	Remarks
1	Product	***TEFC, 3-phase, squirrel cage induction motor***		
2	Product code	***3GBA 133 410-ADDIN***		
3	Type/Frame	***KM2BAX 132MLA 6***		
4	Mounting	***IM1001, B3(foot)***		
5	Rated output P_N	***6.5***	kW	
6	Service factor	***1***		
7	Type of duty	***S4 duty 300 starts/Hr 40% CDF***		
8	Rated voltage U_N	***415***	VD	+10, -10 %
9	Rated frequency f_N	***50***	Hz	+3, -3 %
10	Rated speed n_N	***961***	r/min	
11	Rated current I_N	***15.2***	A	
12	Quantity	***10***	Nos	
13	Starting current I_s/I_N	***5.5***		
14	Nominal torque T_N	***65***	Nm	
15	Locked rotor torque T_S/T_N	***1.6***		
16	Maximum torque T_{max}/T_N	***2.8***		
17	Min voltage for starting	***80% of rated voltage***		
18				
	Load characteristics	Load %	Current A	Efficiency %	Power factor
19	PLL determined from residual loss	*100*	**15.2**	**87.7**	**0.68**
20		*75*	**12.6**	**88**	**0.61**
21		*50*	**10.6**	**87**	**0.49**
22				
23	Thermal withstand time hot	***13***	s	
24	Thermal withstand time cold	***26***	s	
25	Insulation class / Temperature class	***F / B***		
26	Ambient temperature	***40***	°C	
27	Altitude	***1000***	m.a.s.l.	
28	Degree of protection	***IP55***		
29	Cooling system	***IC411***		
30	Bearing DE/NDE	***6208-2Z/C3 - 6208-2Z/C3***		Ball bearings (sealed)
31	Sound pressure level (LP dB(A) 1m)	***65***	dB(A)	at no-load
32	Moment of inertia J = ¼ GD2	***0.05334***	kg-m2	
33	Position of terminal box	***Top***		
34	Direction of rotation	***Bi-directional***		
35	Total weight of motor	***97***	kg	
36	Paint shade	***Light gey 631 of IS 5***		
37	Cable size	***4c x 2.5 sqmm (One hole pluged and other utilize for cable entry)***		
38	Conduit entry size	***2 nos x M32***		
39	Method of starting	***VFD***		
40	S4 duty 300 starts/Hr, 40% CDF			
41	Equivalent S1 kw	***5.5 kw***		
42	IE2 efficiency at equivalent S1 kw	***86%***		
43	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C			
44				
45				
Ex-motors				
46				
47				
48				
Option	Variant Codes / Definition			
49	VPI			
50	Double shaft extension			
51	Light gey 631 of IS 5			
52	Encoder mounting arrangement			
	Only brake provision			
	EN 24 shaft			

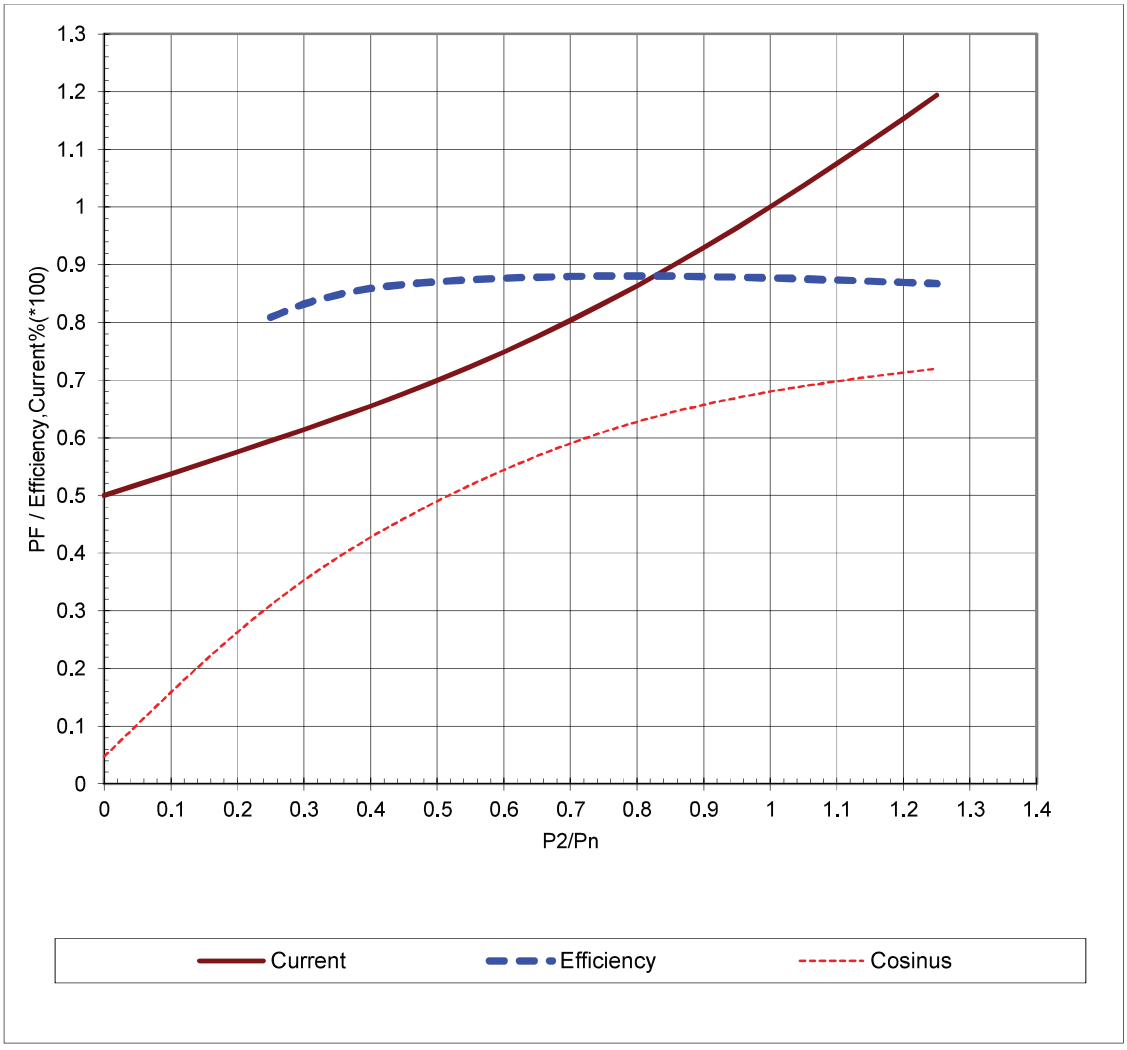
Remarks:

Applicable standards: IS 12615 2018

ABB Motors and Generators	Load Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00003
Our ref.	Rev/Changed by: A	Date of issue: 01-07-2019	Saving ident: untitled.xls
			Pages: 2(3)

Product	**TEFC, 3-phase, squirrel cage induction motor**
Type/Frame	**KM2BAX 132MLA 6**
Product code	**3GBA 133 410-ADDIN**
Rated output P_N	**6.5** kW
Type of duty	**S4 duty 300 starts/Hr 40% CDF**

Voltage (V)	**415**	Current I_N (A)	**15.2**	Power factor at P_N	**0.68**
Frequency (Hz)	**50**	Speed (r/min)	**961**	Efficiency (%) at P_N	**87.7**

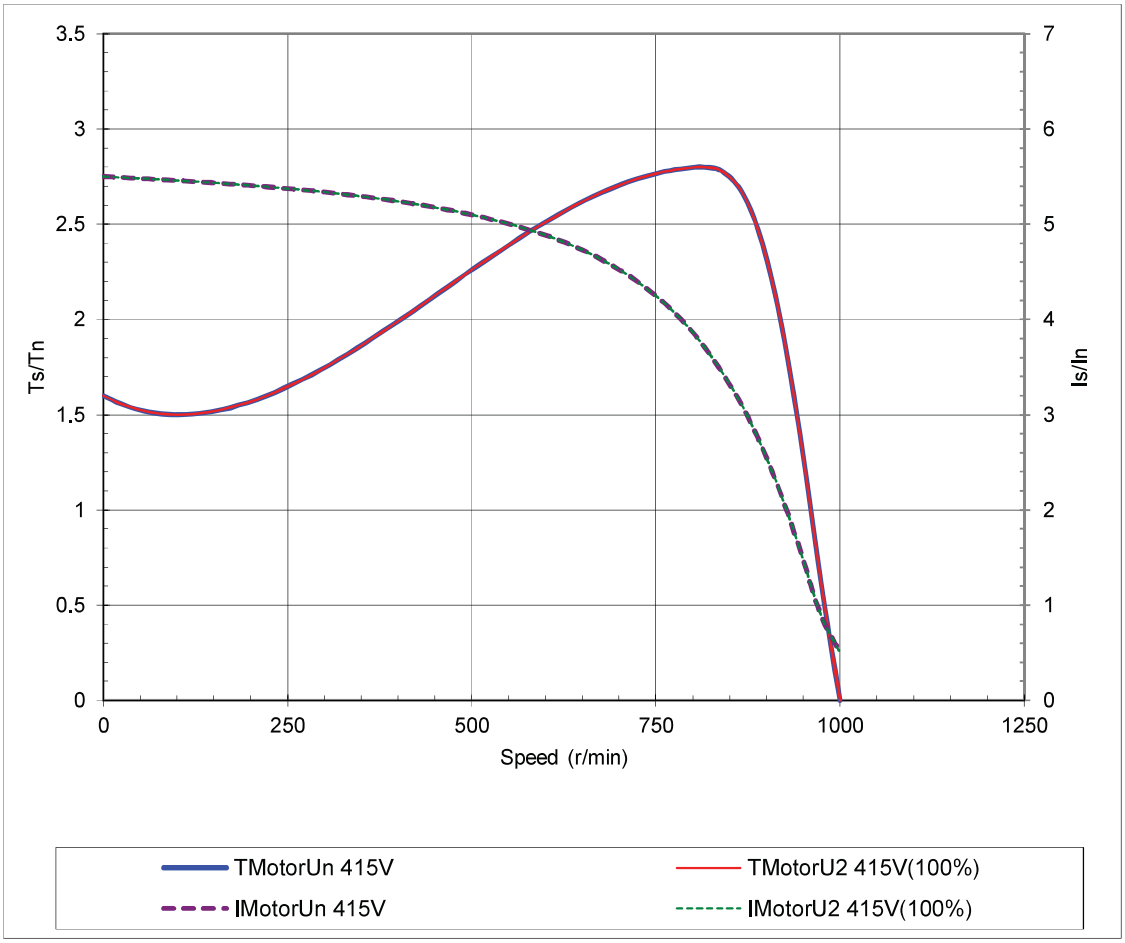


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Starting Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00003
Our ref.	Rev/Changed by Date of issue	Saving ident	Pages
	A 01-07-2019	untitled.xls	3(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KM2BAX 132MLA 6				
Product code	3GBA 133 410-ADDIN		Frequency (Hz)	50	
Rated output P_N	6.5 kW		Rated current I_N	15.2	A
Type of duty	S4 duty 300 starts/Hr 40% CDF				

J_{motor} (kgm2)	0.053	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*1.6*	T_{start}/T_N	*1.6*
Speed (r/min)	961	Starting time (s)		Starting time (s)	
T_N (Nm)	65	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*5.5*	I_s/I_n	*5.5*
		T_{max}/T_n	*2.8*	T_{max}/T_n	*2.8*

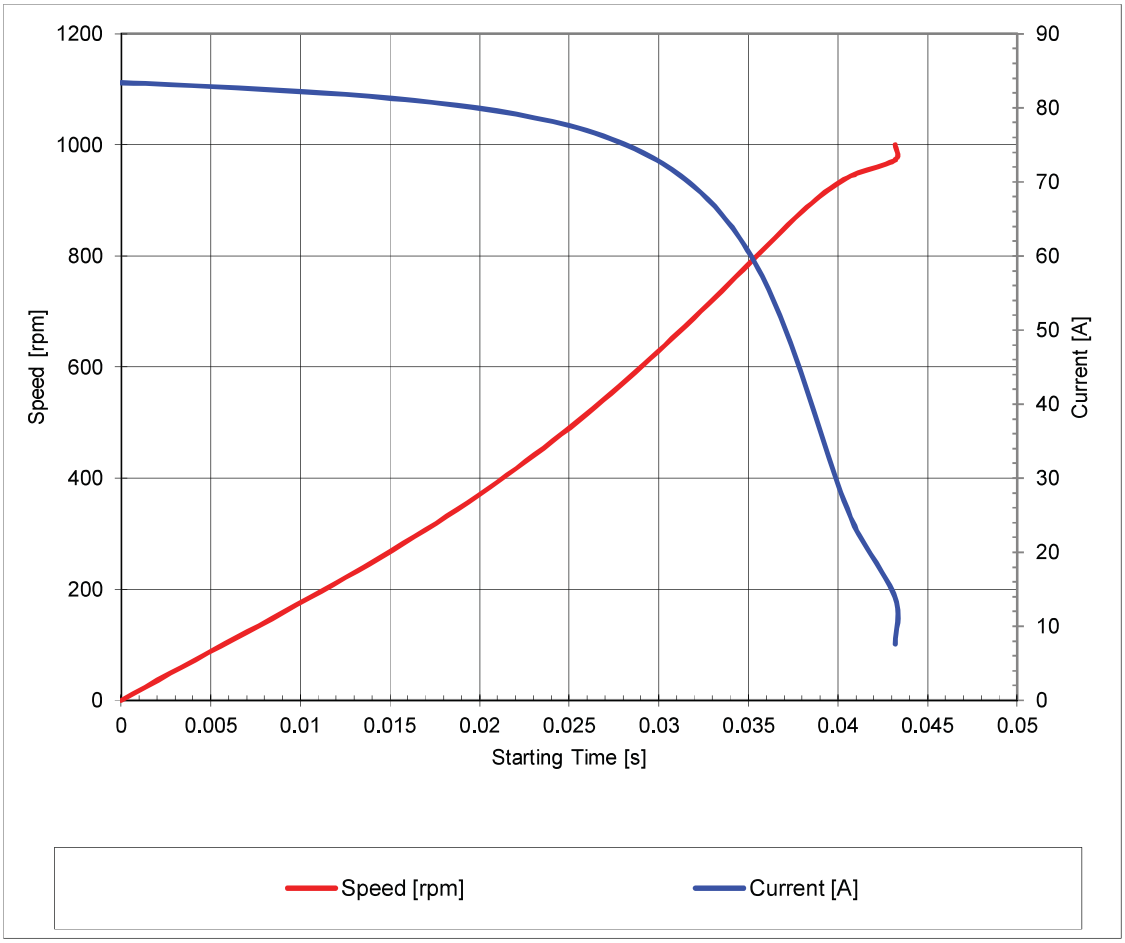


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Current & Speed Vs Time		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00003
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 4(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KM2BAX 132MLA 6				
Product code	3GBA 133 410-ADDIN		Frequency (Hz)	50	
Rated output P_N	6.5	kW	Rated current I_N	15.2	A
Type of duty	S4 duty 300 starts/Hr 40% CDF				

J_{motor} (kgm2)	0.053	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*1.6*	T_{start}/T_N	*1.6*
Speed (r/min)	961	Starting time (s)		Starting time (s)	
T_N (Nm)	65	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*5.5*	I_s/I_n	*5.5*
		T_{max}/T_n	*2.8*	T_{max}/T_n	*2.8*

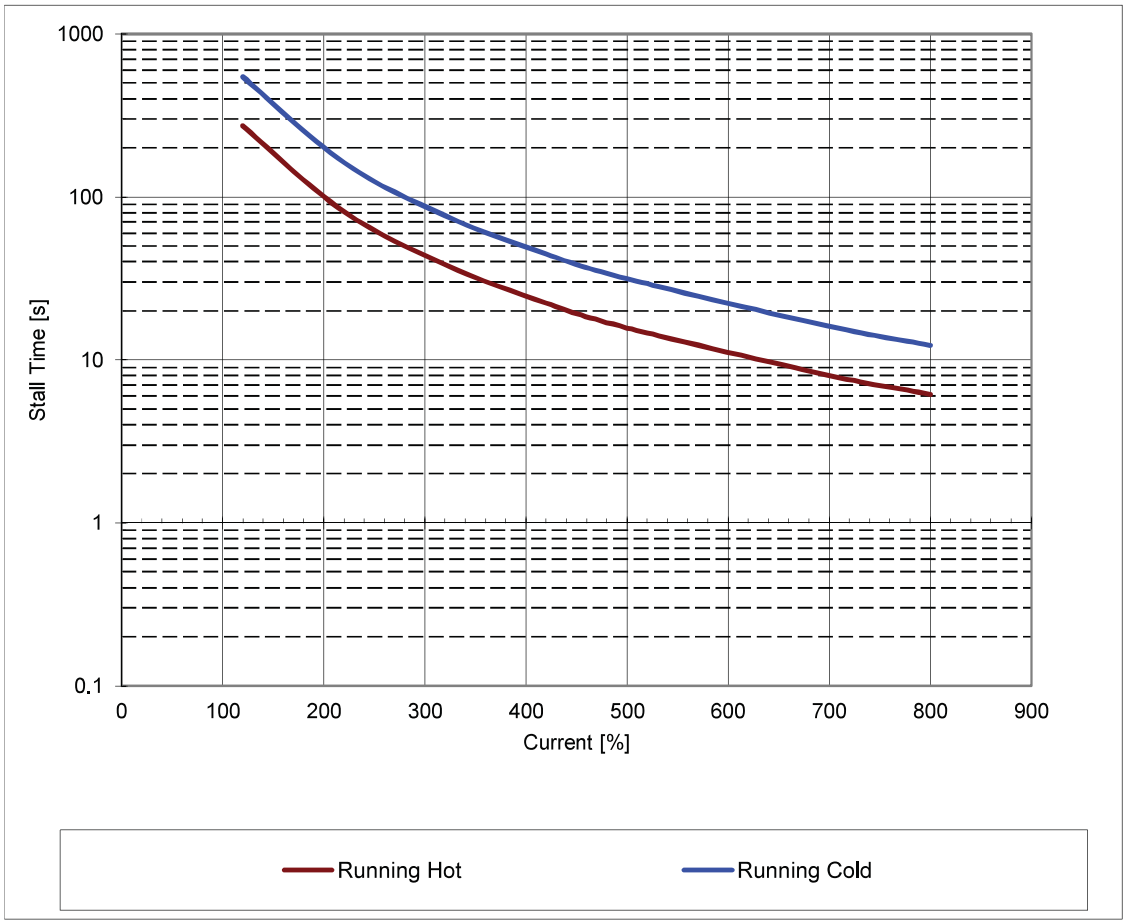


Applicable standards: IS 12615 2018 28.7.2015

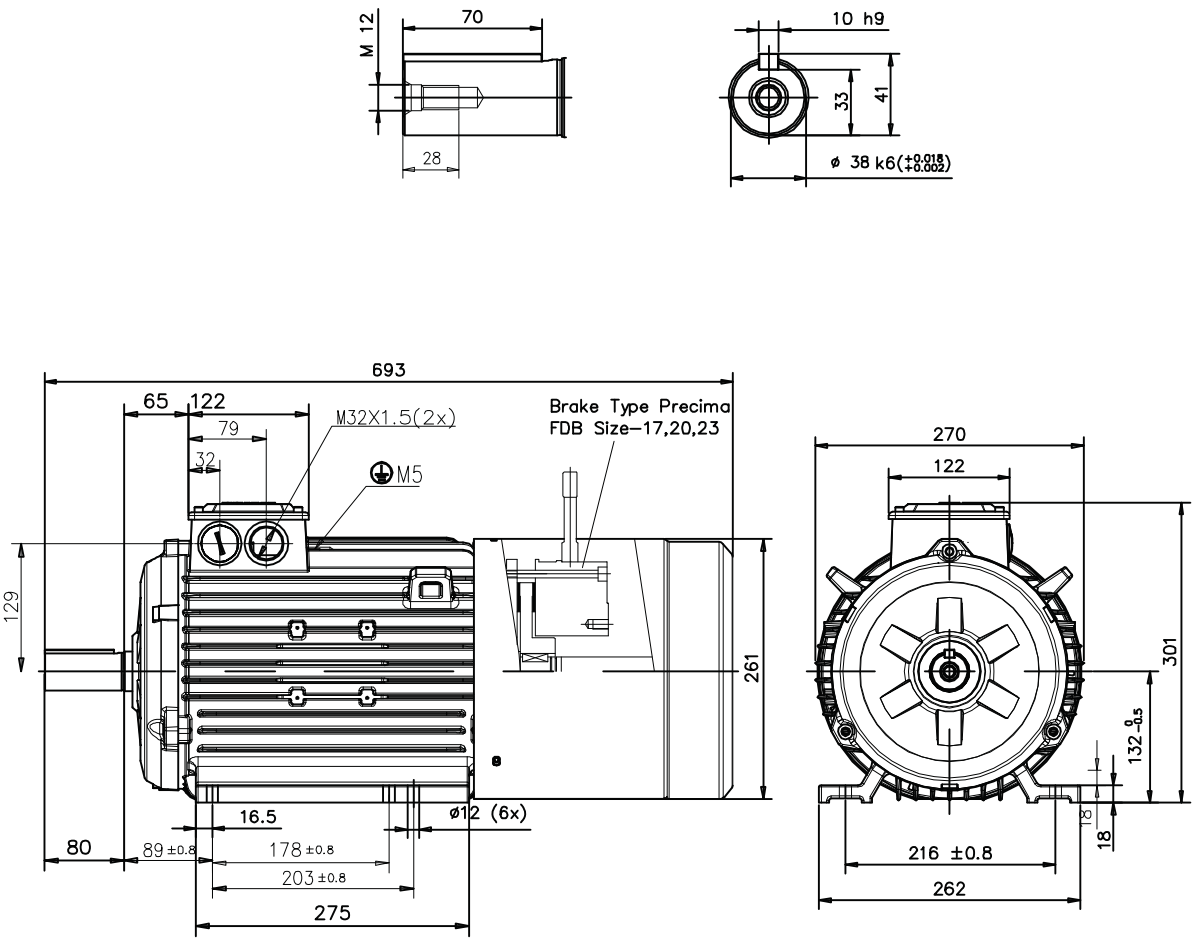
ABB Motors and Generators	Thermal Withstand Curve		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00003
Our ref.	Rev/Changed by / Date of issue: A 01-07-2019	Saving ident: untitled.xls	Pages: 5(3)

Type of product	**TEFC, 3-phase, squirrel cage induction motor**			
Type/Frame	**KM2BAX 132MLA 6**			
Product code	**3GBA 133 410-ADDIN**	Frequency (Hz)	**50**	
Rated output P_N	**6.5** kW	Rated current I_N	**15.2**	A
Type of duty	**S4 duty 300 starts/Hr 40% CDF**			

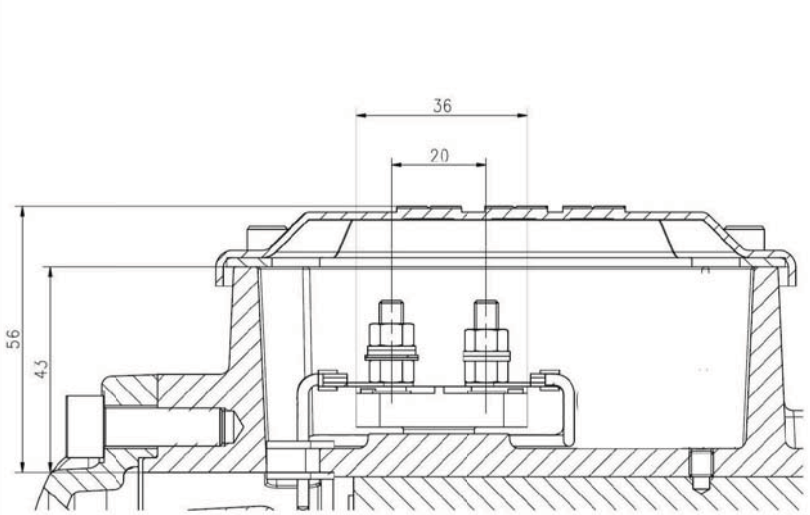
J_{motor} (kgm2)	**0.053**	Voltage (V) 100%	***415***	Voltage (V)	***415V(100%)***
J_{load} (kgm2)		T_{start}/T_N	***1.6***	T_{start}/T_N	***1.6***
Speed (r/min)	**961**	Withstand cold(s)	***26***	Withstand hot (s)	***13***
T_N (Nm)	**65**	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	***5.5***	I_s/I_n	***5.5***
		T_{max}/T_n	***2.8***	T_{max}/T_n	***2.8***



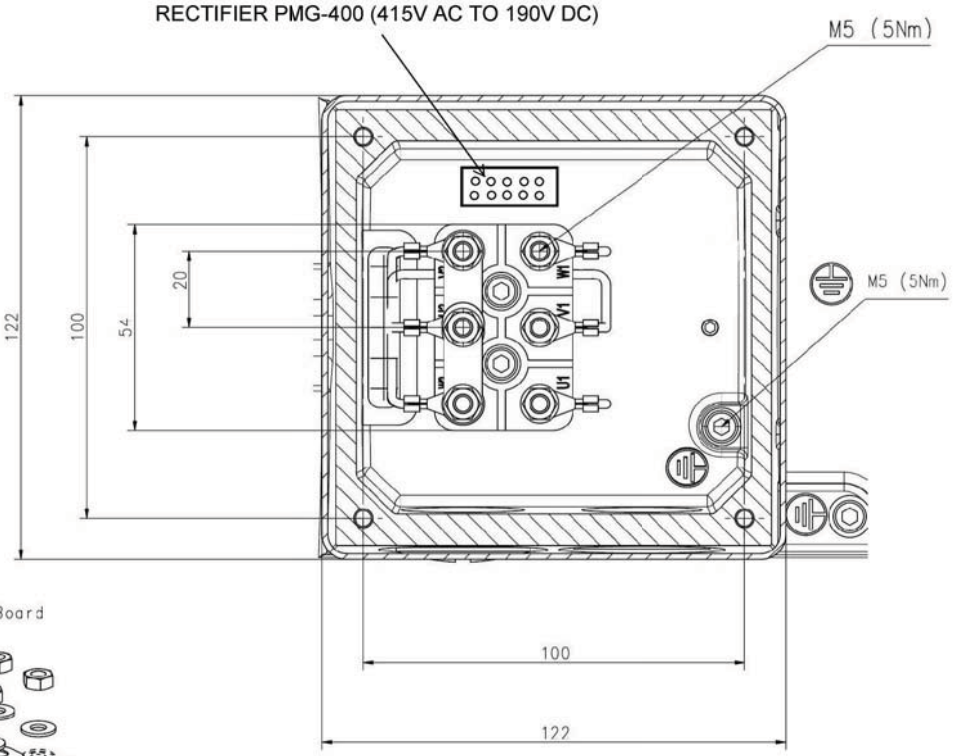
Applicable standards: IS 12615 2018 28.7.2015



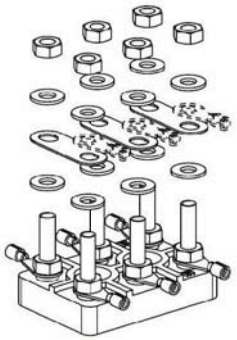
Motor Dimension Print	Motor Type : M2BAX 132ML 2-8P	Document Nº : 3GZH500013-97
Description : Motor IE3 foot mounted IM1001 (with Brake FDB-17,20,23)		
Unit : ABB, LV Motors, India Date : 2018-06-27	Issued by : DKS Approved by : SA	Replaces : Replaced by :
ABB India Ltd.	Customer Reference :	ABB



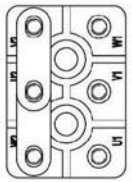
RECTIFIER PMG-400 (415V AC TO 190V DC)



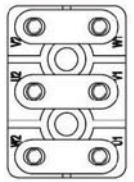
Terminal Board

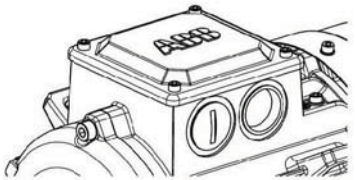


Y-connection



D-connection





Comment: 1/1	**Dimension Print**	Motor Type: M2BAX 100-132	Document No: 3GZH500010-3
	Description: Terminal box		
	Unit: Motors	Issued by: MGB	Replaces:
	Date: 05.19.2014	Approved by: SAA	Replaced by:
	ABB Ltd.	Customer Reference:	ABB

MOTOR DATASHEET FOR CROSS TRAVEL OF 10T ELECTRIC HOIST OF 250/50/10T POWER HOUSE DOUBLE GIRDER CRANE

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	ABB India
2	Motor type	Squirrel cage induction motor
3	Type of starting	VFD
4	Name of the equipment driven by motor & Quantity	Cross travel motor of 10T Electric hoist, 2nos
5	Maximum Power requirement of driven equipment	0.25KW
6	Rated speed of Driven Equipment	900 RPM (regulated by VFD and adjustable at site by VFD parameters)
7	Design ambient temperature	40 deg C
B.	**Design and Performance Data**	
1	Frame size & type designation	KM2BAX 80MC 6
2	Type of duty	S4 duty 300 starts/Hr 40% CDF
3	Rated Voltage	415
4	Permissible variation for	
5	a Voltage	+10%,-10%
6	b Frequency	+3%,-3%
7	c) Combined voltage & frequency	10% (absolute sum)
8	Rated output at design ambient temp (by resistance method)	0.55 kw
9	Synchronous speed & Rated slip	900 RPM, 10%
10	Minimum permissible starting voltage	80%
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	Depends of VFD starting
13	b) At min starting voltage	Depends of VFD starting
14	Locked rotor current as percentage of FLC (including IS tolerance)	NA for VFD starting
15	Torque	
	a) Starting	200%
	b) Maximum	225%
16	Permissible temp rise at rated output over ambient temp & method	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C ambient
17	Noise level at 1.0 m (dB	85 db at 1m
18	Amplitude of vibration	2.8 mm/s
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	70% / 0.68
	c) At 75% load	68.7% / 0.58

	TITLE	SPECIFICATION NO. PE-TS-437-501-A001
	LV MOTOR	VOLUME II B
	DATA SHEET - C	SECTION D
		REV NO. 00 DATE
		SHEET 2 OF 2

S. No.	Description	Data to be filled by successful bidder
	c) At 50% Load	63.7% / 0.44
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	Delta
2	Applicable Standard	IS 12615:2018
3	DOP of Enclosure	TEFC
4	Method of cooling	IC 411
5	Class of insulation	Class F
6	Main terminal box	
	a) Type	Stud type
	b) Power Cable details (Conductor, size, armour/unarmour)	4C x 2.5 sqmm (One hole pluged and other utilize for cable entry)
	c) Cable Gland & lugs details (Size, type & material)	Fafeco Scope, Gland and lug size shall be suitable for Cable and motor terminal size.
	d) Permissible Fault level (kArms & duration in sec)	50kA for 0.25 sec
7	Space heater details (Voltage & watts)	NA
8	Flame proof motor details (if applicable)	NA
	a) Enclosure	NA
	b) suitability for hazardous area	NA
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	3
10	Winding connection	Delta
11	Kind of rotor winding	Die cast Aluminum construction
12	Kind of bearings	Ball bearings
13	Direction of rotation when viewed from NDE	Bi directional
14	Paint Shade & type	Light grey 631 of IS 5
15	Net weight of motor	15
16	Outline mounting drawing No (To be enclosed as annexure)	3GZH500008-36
D.	**Characteristic curves/ drawings**	
	a) Torque speed characteristic	Attached
	b) Thermal withstand characteristic	Attached
	c) Current vs time	Attached
	d) Speed vs time	Attached

ABB Motors and Generators	Technical Data Sheet		
	Project	Location	
Department/Author	Customer name	Customer ref.	**Application** Electric hoist
Our ref.	Rev/Changed by **A**	Date of issue **01-07-2019**	Saving ident **untitled.xls**	Pages **1(3)**

No.	Definition	Data	Unit	Remarks	
1	Product	***TEFC, 3-phase, squirrel cage induction motor***			
2	Product code	***3GBA 083 330-ASDIN***			
3	Type/Frame	***KM2BAX 80MC 6***			
4	Mounting	***IM1001, B3(foot)***			
5	Rated output P_N	***0.55***	kW		
6	Service factor	***1***			
7	Type of duty	***S4 duty 300 starts/Hr 40% CDF***			
8	Rated voltage U_N	***415***	VY	+10, -10 %	
9	Rated frequency f_N	***50***	Hz	+3, -3 %	
10	Rated speed n_N	***900***	r/min		
11	Rated current I_N	***1.61***	A		
12	Quantity	***2***	Nos		
13	Starting current I_s/I_N	***4***			
14	Nominal torque T_N	***5.8***	Nm		
15	Locked rotor torque T_S/T_N	***2***			
16	Maximum torque T_{max}/T_N	***2.25***			
17	Min voltage for starting	***80% of rated voltage***			
18					
	Load characteristics	Load %	Current A	Efficiency %	Power factor
19	PLL determined from residual loss	*100*	**1.61**	**70**	**0.68**
20		*75*	**1.44**	**68.7**	**0.58**
21		*50*	**1.37**	**63.7**	**0.44**
22					
23	Thermal withstand time hot	***11***	s		
24	Thermal withstand time cold	***22***	s		
25	Insulation class / Temperature class	***F / B***			
26	Ambient temperature	***40***	°C		
27	Altitude	***1000***	m.a.s.l.		
28	Degree of protection	***IP55***			
29	Cooling system	***IC411***			
30	Bearing DE/NDE	***6204-2Z/C3 - 6203-2Z/C3***		Ball bearings	
31	Sound pressure level (LP dB(A) 1m)	***60***	dB(A)	at no-load	
32	Moment of inertia J = ¼ GD2	***0.0022***	kg-m2		
33	Position of terminal box	***Top***			
34	Direction of rotation	***Bi-directional***			
35	Total weight of motor	***15***	kg		
36	Paint shade	***Light grey 631 of IS 5***			
37	Cable size	***4c x 2.5 sqmm (One hole pluged and other utilize for cable entry)***			
38	Conduit entry size	***2 nos x M25***			
39	Method of starting	***VFD***			
40	S4 duty 300 starts/Hr, 40% CDF				
41	Equivalent S1 kw	***0.37 kw***			
42	IE2 efficiency at equivalent S1 kw	***69%***			
43	Motor temp rise will be 60 Deg C at sinusoidal supply over ambient of 40 Deg C.				
44					
45					
Ex-motors					
46					
47					
48					

Option	Variant Codes / Definition
49	VPI
50	Double shaft extension
51	Light grey 631 of IS 5
52	Encoder mounting arrangement
	Only brake provision
	EN 24 shaft

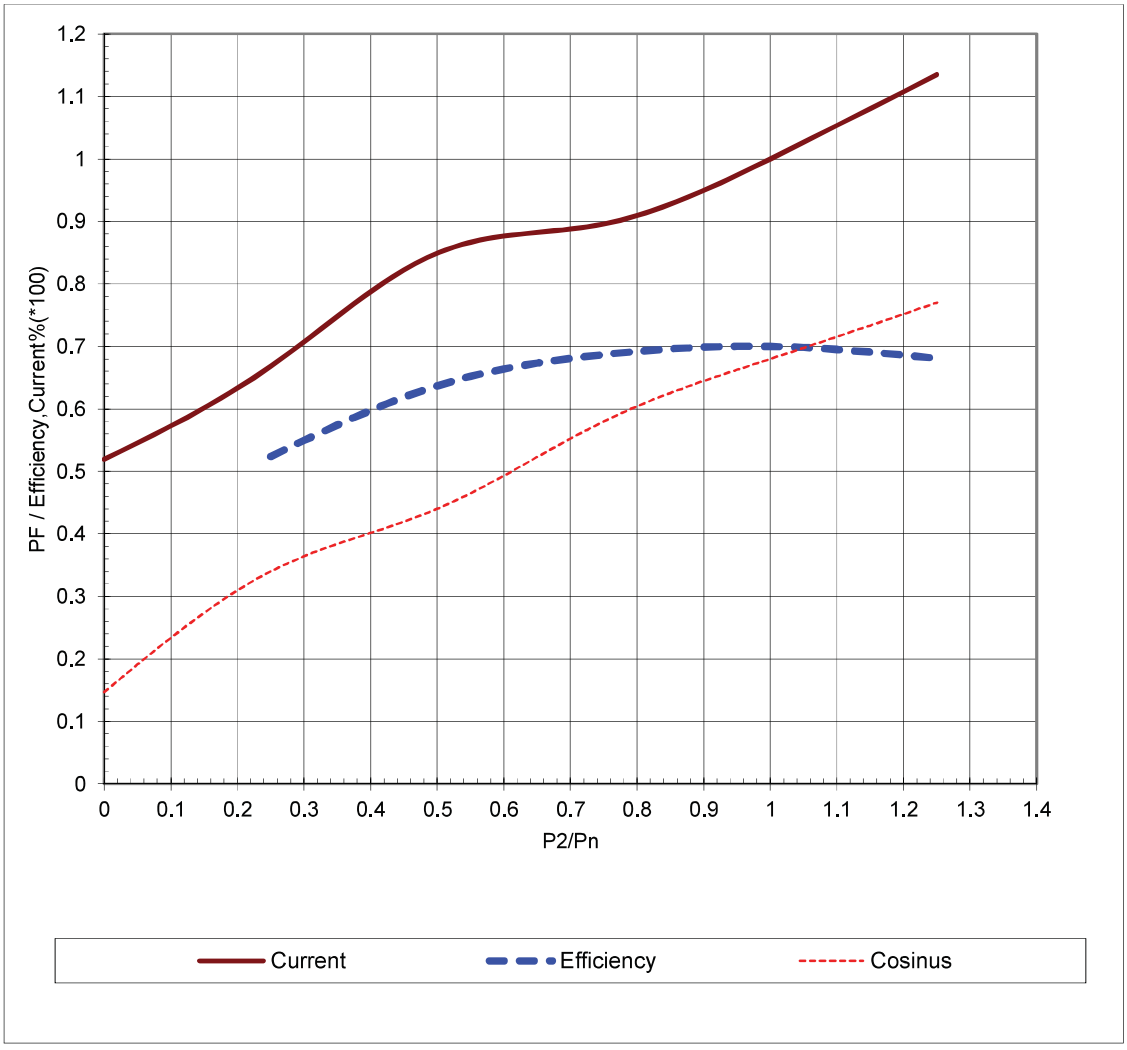
Remarks:

Applicable standards: IS 12615 2018

ABB Motors and Generators	Load Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00001
Our ref.	Rev/Changed by: A	Date of issue: 01-07-2019	Saving ident: untitled.xls / Pages: 2(3)

Product	**TEFC, 3-phase, squirrel cage induction motor**
Type/Frame	**KM2BAX 80MC 6**
Product code	**3GBA 083 330-ASDIN**
Rated output P_N	**0.55** kW
Type of duty	**S4 duty 300 starts/Hr 40% CDF**

Voltage (V)	**415**	Current I_N (A)	**1.61**	Power factor at P_N	**0.68**
Frequency (Hz)	**50**	Speed (r/min)	**900**	Efficiency (%) at P_N	**70**

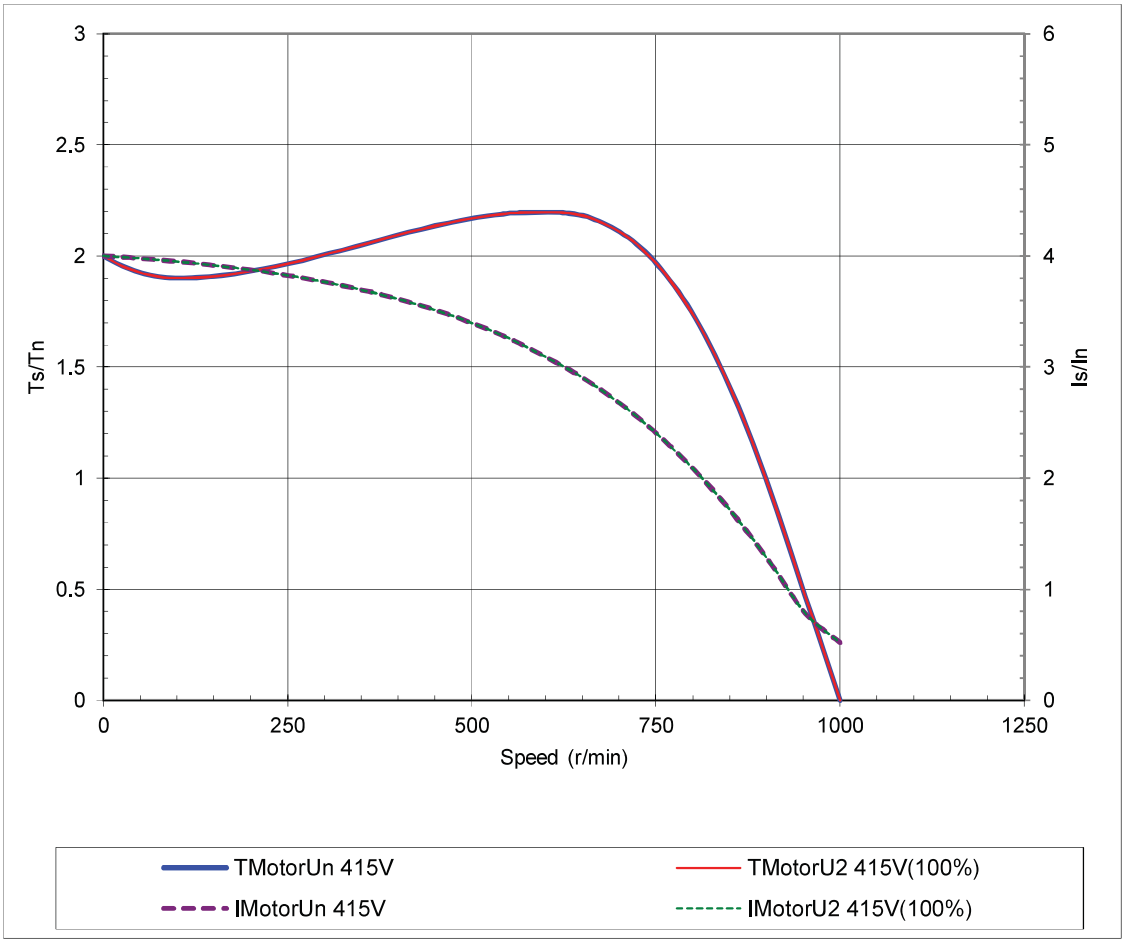


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Starting Curves		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00001
Our ref.	Rev/Changed by Date of issue	Saving ident	Pages
	A 01-07-2019	untitled.xls	3(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor				
Type/Frame	KM2BAX 80MC 6				
Product code	3GBA 083 330-ASDIN		Frequency (Hz)	50	
Rated output P_N	0.55 kW		Rated current I_N	1.61	A
Type of duty	S4 duty 300 starts/Hr 40% CDF				

J_{motor} (kgm2)	0.0022	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*2*	T_{start}/T_N	*2*
Speed (r/min)	900	Starting time (s)		Starting time (s)	
T_N (Nm)	5.8	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*4*	I_s/I_n	*4*
		T_{max}/T_n	*2.2*	T_{max}/T_n	*2.2*

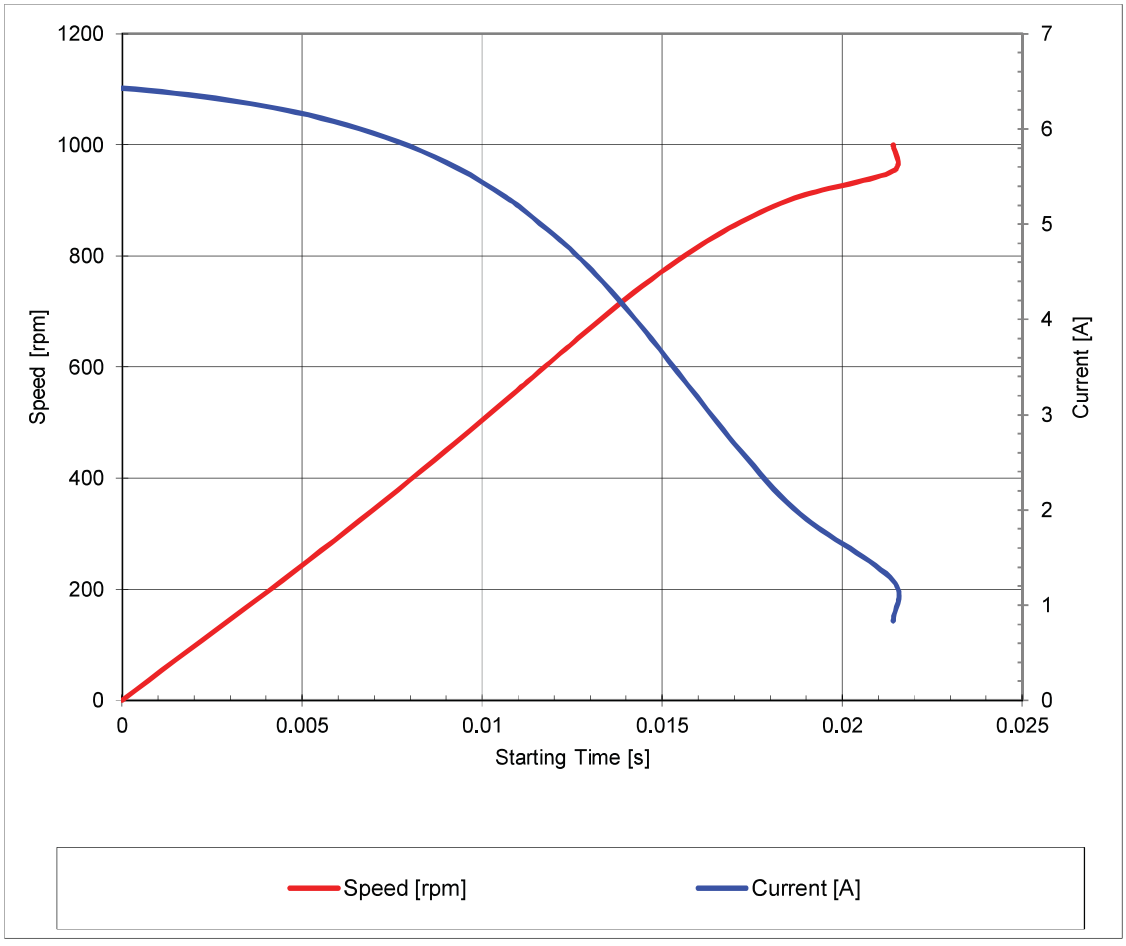


Applicable standards: IS 12615 2018 28.7.2015

ABB Motors and Generators	Current & Speed Vs Time		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00001
Our ref.	Rev/Changed by Date of issue A 01-07-2019	Saving ident untitled.xls	Pages 4(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor			
Type/Frame	KM2BAX 80MC 6			
Product code	3GBA 083 330-ASDIN	Frequency (Hz)	50	
Rated output P_N	0.55 kW	Rated current I_N	1.61	A
Type of duty	S4 duty 300 starts/Hr 40% CDF			

J_{motor} (kgm2)	0.0022	Voltage (V) 100%	*415*	Voltage (V)	*415V(100%)*
J_{load} (kgm2)		T_{start}/T_N	*2*	T_{start}/T_N	*2*
Speed (r/min)	900	Starting time (s)		Starting time (s)	
T_N (Nm)	5.8	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	*4*	I_s/I_n	*4*
		T_{max}/T_n	*2.2*	T_{max}/T_n	*2.2*

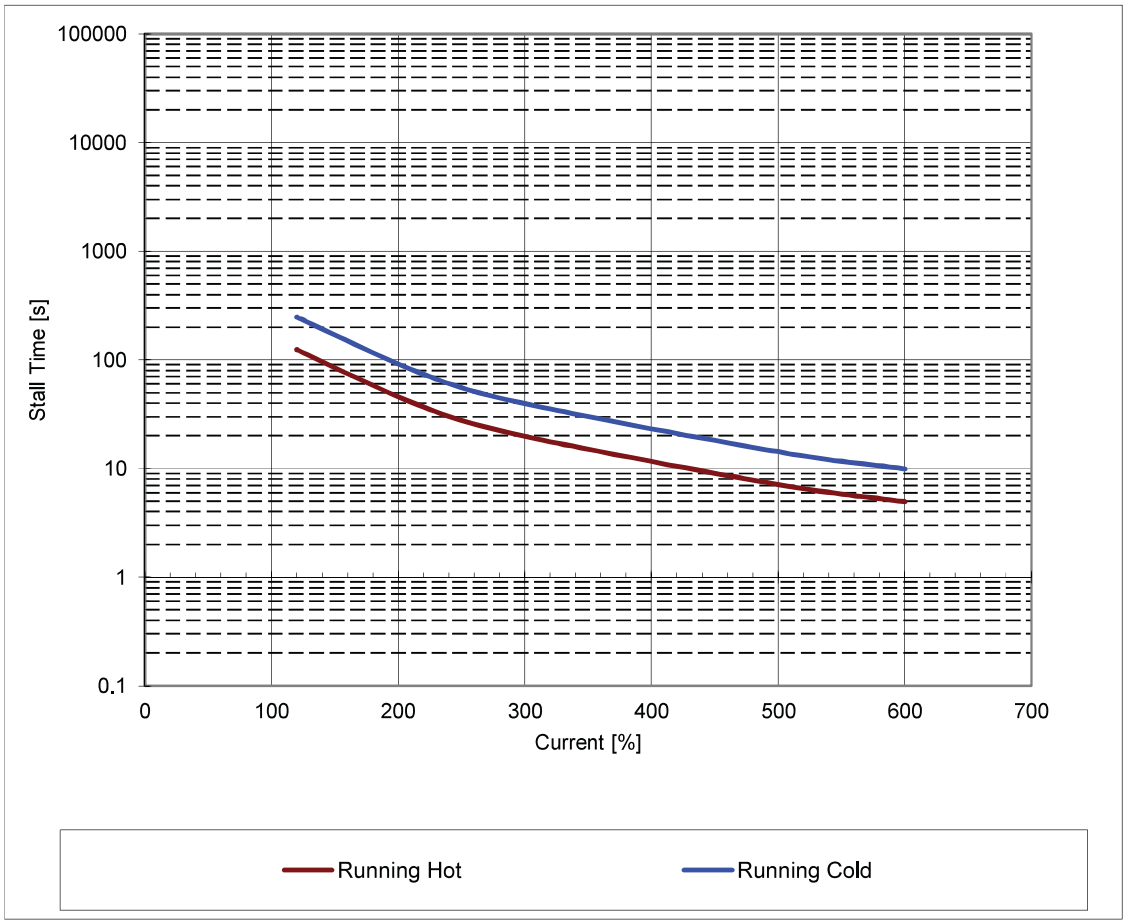


Applicable standards: IS 12615 2018 28.7.2015

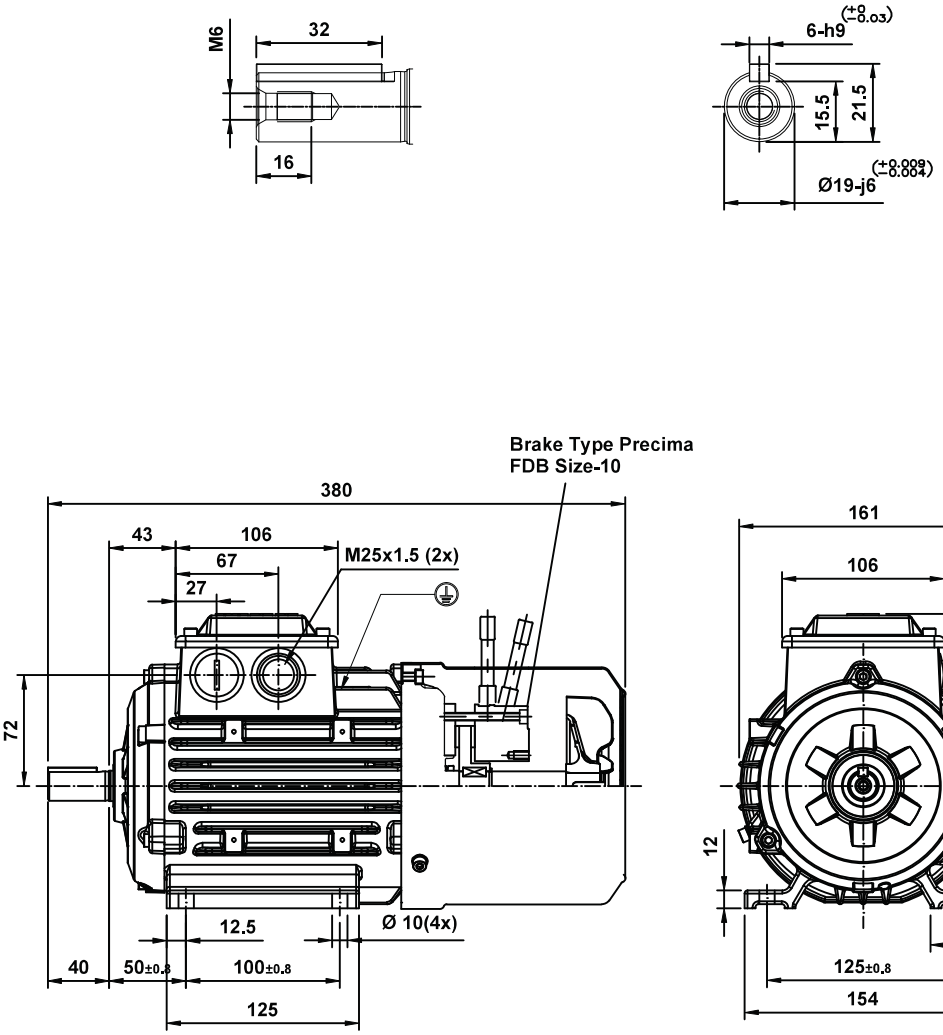
ABB Motors and Generators	Thermal Withstand Curve		
	Project	Location	
Department/Author	Customer name	Customer ref.	Item name 1.00001
Our ref.	Rev/Changed by Date of issue	Saving ident	Pages
	A 01-07-2019	untitled.xls	5(3)

Type of product	TEFC, 3-phase, squirrel cage induction motor			
Type/Frame	KM2BAX 80MC 6			
Product code	3GBA 083 330-ASDIN	Frequency (Hz)	50	
Rated output P_N	0.55 kW	Rated current I_N	1.61	A
Type of duty	S4 duty 300 starts/Hr 40% CDF			

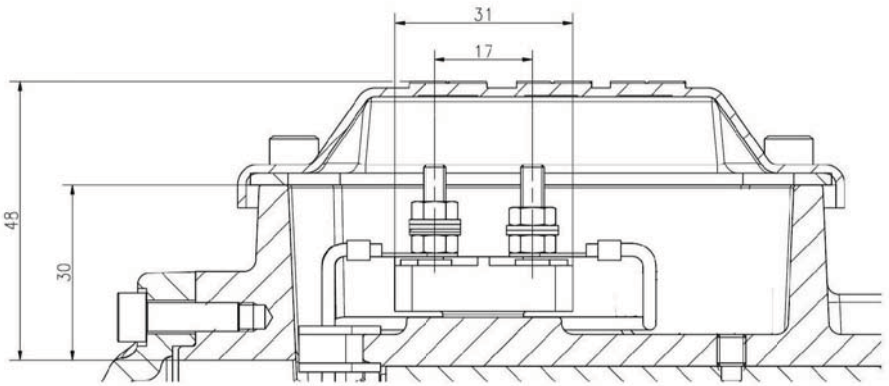
J_{motor} (kgm2)	0.0022	Voltage (V) 100%	415	Voltage (V)	415V(100%)
J_{load} (kgm2)		T_{start}/T_N	2	T_{start}/T_N	2
Speed (r/min)	900	Withstand cold(s)	22	Withstand hot (s)	11
T_N (Nm)	5.8	Speed (r/min)		Speed (r/min)	
T_{load} (Nm)		I_s/I_n	4	I_s/I_n	4
		T_{max}/T_n	2.2	T_{max}/T_n	2.2



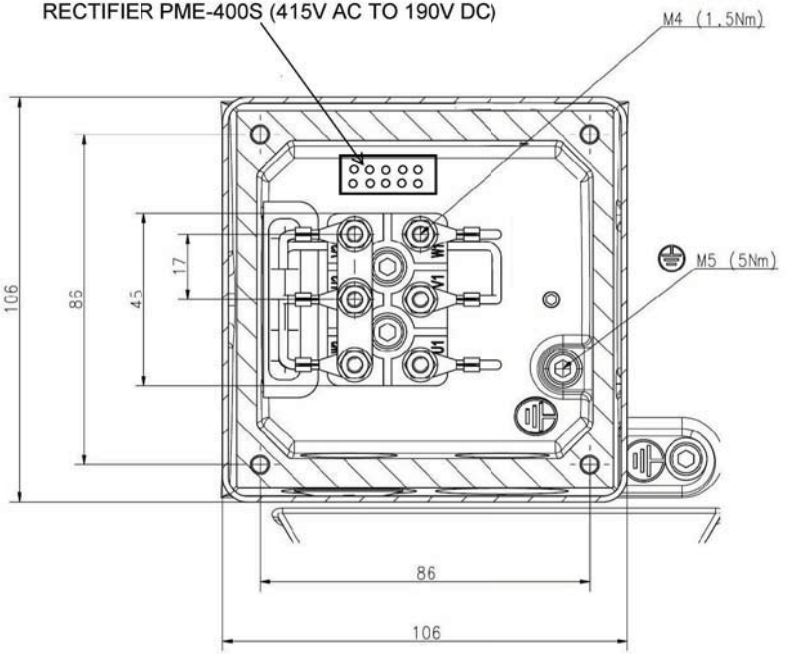
Applicable standards: IS 12615 2018 28.7.2015



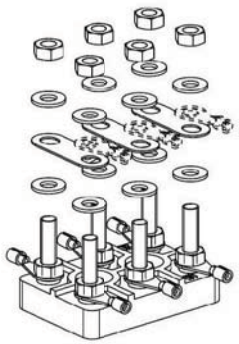
Motor Dimension Print	Motor Type : M2BAX 80M 2-6P	Document N° : 3GZH500008-44
Description : Motor Foot mounted IM1001 (Brake FDB-10)		
Unit : ABB, LV Motors, India Date : 2019-10-14	Issued by : SBU Approved by : *	Replaces : Replaced by :
ABB India Ltd.	Customer Reference :	



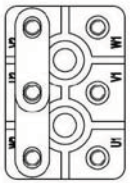
RECTIFIER PME-400S (415V AC TO 190V DC)



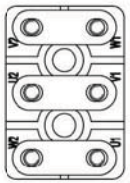
Terminal Board

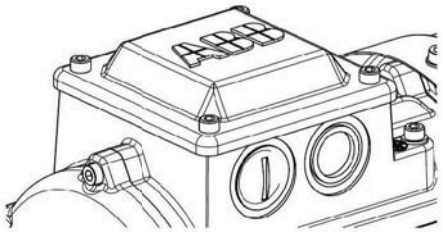


Y-connection

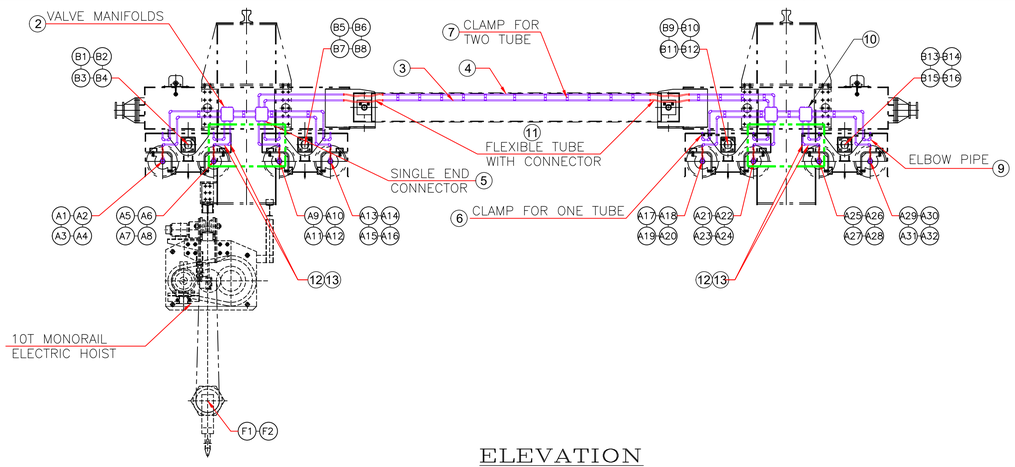


D-connection

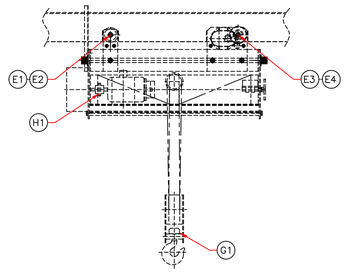




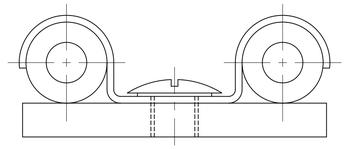
Comment: 1/1	**Dimension Print**	Motor Type: M2BAX 80-90	Document No: 3GZH500008-3
	Description: Terminal box		
	Unit: Motors	Issued by: MGB	Replaces:
	Date: 05.19.2014	Approved by: SAA	Replaced by:
	ABB Ltd.	Customer Reference:	ABB



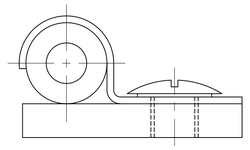
ELEVATION



10T MONORAIL ELECTRIC HOIST



TYPICAL CLAMP FOR TWO TUBES

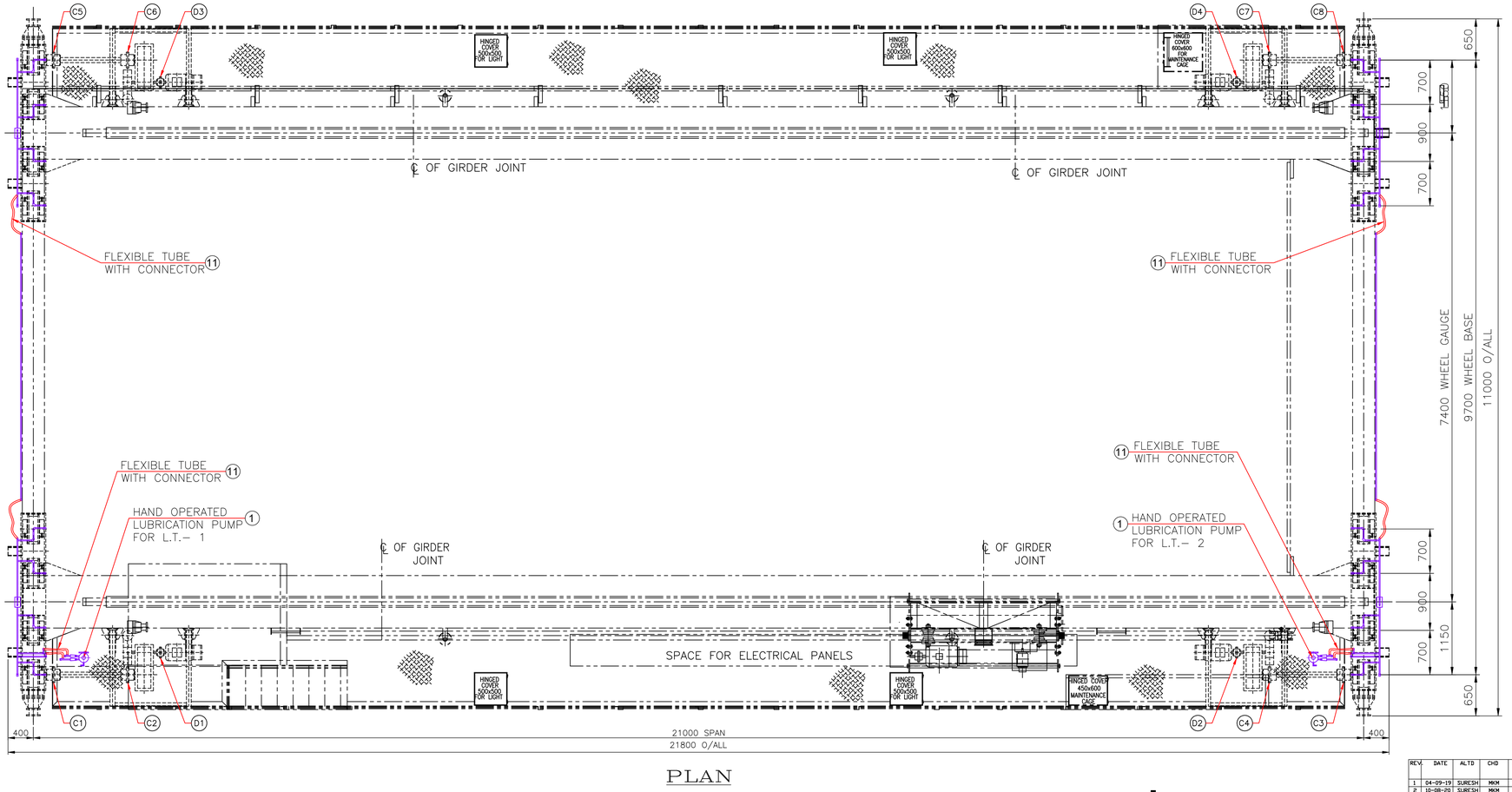


TYPICAL CLAMP FOR ONE TUBE

SR. NO.	REFERENCE	HAND OPERATED PUMP LUBRICATION SYSTEM POSITION OF POINTS	HAND OPERATED PUMP LUBRICATION SYSTEM NO. OF POINTS	LUBRICATION POSITION OF POINTS	LUBRICATION NO. OF POINTS
1	L.T. WHEEL ASSEMBLY	A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A25 A26 A27 A28 A29 A30 A31 A32	32		
2	L.T. BOGIE PINS	B1 B2 B3 B4 B5 B6 B7 B8 B1 B2 B3 B4 B5 B6 B7 B8	16		
3	L.T. OUTPUT COUPLING			C1 C2 C3 C4 C5 C6 C7 C8	8
4	L.T. INPUT COUPLING			D1 D2 D3 D4	4
5	10T HOIST WHEEL ASSEMBLY			E1 E2 E3 E4	4
6	10T HOIST BOTTOM SHEAVE ASSLY			F1 F2	2
7	10T HOIST HOOK BEARING (LOAD CAPACITY 10T)			G1	1
8	10T HOIST INPUT COUPLING			H1	1
9	L.T. SPARE LUBRICATION POINTS		6		
TOTAL NO. OF LUBRICATION POINT			54		20
HAND PUMP QTY. :- 2 NOs. PER CRANE				MANUAL GREASE GUN :- 1 NO./CRANE	

NOTES:–

1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2) CENTRALIZED LUBRICATION THROUGH HAND OPERATED GREASE PUMP SHALL BE PROVIDED.
3) PIPING LAYOUT IS TENTATIVE ACTUAL PIPING SHALL BE DECIDED AT SHOP/SITE.
4) GREASE TYPE EP2–ISO VG220,LUBRICATION OIL VG320 SERVOMESH SP460
5) GREASE NIPPLE 1/4"
6) SIZE OF PIPING 10NB OF SS: (COPPER FOR IN ACCESSIBLE BEARING OF END CARRIAGE)
7) MOUNTING OF PUMP SHOWN ARE ITS TENTATIVE POSITION, SO MOUNTING OF PUMP AS SUIT PRACTICALLY AT SHOP/SITE.
8) ALL FITTING TO BE DONE AT SHOP AND SITE FITTING TO SUPPLIED LOOSE AS REQUIRED.
9) PROPER PACKING SHALL BE PROVIDED TO LUBRICATION PIPES BY M/S FAFECO IN ORDER TO AVOID ANY DAMAGE DURING TRANSPORTATION.



PLAN

Mfr/ FAFECO to show final quantity in As built drawing.

(QTY. IN BOM IS FOR GUIDELINE ACTUAL MAY VERY PRACTICALLY.)

ITEM NO.	DESCRIPTION	QTY / crane	MATL.
13	ELBOW FOR 10 N.B. PIPE	20	COPPER
12	10 N.B. PIPE		COPPER
11	FLEXIBLE TUBES		
10	PLUGS	8	
9	ELBOW FOR 10 N.B. PIPE	100	
8	1/4" SOCKET	8	
7	CLAMP FOR TWO TUBE	60	
6	CLAMP FOR ONE TUBE	20	
5	1/4" SINGLE END CONNECTOR	60	
4	SEAMLESS HEADER 10 N.B. PIPE		STAINLESS STEEL
3	SEAMLESS 10 N.B. PIPE (INPUT LINE)		STAINLESS STEEL
2	VALVE MANIFOLD TWO OUTLETS	4	
1	HAND OPERATED LUBRICATION PUMP	2	

REV.	DATE	ALTD	CHD	APPD
1	04-09-19	SURESH	MKM	
2	10-08-20	SURESH	MKM	

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	Suresh		28.08.19
	DESN	MKM		28.08.19
	CHD	MKM		28.08.19
	APPD	SMG		28.08.19

FAFECO — FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no. OG-06/250-50-10Tx21M/142

JOB NO.	437
STATUS	CONTRACT
DISTRIBUTION	

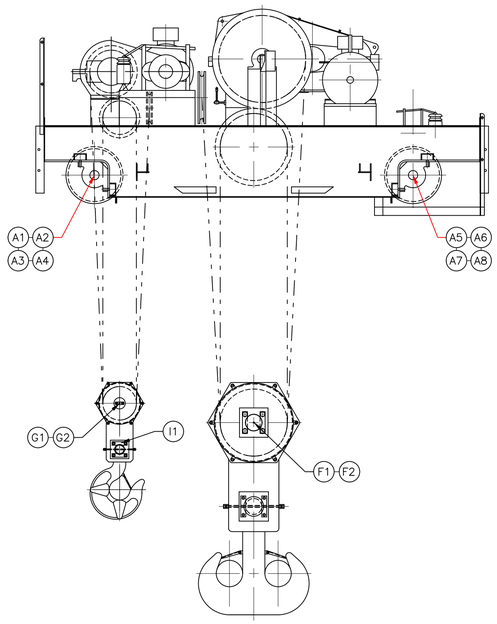
TITLE

Lubrication Drg. for L.T. wheel assembly for 250/50/10T Power House Crane

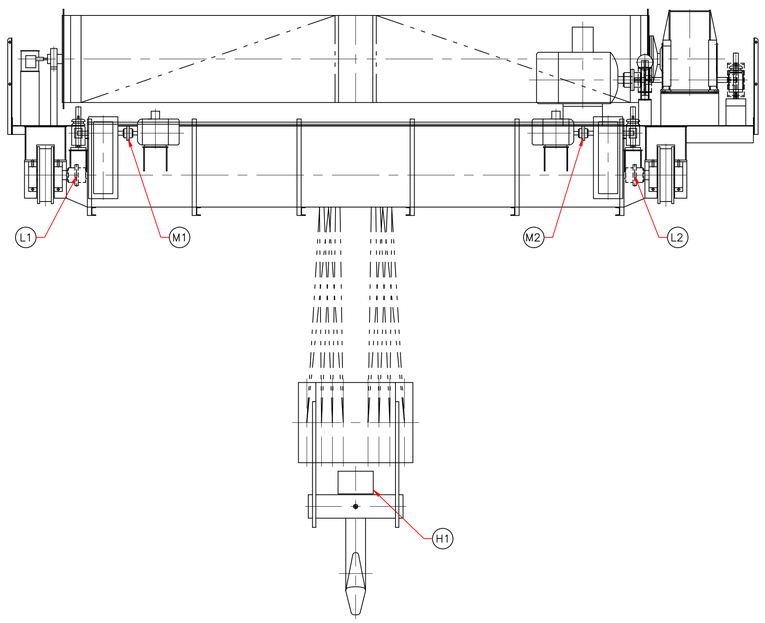
DEPT.	SCALE – 160	DRAWING NO. PE-V0-437-501-A506
SIGN		
DATE	SHEET 1 OF 2	REV. 2

SIZE-A1

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0



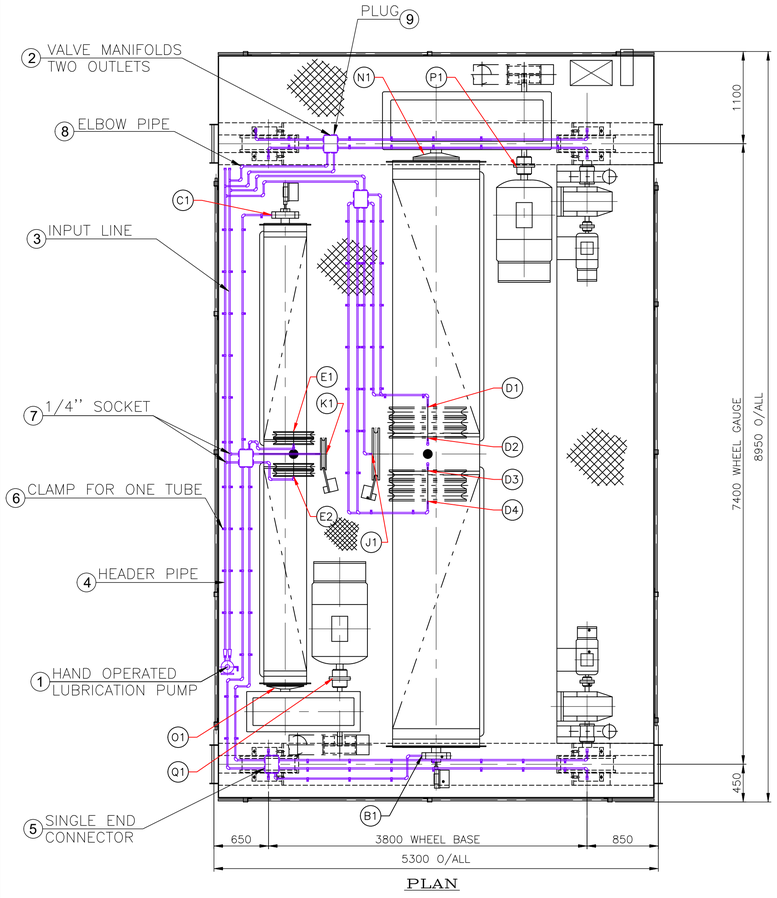
ELEVATION



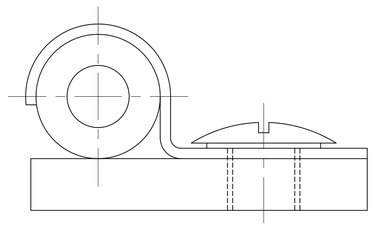
SR. NO.	REFERENCE	HAND OPERATED PUMP LUBRICATION SYSTEM			LUBRICATION	
		POSITION OF POINTS	NO. OF POINTS		POSITION OF POINTS	NO. OF POINTS
1	C.T. WHEEL ASSEMBLY	A1 A2 A3 A4 A5 A6 A7 A8	8			
2	M.H. DRUM BEARING BLOCK	B1	1			
3	A.H. DRUM BEARING BLOCK	C1	1			
4	M.H. TOP SHEAVE ASSEMBLY	D1 D2 D3 D4	4			
5	A.H. TOP SHEAVE ASSEMBLY	E1 E2	2			
6	M.H. BOTTOM SHEAVE ASSEMBLY				F1 F2	2
7	A.H. BOTTOM SHEAVE ASSEMBLY				G1 G2	2
8	M.H. HOOK BEARING (LOAD CAPACITY 125T)				H1	1
9	A.H. HOOK BEARING (LOAD CAPACITY 32T)				I1	1
10	M.H. EQUILIZER PULLEY.	J1	1			
11	A.H. EQUILIZER PULLEY.	K1	1			
12	C.T. OUTPUT COUPLING				L1 L2	2
13	C.T. INPUT COUPLING				M1 M2	2
14	M.H. DRUM COUPLING				N1	1
15	A.H. DRUM COUPLING				O1	1
16	M.H. INPUT COUPLING				P1	1
17	A.H. INPUT COUPLING				Q1	1
SPARE LUBRICATION POINT			4			
TOTAL NO. OF LUBRICATION POINT			22			14
HAND PUMP QTY. :- 1 NO. PER CRANE						

NOTES:-

1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2) CENTRALIZED LUBRICATION THROUGH HAND OPERATED GREASE PUMP SHALL BE PROVIDED.
3) PIPING LAYOUT IS TENTATIVE ACTUAL PIPING SHALL BE DECIDED AT SHOP/SITE.
4) GREASE TYPE EP2-ISO VG220,LUBRICATION OIL VG320 SERVOMESH SP460
5) GREASE NIPPLE 1/4"
6) SIZE OF PIPING 10NB (STANLESS STEEL)
7) MOUNTING OF PUMP SHOWN ARE ITS TENTATIVE POSITION, SO MOUNTING OF PUMP AS SUIT PRACTICALLY AT SHOP/SITE.
8) ALL FITTING TO BE DONE AT SHOP AND SITE FITTING TO SUPPLIED LOOSE AS REQUIRED.
9) PROPER PACKING SHALL BE PROVIDED TO LUBRICATION PIPES BY M/S FAFECO IN ORDER TO AVOID ANY DAMAGE DURING TRANSPORTATION.



PLAN



TYPICAL CLAMP FOR ONE TUBE

Mrs FAFECO to show final quantity in As built drawing.

(QTY. IN BOM IS FOR GUIDELINE ACTUAL MAY VERY PRACTICALLY.)

ITEM NO.	DESCRIPTION	QTY / crane	MATL.
10	FLEXIBLE TUBES		
9	PLUGS	4	
8	ELBOW FOR 10 N.B. PIPE	60	
7	1/4" SOCKET	6	
6	CLAMP FOR ONE TUBE	120	
5	1/4" SINGLE END CONNECTOR	28	
4	SEAMLESS HEADER 10 N.B. PIPE		STAINLESS STEEL
3	SEAMLESS 10 N.B. PIPE (INPUT LINE)		STAINLESS STEEL
2	VALVE MANIFOLD TWO OUTLETS	4	
1	HAND OPERATED LUBRICATION PUMP	1	

REV.	DATE	ALTD	CHD	APPD
1	04-09-19	SURESH	MKM	
2	10-08-20	SURESH	MKM	

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	Suresh		28.08.19
	DESN	MKM		28.08.19
	CHD	MKM		28.08.19
	APPD	SMG		28.08.19

FAFECO FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72

FAFECO Drawing no. OG-06/250-50-10Tx21M/143

JOB NO. 437
STATUS CONTRACT
DISTRIBUTION

TITLE
Lubrication Drg. for Crab sub assembly with CT wheel assembly for 250/50/10T Power House Crane

DEPT.	SCALE - 1:60	DRAWING NO	REV.
SIGN		PE-V0-437-501-A506	2
DATE		SHEET 2 OF 2	SIZE-1A1

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0

All Electrical, Control Drawings and Schematic circuit diagram & Bom for 250-50-10Tx21M Power House Crane.

(VENDOR : M/S. FAFECO)

AMBIENT TEMPERATURE - 40°C

SJVN Arun-3Power Development Company (P.) Ltd.
(A company promoted by SJVN Limited, joint venture of Govt. of India and Govt. of H.P)
Regd. No.: 111608/49/070

Approved by Consultant	To be Issued to Contractor		
	Category: APPROVAL		
☑Yes ☐No	Reviewed	Recommended	Approved

⚠1 Note: This Scheme is common for both cranes except the following features:

1) Lifting Beam Radio Remote Transmitter is located on Lifting beam which shall be lifted by both cranes with near to equal loading on each crane.

2) Lifting Beam Radio Remote Receiver is located on crane–1 only. Some cables as marked in cable schedule are for crane–1 only or crane–2 only. Other common cables are applicable for both cranes.

3) Crane–1 is equiped with crane plug and crane–2 is equiped with crane socket for control communication & Ethernet between both cranes for PLC communication.

Consultant:- SJVN LTD.

Recommended for Approval

SUB GROUP			SECTIONAL HEAD	HOD
Checked		Reviewed		

Bharat Heavy Electricals Limited
PPEI
Sector-16A
NOIDA
201 301
PEM/Mech./Aux.

⚠3 OTHER RELATED ELECTRICAL DRAWINGS

SR NO.	DRAWING TITLE	BHEL DWG NO.	FAFECO DWG NO.
1	GA OF PANEL LAYOUT	PE–V0–437–501–A518	0G–06/250–50–10Tx21M/211
2	EQUIPMENT LAYOUT ON CRANE	PE–V0–437–501–A517	0G–06/250–50–10Tx21M/213
3	EARTHING LAYOUT	PE–V0–437–501–A517	0G–06/250–50–10Tx21M/214
4	CABIN EQUIPMENT LAYOUT	PE–V0–437–501–A516	0G–06/250–50–10Tx21M/181
5	CABLE SCHEDULE	PE–V0–437–501–A519	0G–06/250–50–10Tx21M/212
6	GA OF PH CRANE	PE-V0-437-501-A505	0G-06/250-50-10Tx21M/100
7	SINGLE LINE DIAGRAM FOR LV SYSTEM	32914170001	-

SHEET NO. 1 OF 65

CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY Pvt. LTD. (SAPDC)
CONSULTANT	SJVN LTD.
PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT (NEPAL) (4X225MW)

BHEL
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	DP		05.06.19
	DESN	DP		05.06.19
	CHD	SM		05.06.19
	APPD	SM		05.06.19

FAFECO
FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO Drawing no.
OG-06/250-50-10Tx21M/201

JOB NO. 437

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD
0	09.07.19	DP	SM	SM
1	18.09.19	DP	SM	SM
2	30.09.19	DP	SM	SM
3	29.11.19	DP	SM	SM

REV.	DATE	ALTD	CHD	APPD

TITLE: All Electrical, Control Drawings and Schematic circuit diagram & Bom for 250/50/10T x 21M Power House Crane (CRANE-1&2)

DEPT. | SCALE – 1:1 | DRAWING NO: PE-V0-437-501-A517

SIGN / DATE

SHEET–1 OF 65 | REV. 3

A3.dwg

THIS IS PART OF TECHNICAL SPECIFICATION PE-TS-437-501-A001A REV 0

TABLE OF CONTENTS ①②③

③ SCHEMATIC CIRCUIT DIAGRAM

SR NO.	CRANES	SHEETS
1	CRANE–1	7, 7B, 18, 20, 39, 40, 45
2	CRANE–2	7A, 7C, 18A, 20A, 39A, 40A, 45A
3	CRANE–1 & 2	1–7, 8–17, 19, 20B–38, 41–44, 46–65
4	TANDEM OPRATION CRANE–1 & 2	7B, 7C, 20B, 44

Issue	Remarks	Name	Date
3	REVISED AS NOTED	DP	19.11.2019
2	REVISED AS NOTED	DP	30.09.2019
1	REVISED AS NOTED	DP	07.09.2019

Prep. DINESH | Ckd. ABHAY | APPR. SMG | ALL DIMENSIONS ARE IN MM.

CLIENT: BHARAT HEAVY ELECTRICAL LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

BHEL DRG NO. : PE–V0–437–501–A517

FAFECO

DESCRIPTION: 250–50–10T x 21M POWER HOUSE CRANE (CRANE–1&2)

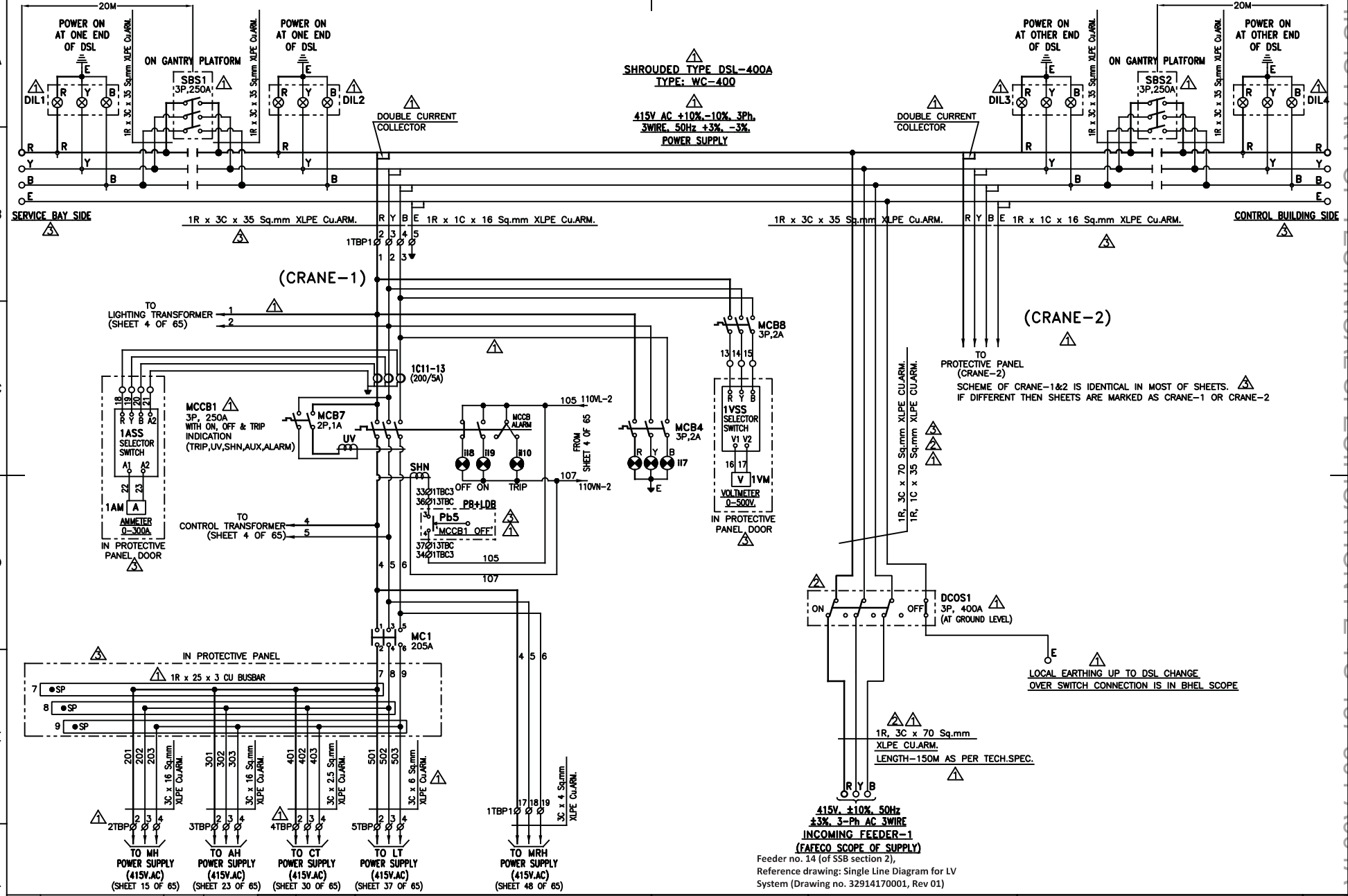
TITLE : TABLE OF CONTENTS

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO DRG NO.: OG–06/250–50–10Tx21M/201

Sheet 2 / 65

A3.dwg



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2	REVISED AS NOTED	DP	30.09.2019
1	REVISED AS NOTED	DP	07.09.2019

Prep. DINESH | Ckd. ABHAY | APPR. SMG | ALL DIMENSIONS ARE IN MM.

CLIENT

BHARAT HEAVY ELECTRICAL LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)

TITLE : POWER SUPPLY DISTRIBUTION + SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72

FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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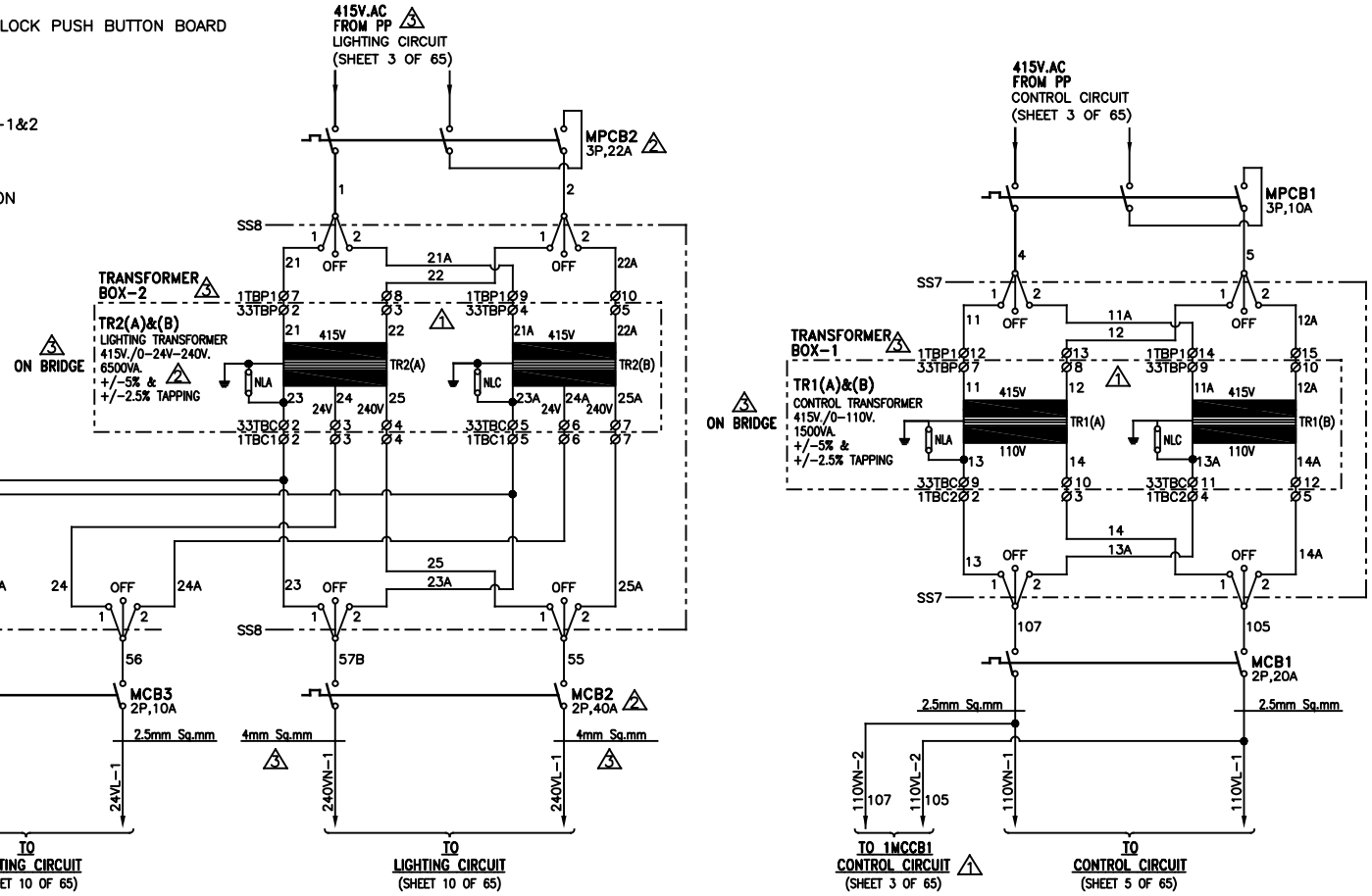
LEGEND DETAILS (1)

1) CR1 – CRANE–1
2) PB+LDB – PUSH BUTTON + LIGHTING D.BOARD
3) CPBS – CRANE PUSH BUTTON STATION
4) RRC – RADIO REMOTE CONTROL
5) HBPBS – HOIST BLOCK PUSH BUTTON STATION
6) JBG – JN. BOX ON GIRDER
7) JBT – JN. BOX ON TROLLEY
8) CKSJB – CONTROL KEY SWITCH JN.BOX
9) JPB+HBPBB – JOG PUSH BUTTON + HOIST BLOCK PUSH BUTTON BOARD
10) DGJB–1&2 – DRIVE GIRDER JN.BOX–1&2
11) IGJB–1 – IDLE GIRDER JN.BOX–1
12) CJB–1 – CABIN JN. BOX–1
13) UBLJB1–2 – UNDER BRIDGE LIGHT JN. BOX–1&2
14) LBDB – LIFTING BEAM D.BOARD
15) MCR – MASTER CONTROLLER
16) HBPBS – HOIST BLOCK PUSH BUTTON STATION
17) MHP – MAIN HOIST PANEL
18) AHP – AUX HOIST PANEL
19) CTP – CROSS TRAVEL PANEL
20) LTP – LONG TRAVEL PANEL
21) MRHP – MONO RAIL HOIST PANEL
22) MRCT – MONO RAIL C.T.



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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE–V0–437–501–A517

FAFECO

DESCRIPTION: 250–50–10T x 21M POWER HOUSE CRANE (CRANE–1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72
FAFECO DRG NO.: OG–06/250–50–10Tx21M/201

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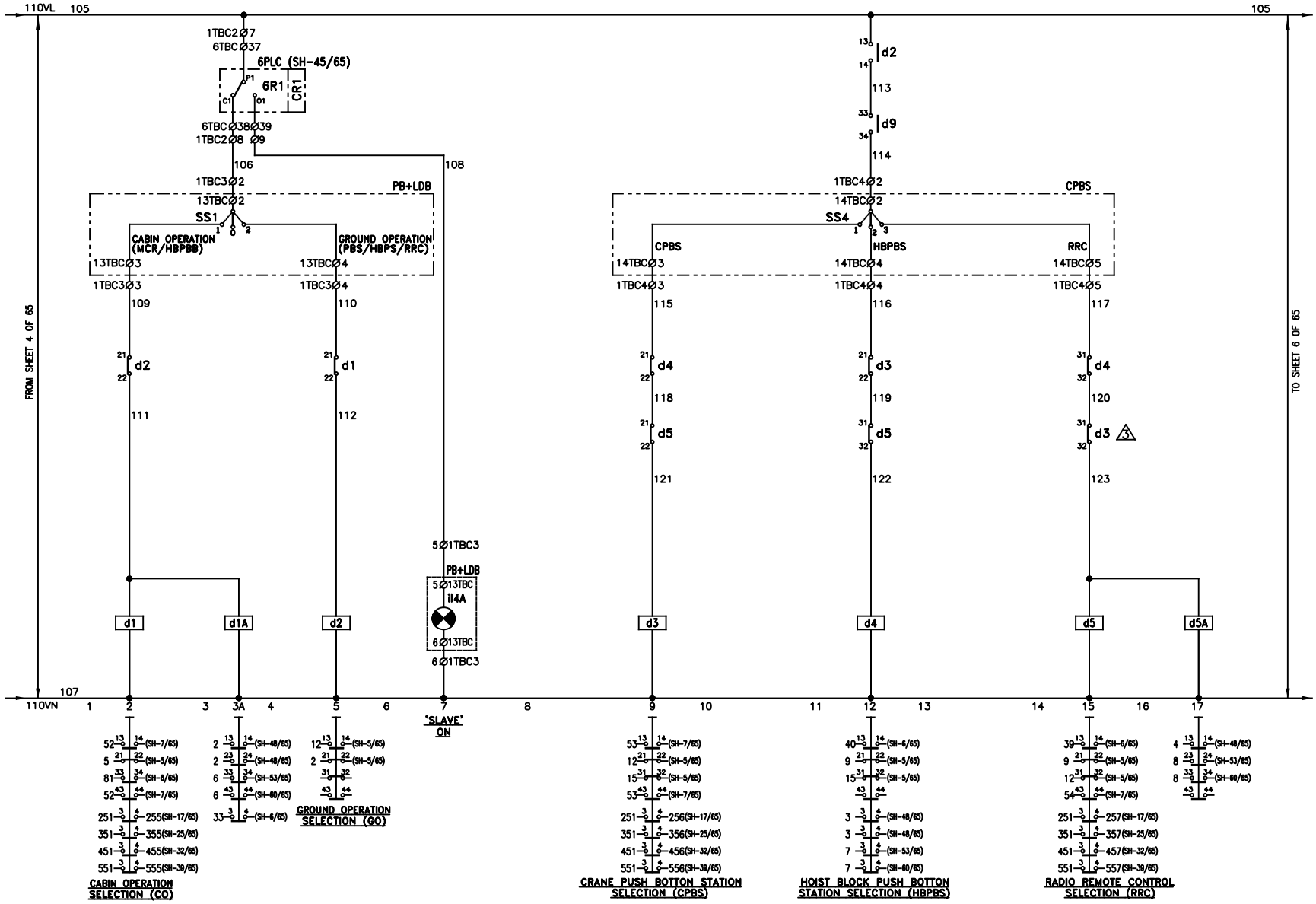

				Prep.	DINESH
				Ckd.	ABHAY
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CLIENT: BHARAT HEAVY ELECTRICAL LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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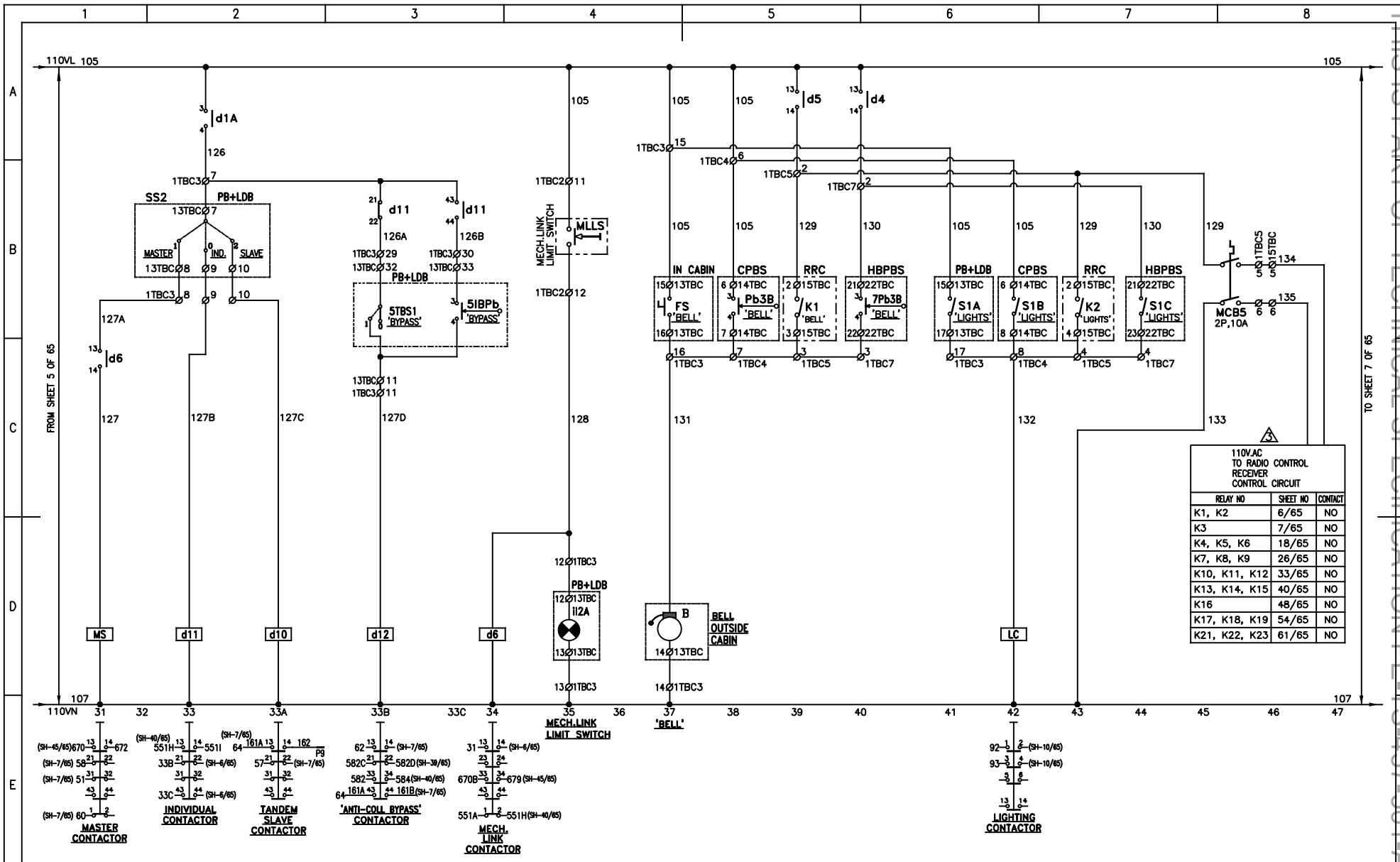

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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)

TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72

FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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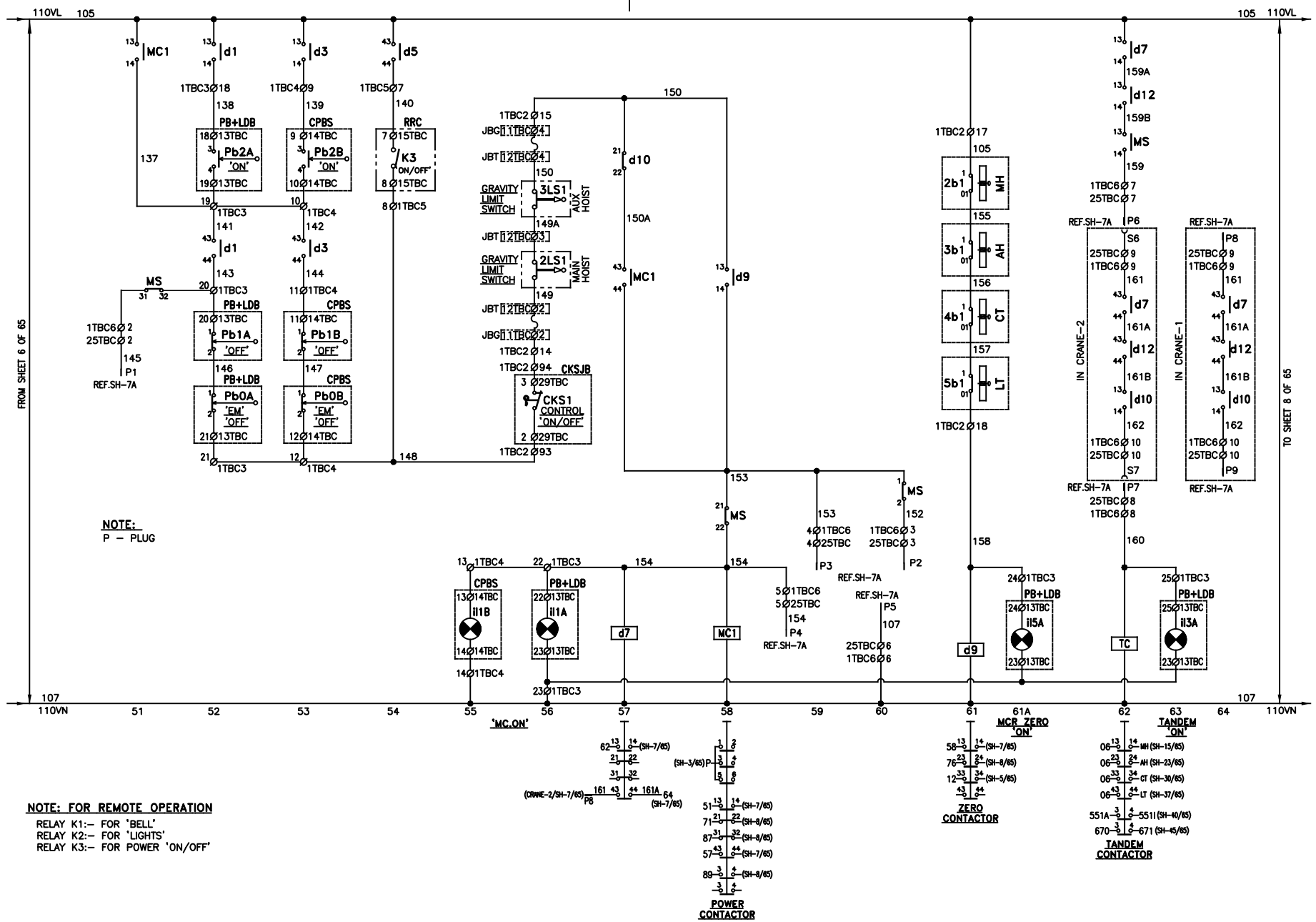

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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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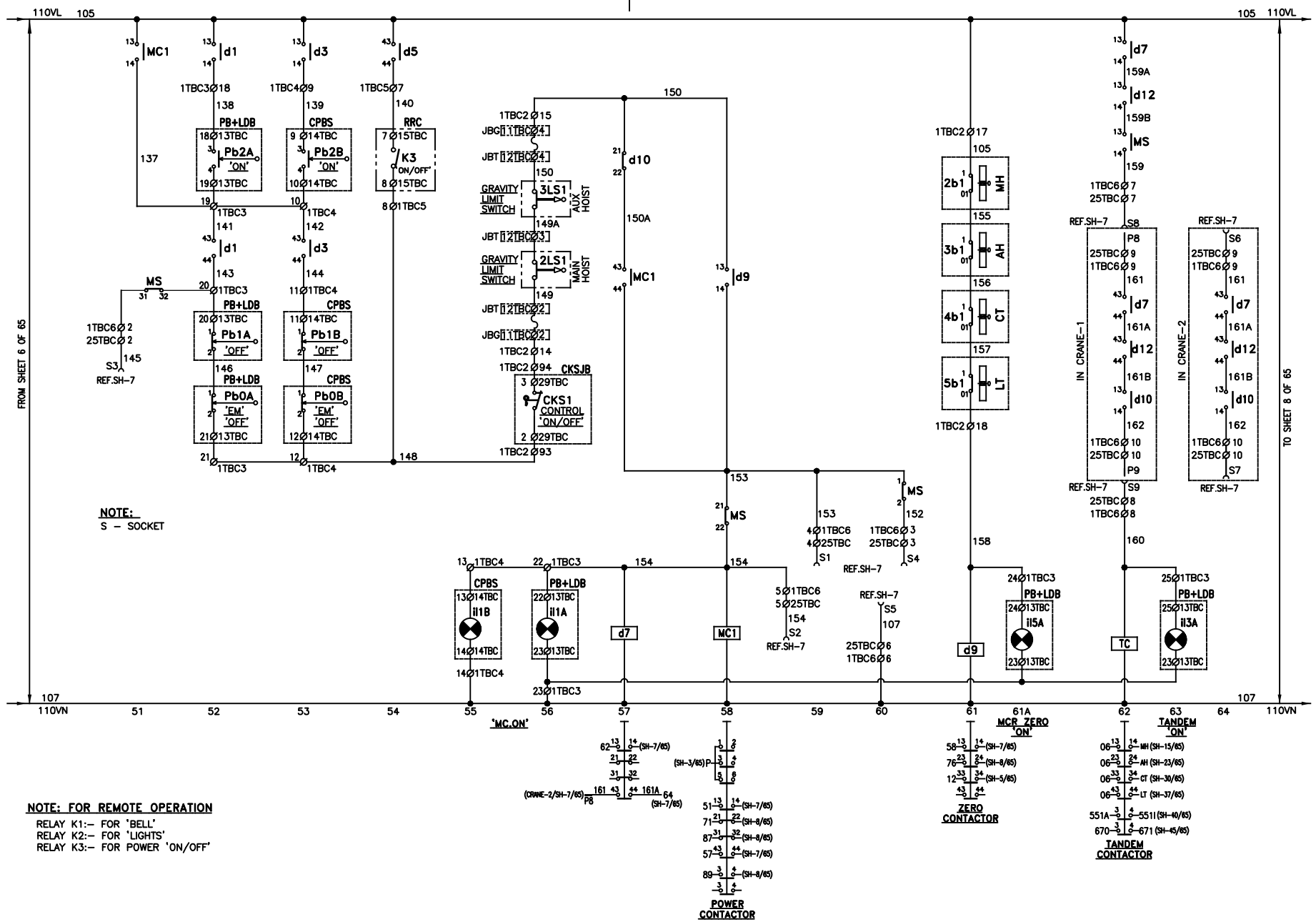
A3.dwg



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CLIENT

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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-2)

TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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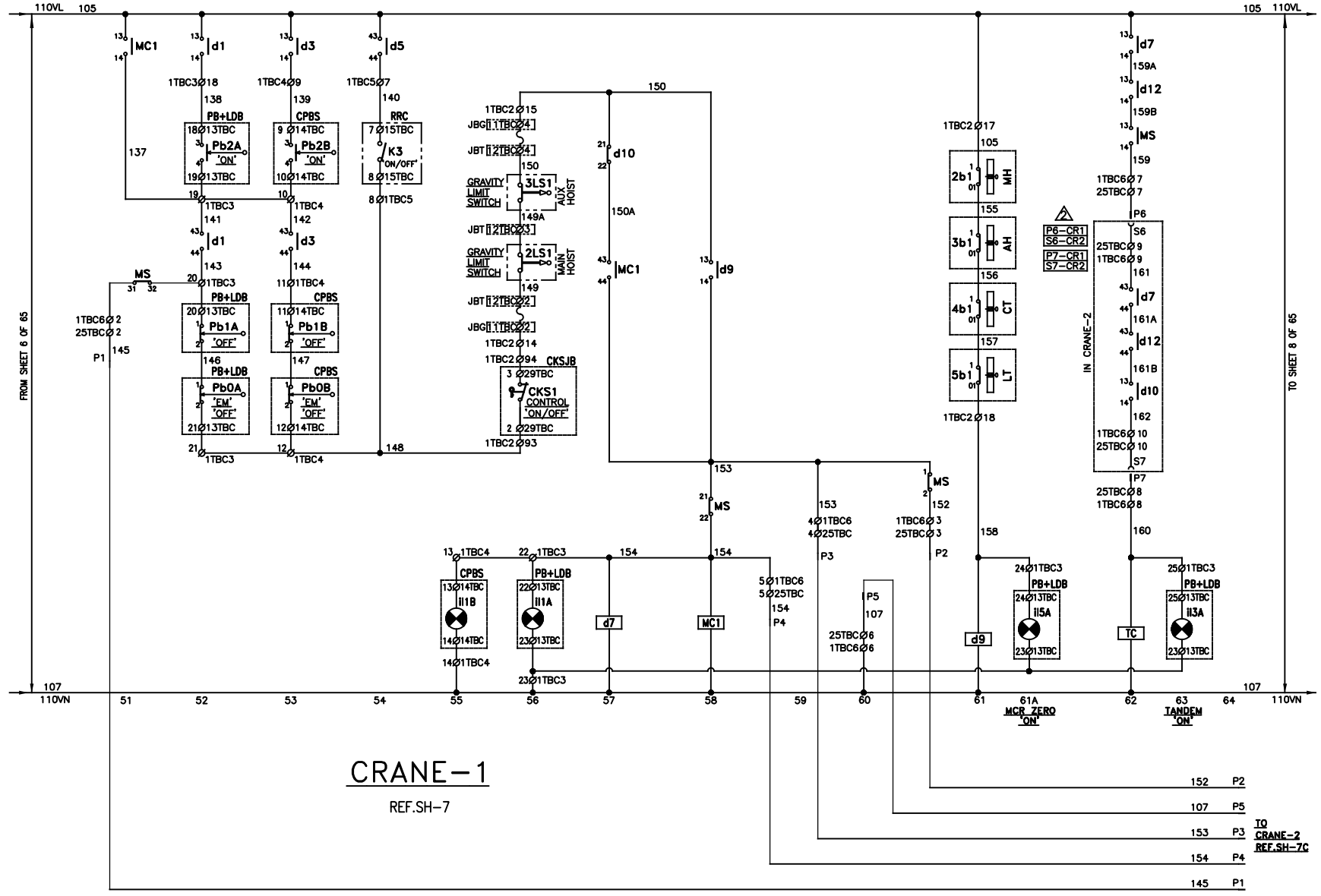

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				Ckd.	ABHAY					
3	REVISED AS NOTED	DP	19.11.2019	APPR.	SMG			TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL	FAFECO DRG NO.: OG-06/250-50-10Tx21M/201	
Issue	Remarks	Name	Date	ALL DIMENSIONS ARE IN MM.		BHEL DRG NO. : PE-V0-437-501-A517				

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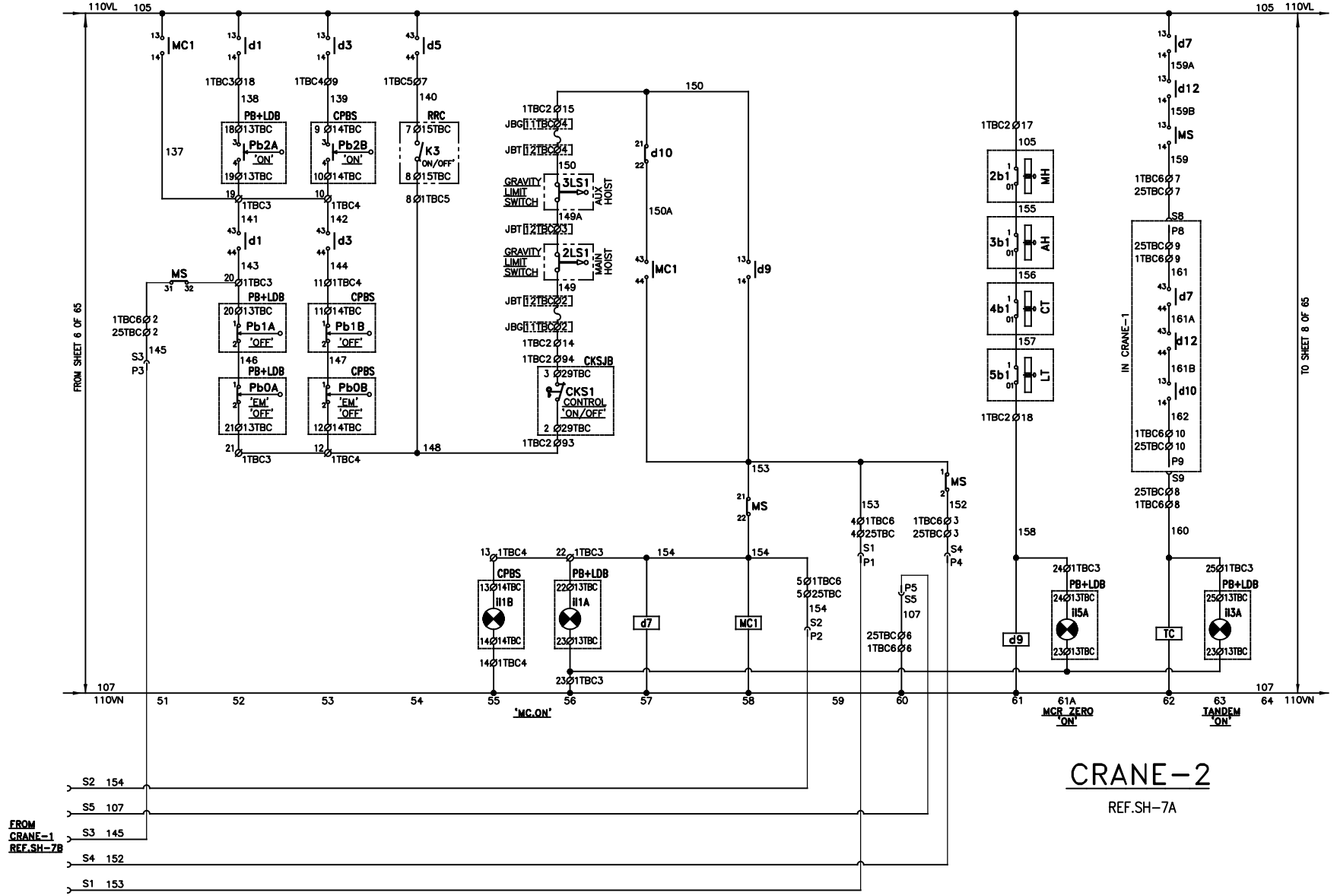

CRANE–2

REF.SH–7A

				Prep.	DINESH	CLIENT	BHARAT HEAVY ELECTRICAL LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI	FAFECO	DESCRIPTION: 250–50–10T x 21M POWER HOUSE CRANE (CRANE–2)	FURNACE & FOUNDRY EQUIPMENT CO. CHANDIVALI FARM MUMBAI – 72	Sheet 7C / 65
				Ckd.	ABHAY						
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Issue	Remarks	Name	Date	ALL DIMENSIONS ARE IN MM.		BHEL DRG NO. : PE–V0–437–501–A517					

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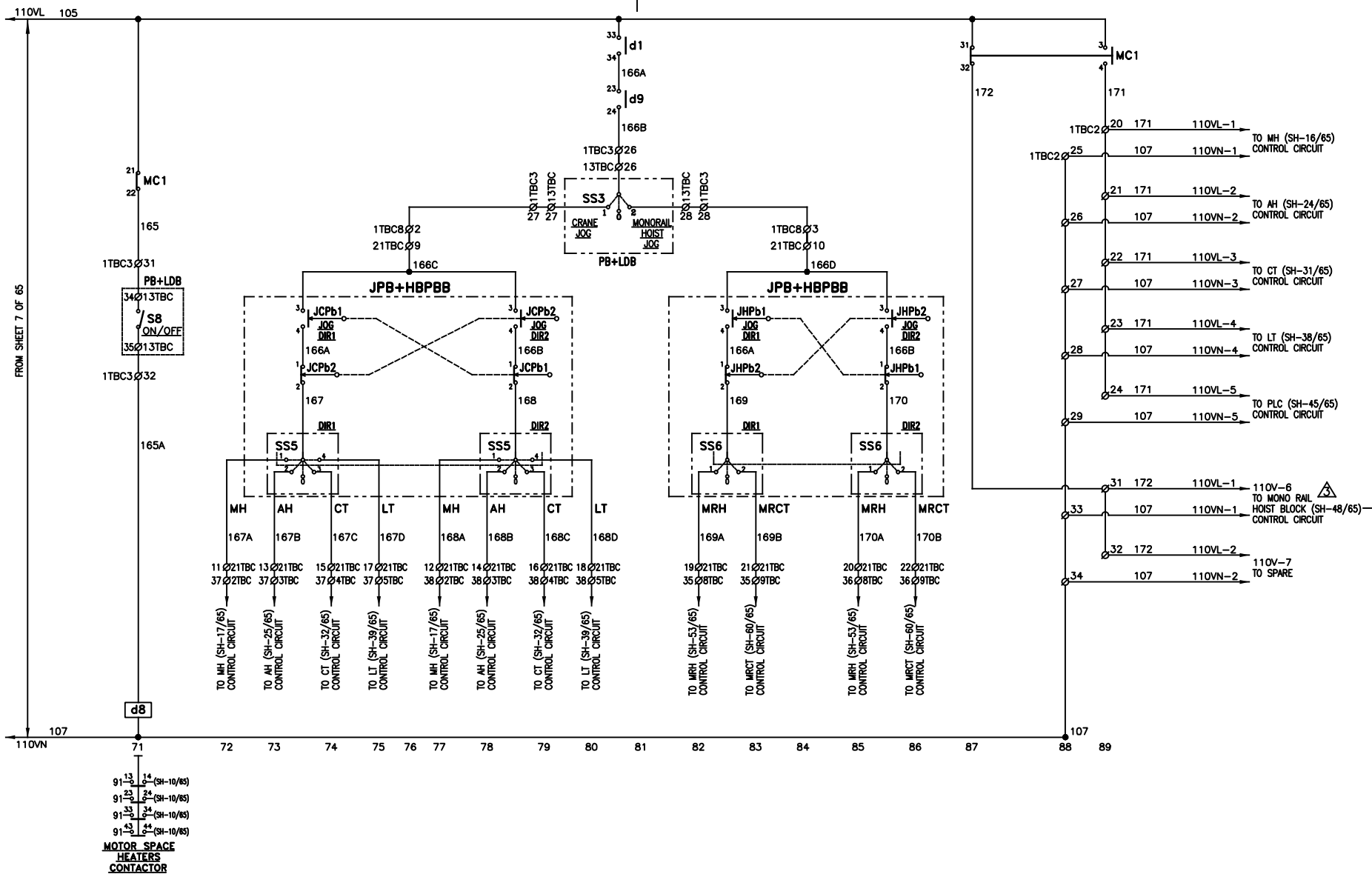

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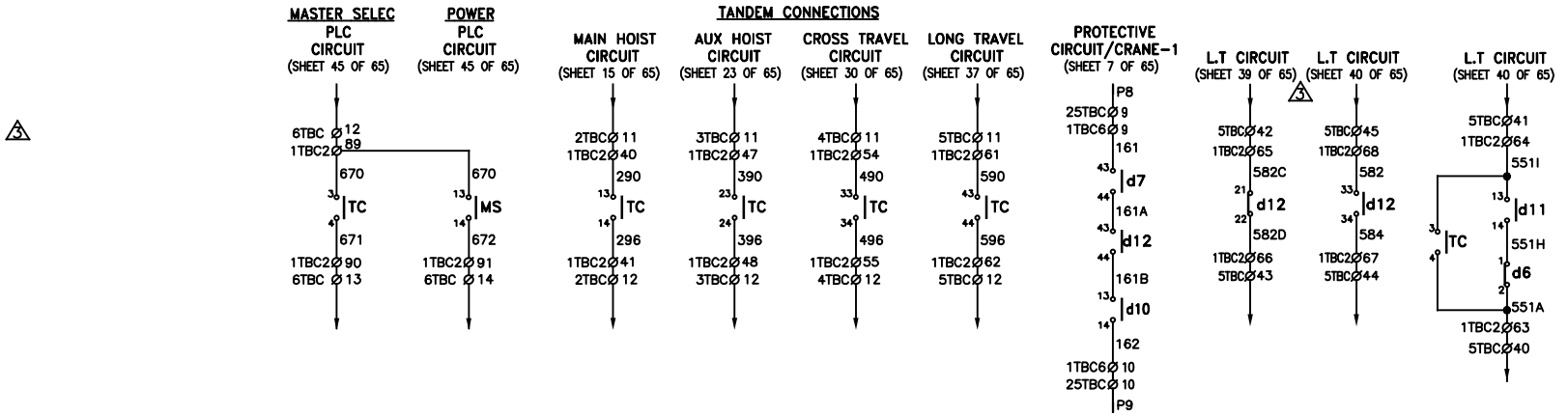

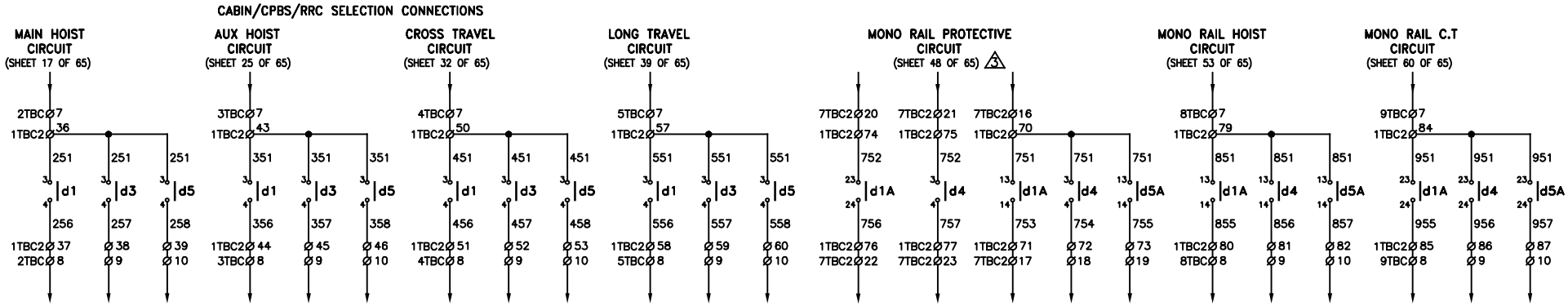

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				Ckd.	ABHAY					
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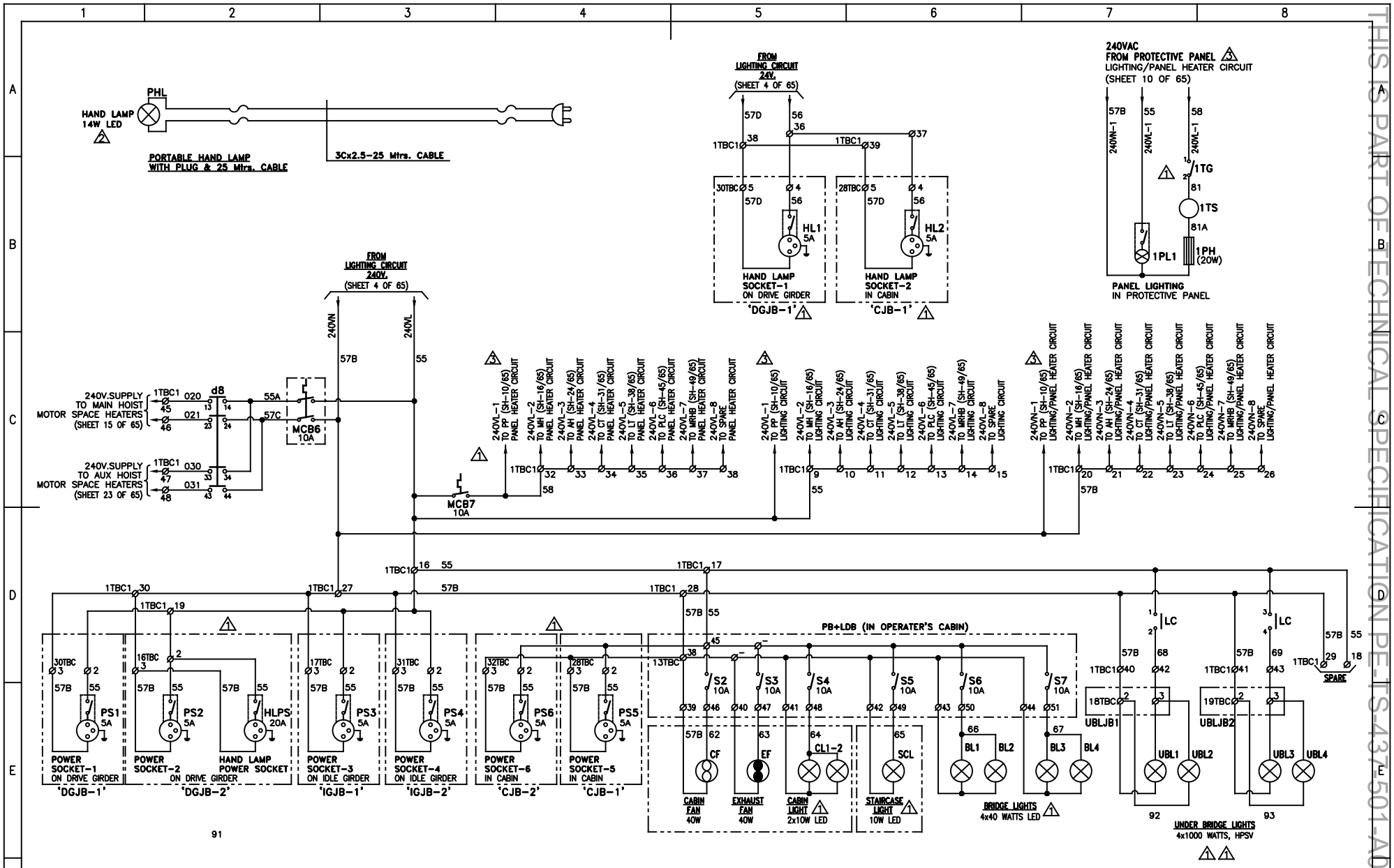

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NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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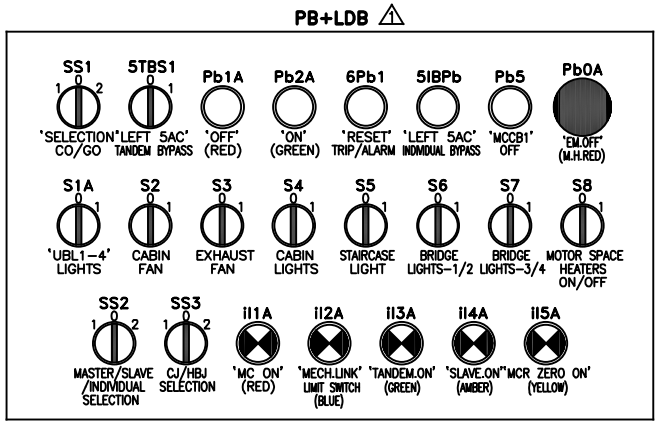
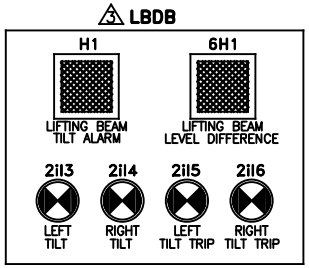
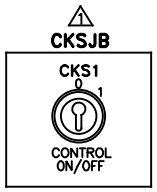


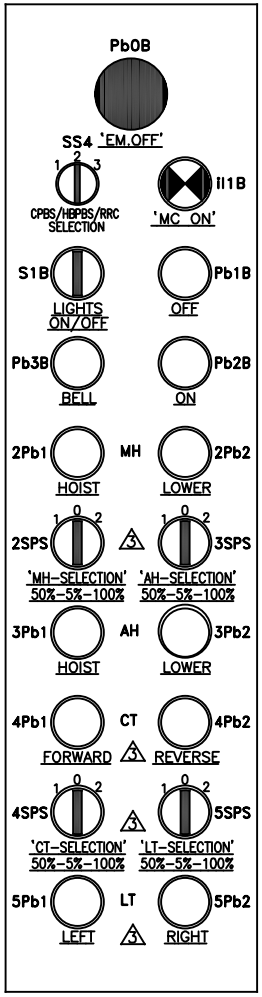
PUSH BUTTON + LIGHTING D.BOARD
(IN OPERATER'S CABIN)



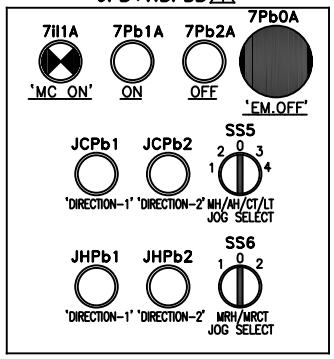
LIFTING BEAM D.BOARD
(IN OPERATER'S CABIN)



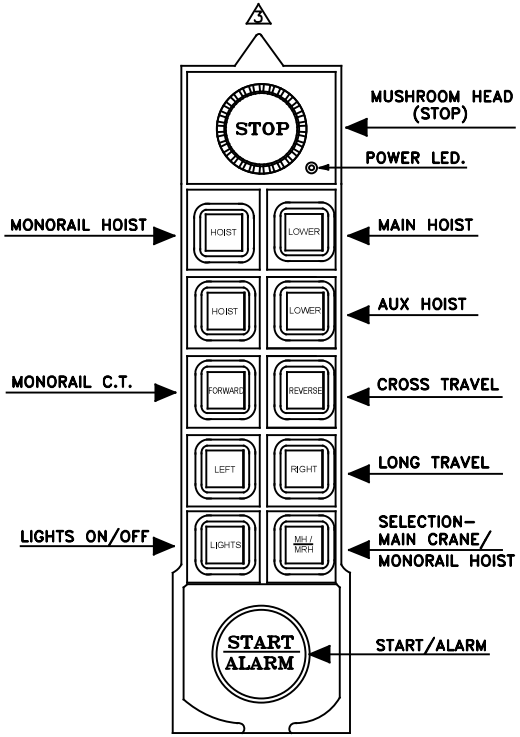
CONTROL KEY SWITCH JN.BOX-CKSJB
(ON CABIN PLATFORM)



PUSH BUTTON STATION
(CPBS)



JOG PUSH BUTTON +
HOIST BLOCK PUSH BUTTON BOARD
(IN OPERATER'S CABIN)



RADIO REMOTE CONTROL
ALL PUSH BUTTONS ARE DOUBLE STEP.
(RRC)

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BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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PROTECTIVE PANEL

Device Tag	Quantity	Material Description	Technical Description	Make	Location
DCDS1	1	DSL CHANGE OVER SWITCH UNIT	415V.AC, 3POLE, 400A.	SIEMENS/GE/L&T/SCHN./C&S	AT GROUND LEVEL
SBS1-2	2	SICK BAY ISOLATING SWITCH-1 & 2	415V.AC, 3POLE, 250A.	SIEMENS/GE/L&T/SCHN./C&S	ON GANTRY PLATFORM
DIL1-2	2	DSL INDICATING LAMP ONE END	415V.	DSS/MMC/REPUTED	AT ONE END OF DSL
DIL3-4	2	DSL INDICATING LAMP OTHER END	415V.	DSS/MMC/REPUTED	AT OTHER END OF DSL
1MCCB1	1	MOULDED CASE CIRCUIT BREAKER	415V.AC, 3POLE, 250A. (ON, OFF & TRIP INDICATION) 65KA TRIP UNIT, UV & SHUNT RELEASE, AUX & ALARM SWITCH	SIEMENS	IN PANEL
MC1	1	MAIN CONTACTOR-1	COIL:110V., 205A., 3P+2NO+2NC, ADD ON-2NO	SIEMENS	IN PANEL
LC	1	LIGHTING CONTACTOR	COIL:110V., 12A., 3P+1NO	SIEMENS	IN PANEL
MS	1	MASTER AUX CONTACTORS	COIL:110V., 10A., 2NO+2NC, ADD ON-1NC	SIEMENS	IN PANEL
TC	1	TANDEM AUX CONTACTORS	COIL:110V., 10A., 4NO, ADD ON-1NO	SIEMENS	IN PANEL
d1	1	AUX CONTACTORS	COIL:110V., 10A., 3NO+1NC, ADD ON-4NO	SIEMENS	IN PANEL
d1A	1	AUX CONTACTORS	COIL:110V., 10A., 4NO	SIEMENS	IN PANEL
d2	1	AUX CONTACTORS	COIL:110V., 10A., 2NO+2NC	SIEMENS	IN PANEL
d3-d4-d5	3	AUX CONTACTORS	COIL:110V., 10A., 2NO+2NC, ADD ON-4NO	SIEMENS	IN PANEL
d5A	1	AUX CONTACTORS	COIL:110V., 10A., 4NO	SIEMENS	IN PANEL
d6	1	AUX CONTACTORS	COIL:110V., 10A., 4NO, ADD ON-1NC	SIEMENS	IN PANEL
d7, d10, d11	4	AUX CONTACTORS	COIL:110V., 10A., 2NO+2NC	SIEMENS	IN PANEL
d12	1	AUX CONTACTORS	COIL:110V., 10A., 3NO+1NC	SIEMENS	IN PANEL
d8-d9	2	AUX CONTACTORS	COIL:110V., 10A., 4NO	SIEMENS	IN PANEL
MPCB1	1	MOTOR PROTECTION CIRCUIT BREAKER	3POLE MPCB, RANGE: 7-10A	SIEMENS	IN PANEL
MPCB2	1	MOTOR PROTECTION CIRCUIT BREAKER	3POLE MPCB, RANGE: 17-22A	SIEMENS	IN PANEL
MCB1	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 20A	SIEMENS	IN PANEL
MCB2	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 40A	SIEMENS	IN PANEL
MCB3	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 10A	SIEMENS	IN PANEL
MCB4	1	MINIATURE CIRCUIT BREAKER	3POLE MCB, 2A	SIEMENS	IN PANEL
MCB5	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 10A	SIEMENS	IN PANEL
MCB6	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 10A	SIEMENS	IN PANEL
MCB7	1	MINIATURE CIRCUIT BREAKER	2POLE MCB, 1A	SIEMENS	IN PANEL
1PL1	1	PANEL LIGHT WITH SWITCH	240V., 2.5W, TYPE: LED	DSS	IN PANEL
1TS	1	THERMOSTAT FOR `1PH'	240V.AC, 0-80	VILECO/REPUTED	IN PANEL
1PH	1	PANEL HEATER	240V.AC, 20W.	VILECO/REPUTED	IN PANEL
1TG	1	TOGGLE SWITCH FOR 1TS	240V.AC, 10A.	KAYCEE	IN PANEL
MCB8	1	MINIATURE CIRCUIT BREAKER	3POLE MCB, 2A	SIEMENS	IN PANEL
1C11-13	3	C.T. COILS FOR AMMETER	RATIO:200/5A., (ACC.CLASS 1.0)	AE/IMP/MECO	IN PANEL
TR1A-B	2	CONTROL TRANSFORMER	415V./0-110V., +/-5%&+/-2.5%TAPPING, 1500VA	NEC	IN TRANSFORMER BOX-1
TR2A-B	2	LIGHTING TRANSFORMER	415V./0-24V-240V., +/-5%&+/-2.5%TAPPING, 6500VA	NEC	IN TRANSFORMER BOX-2
il7	1	R,Y,B INDICATING LAMP	220V AC LAMP, RED,YELLOW,BLUE, TYPE:LED	SIEMENS	ON PANEL DOOR
il8	1	MCCB1 'OFF' INDICATING LAMP	110V AC LAMP, GREEN, TYPE:LED	SIEMENS	ON PANEL DOOR
il9	1	MCCB1 'ON' INDICATING LAMP	110V AC LAMP, RED, TYPE:LED	SIEMENS	ON PANEL DOOR
il10	1	MCCB1 'TRIP' INDICATING LAMP	110V AC LAMP, WHITE, TYPE:LED	SIEMENS	ON PANEL DOOR
SS7	1	SELECTOR SWITCH FOR CONTROL TRANSFORMER STANDBY	10A, 3 POSITION, 4POLE, 1NO+1NC	SIEMENS/KAYCEE	ON PANEL DOOR
SS8	1	SELECTOR SWITCH FOR LIGHTING TRANSFORMER STANDBY	10A, 3 POSITION, 4POLE, 1NO+1NC	SIEMENS/KAYCEE	ON PANEL DOOR
SS9	1	SELECTOR SWITCH FOR LIGHTING TRANSFORMER STANDBY	10A, 3 POSITION, 2POLE, 1NO+1NC	SIEMENS/KAYCEE	ON PANEL DOOR
1VM	1	VOLTMETER	RANGE:0-500V. (ACC.CLASS 1.5)	AE/IMP/MECO	ON PANEL DOOR
1VSS	1	VOLTMETER SELECTOR SWITCH	10A, 1POLE, 1NO+1NC	SIEMENS/KAYCEE	ON PANEL DOOR
1AM	1	AMMETER	RANGE:0-300V. (ACC.CLASS 1.5)	AE/IMP/MECO	ON PANEL DOOR
1ASS	1	AMMETER SELECTOR SWITCH	10A, 1POLE, 1NO+1NC	SIEMENS/KAYCEE	ON PANEL DOOR

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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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PROTECTIVE PANEL					
Device Tag	Quantity	Material Description	Technical Description	Make	Location
il1A	1	'MAIN CONTACTOR-1 'ON' INDICATING LAMP	110V AC, LED LAMP, (RED)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
il2A	1	'MECH.LINK' LIMIT SWITCH INDICATING LAMP	110V AC, LED LAMP, (BLUE)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
il3A	1	'TANDEM ON' INDICATING LAMP	110V AC, LED LAMP, (GREEN)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
il4A	1	'SLAVE ON' INDICATING LAMP	110V AC, LED LAMP, (AMBER)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
il5A	1	'MCR ZERO ON' INDICATING LAMP	110V AC, LED LAMP, (YELLOW)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
SS1	1	SELECTOR SWITCH FOR CABIN OPERATION & GROUND OPERATION SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	PUSH BOTTON+ LIGHTING D.BOARD
SS2	1	SELECTOR SWITCH FOR MASTER, INDIVIDUAL & TANDEM SLAVE SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	PUSH BOTTON+ LIGHTING D.BOARD
SS3	1	SELECTOR SWITCH FOR CRANE JOG & MONORAIL HOIST BLOCK JOG SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	PUSH BOTTON+ LIGHTING D.BOARD
Pb0A	1	EMOFF' PUSH BUTTON	10A, 1NC (MUSHROOM HEAD-RED)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
Pb1A	1	OFF' PUSH BUTTON	10A, 1NC (RED)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
Pb2A	1	ON' PUSH BUTTON	10A, 1NO (GREEN)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
Pb5	1	'MCCB.1' OFF PUSH BUTTON	10A, 1NO (BLACK)	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S1A	1	ON/OFF SWITCH FOR 'UBL1-4'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S2	1	ON/OFF SWITCH FOR 'CF'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S3	1	ON/OFF SWITCH FOR 'EP'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S4	1	ON/OFF SWITCH FOR 'CL'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S5	1	ON/OFF SWITCH FOR 'SCL'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S6	1	ON/OFF SWITCH FOR 'BL1-2'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S7	1	ON/OFF SWITCH FOR 'BL3-4'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
S8	1	ON/OFF SWITCH FOR 'MOTOR SPACE HEATERS'	10A, 2 POSITION, 1NO+1NC	SIEMENS	PUSH BOTTON+ LIGHTING D.BOARD
il1B	1	MAIN CONTACTOR-1 'ON' INDICATING LAMP	110V AC, LED LAMP, (RED)	SIEMENS	ON CRANE PUSH BOTTON STATION
SS4	1	SELECTOR SWITCH FOR CRANE PUSH BUTTON/ HOIST BLOCK PUSH BUTTON/RRC STATION SELECTION	10A, 3 POSITION, 2NO+2NC	SIEMENS/KAYCEE	ON CRANE PUSH BOTTON STATION
Pb0B	1	EMOFF' PUSH BUTTON	10A, 1NC (MUSHROOM HEAD-RED)	SIEMENS	ON CRANE PUSH BOTTON STATION
Pb1B	1	'OFF' PUSH BUTTON	10A, 1NC (RED)	SIEMENS	ON CRANE PUSH BOTTON STATION
Pb2B	1	'ON' PUSH BUTTON	10A, 1NO (GREEN)	SIEMENS	ON CRANE PUSH BOTTON STATION
Pb3B	1	'BELL' PUSH BUTTON	10A, 1NO (YELLOW)	SIEMENS	ON CRANE PUSH BOTTON STATION
S1B	1	ON/OFF SWITCH FOR 'UBL1-4'	10A, 2 POSITION, 1NO+1NC	SIEMENS	ON CRANE PUSH BOTTON STATION
K1,K2,K3	3	POTENTIAL FREE CONTACTS OF PENDANT RADIO REMOTE CONTROL PANEL FOR PP	POTENTIAL FREE RELAY, 110V.AC	SNT/REPUTED	IN REMOTE PANEL
JCPb1	1	'JOG FOR CRANE' PUSH BUTTON-1 (DIRECTION-1)	10A, 2NO+2NC (BLACK)	SIEMENS	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH
JCPb2	1	'JOG FOR CRANE' PUSH BUTTON-2 (DIRECTION-2)	10A, 2NO+2NC (BLACK)	SIEMENS	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH
SS5	1	SELECTOR SWITCH OF DIRECTION-1 JOG & DIRECTION-2 JOG FOR MH, AH, CT, LT SELECTION	10A, 5 POSITION, 2POLE, 1NO+1NC	SIEMENS/KAYCEE	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH
JHPb1	1	'JOG FOR HOIST BLOCK' PUSH BUTTON-1 (DIRECTION-1)	10A, 2NO+2NC (BLACK)	SIEMENS	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH
JHPb2	1	'JOG FOR HOIST BLOCK' PUSH BUTTON-2 (DIRECTION-2)	10A, 2NO+2NC (BLACK)	SIEMENS	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH
SS6	1	SELECTOR SWITCH OF DIRECTION-1 JOG & DIRECTION-2 JOG FOR MRH, MRCT SELECTION	10A, 3 POSITION, 2POLE, 1NO+1NC	SIEMENS/KAYCEE	ON JOG PUSH BOTTON+ HOIST BLOCK PUSH BUTTON BOARD

Issue	Remarks	Name	Date
1	REVISED AS NOTED	DP	07.09.2019

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CLIENT: BHARAT HEAVY ELECTRICAL LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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PROTECTIVE PANEL

Device Tag	Quantity	Material Description	Technical Description	Make	Location
CF	1	CABIN FAN	240V., 400mm SWEEP, 40W	EMCO/CINI	IN CABIN
EF	1	EXHAUST FAN	240V., 300mm SWEEP, 40W	EMCO/CINI	IN CABIN
CL1-2	2	CABIN LIGHTS	240V., 10W., LED	PHILIPS/CROMPTION/BAJAJ/GE	IN CABIN
FS	1	FOOT SWITCH FOR BELL	10A., 40W.	REPUTED	IN CABIN
SCL	1	STAIRCASE LIGHT	240V., 10W., LED	PHILIPS/CROMPTION/BAJAJ/GE	OUTSIDE CABIN
B	1	ELECTRICAL BELL	110V.	KHERAJ/REPUTED	OUTSIDE CABIN
HL1	1	HAND LAMP SOCKET WITH SWITCH (DGIB-1)	24V., 5A.	PHILIPS/CROMPTION	ON DRIVE GIRDER JN. BOX-1
PS1	1	POWER SOCKET WITH SWITCH (DGIB-1)	240V., 5A.	PHILIPS/CROMPTION	ON DRIVE GIRDER JN. BOX-1
PS2	1	POWER SOCKET WITH SWITCH (DGIB-2)	240V., 5A.	PHILIPS/CROMPTION	ON DRIVE GIRDER JN. BOX-2
HLPS	1	HAND LAMP POWER SOCKET WITH SWITCH (DGIB-2)	240V., 20A.	PHILIPS/CROMPTION	ON DRIVE GIRDER JN. BOX-2
PS3	1	POWER SOCKET WITH SWITCH (IGIB-1)	240V., 5A.	PHILIPS/CROMPTION	ON IDLE GIRDER JN. BOX-1
PS4	1	POWER SOCKET WITH SWITCH (IGIB-2)	240V., 5A.	PHILIPS/CROMPTION	ON IDLE GIRDER JN. BOX-2
HL2	1	HAND LAMP SOCKET WITH SWITCH (CJB-1)	24V., 5A.	PHILIPS/CROMPTION	ON CABIN JN. BOX-1
PS5	1	POWER SOCKET WITH SWITCH (CJB-1)	240V., 5A.	PHILIPS/CROMPTION	ON CABIN JN. BOX-1
PS6	1	POWER SOCKET WITH SWITCH (CJB-2)	240V., 5A.	PHILIPS/CROMPTION	ON CABIN JN. BOX-2
2LS1	1	LIMIT SWITCH (MAIN HOIST)	TYPE: GRAVITY, 10A., 1NC	EMM/SOC	ON TROLLEY
3LS1	1	LIMIT SWITCH (AUX HOIST)	TYPE: GRAVITY, 10A., 1NC	EMM/SOC	ON TROLLEY
MLLS	1	MECH-LINK LIMIT SWITCH FOR TANDEM	TYPE: SNAP ACTION, 10A., 1NO+1NC	SIEMENS/REPUTED	ON END CARRIAGE
UBL1-4	4	UNDER BRIDGE LIGHTS	240V., 1000W., TYPE: HPSV	PHILIPS/CROMPTION/BAJAJ/GE	UNDER BRIDGE
BL1-4	4	BRIDGE LIGHTS	240V., 40W., TYPE: LED	PHILIPS/CROMPTION/BAJAJ/GE	ON BRIDGE
P	1	16 PIN PLUG	110V.AC, 16 PIN	CONTROLWELL/REPUTED	ON BRIDGE
S	1	16 SOCKET	110V.AC, 16 SOCKET	CONTROLWELL/REPUTED	ON BRIDGE
PHL	1	PORTABLE HAND LAMP WITH PLUG & 25 Mtrs	24V.AC, 14W LED	REPUTED	ON BRIDGE
CKS1	1	CONTROL KEY REMOVABLE OFF SWITCH	10A, 2 POSITION, 2NO+2NC, KEY ACTUATOR	SIEMENS/KAYCEE	ON CABIN PLATFORM JN.BOX

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3	REVISED AS NOTED	DP	19.11.2019
2	REVISED AS NOTED	DP	19.10.2019
1	REVISED AS NOTED	DP	07.09.2019

Prep. DINESH | Ckd. ABHAY | APPR. SMG | ALL DIMENSIONS ARE IN MM.

CLIENT: BHARAT HEAVY ELECTRICAL LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF PROTECTIVE PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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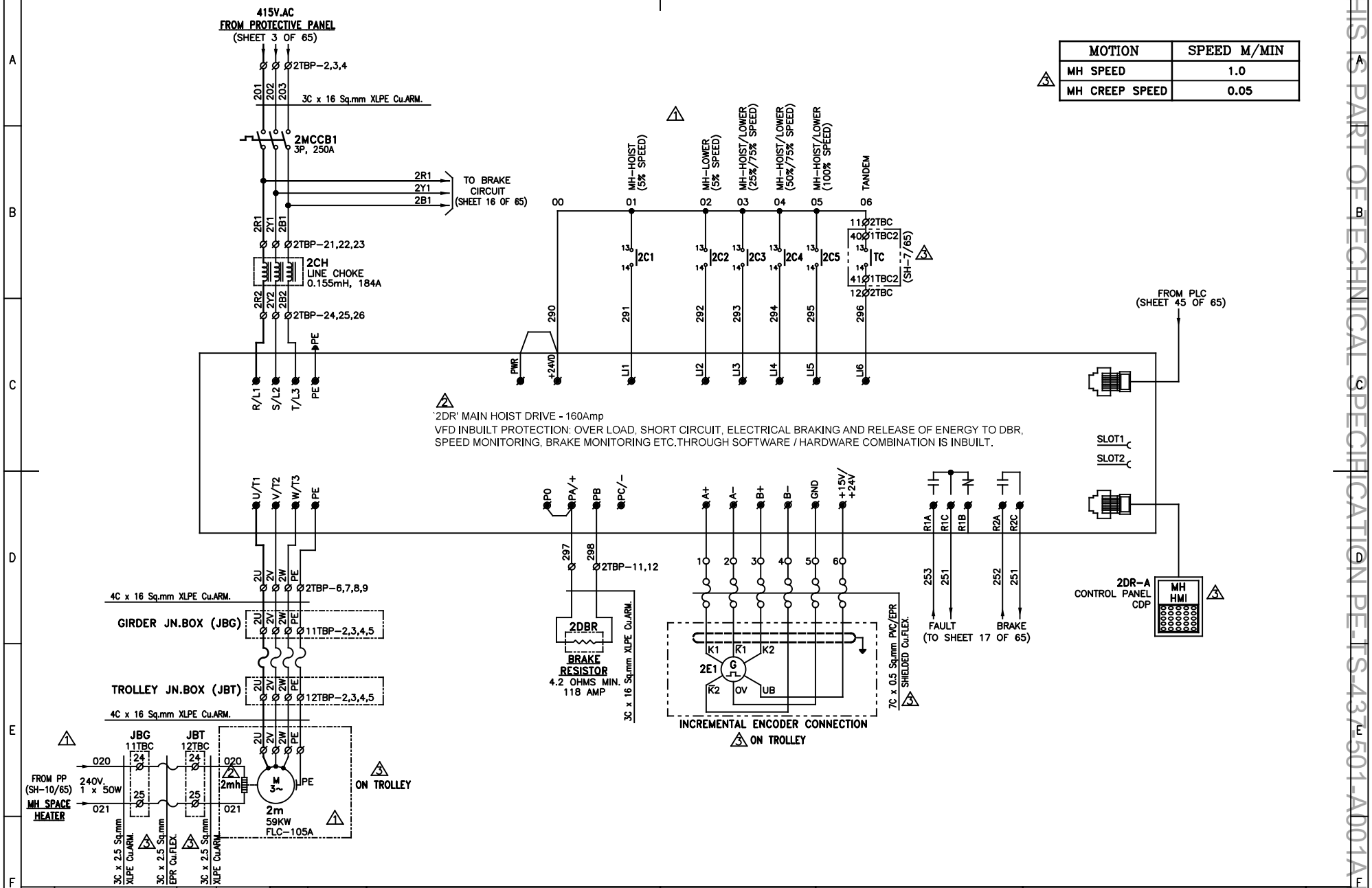

MOTION	SPEED M/MIN
MH SPEED	1.0
MH CREEP SPEED	0.05

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PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

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DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1&2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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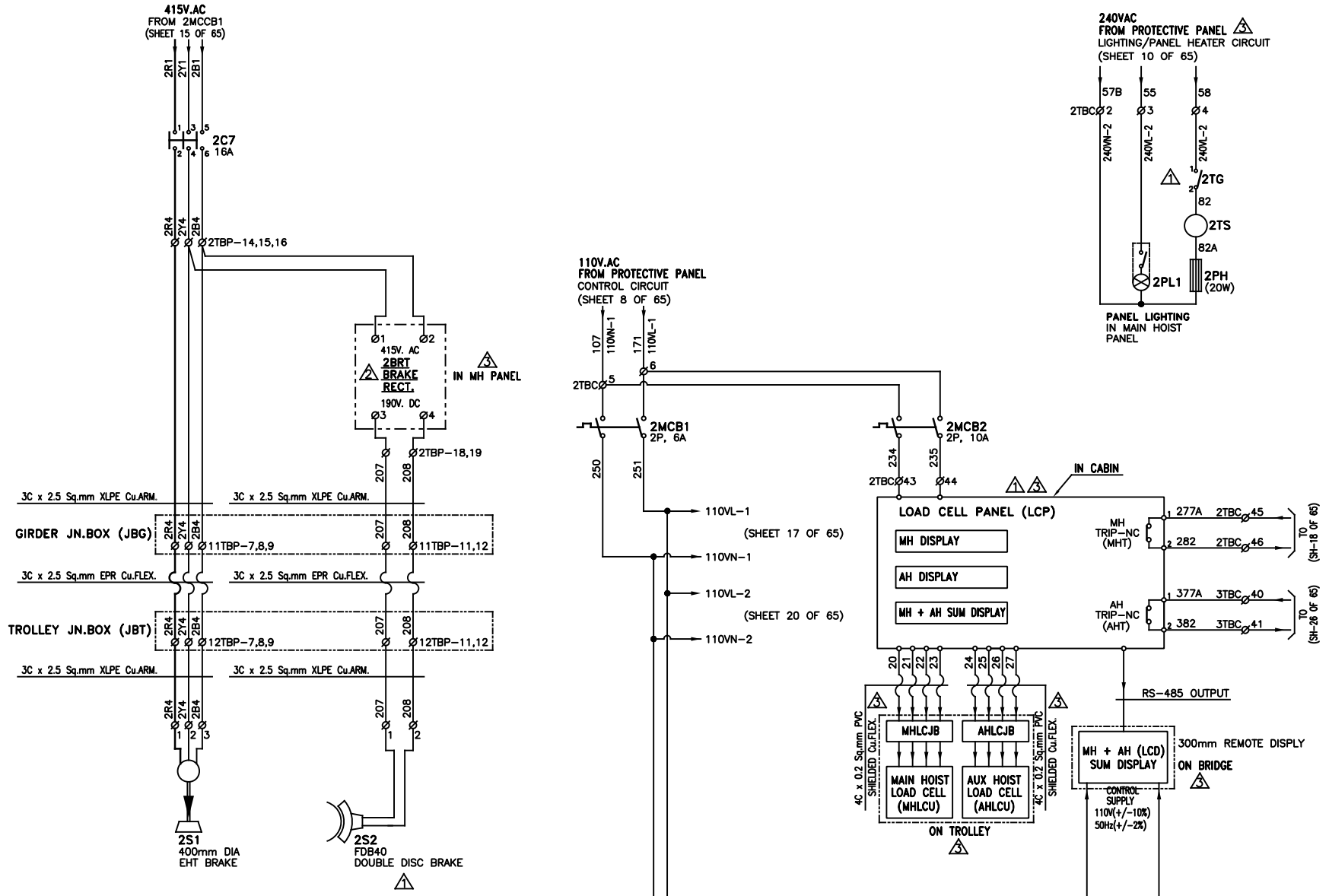

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CHANDIVALI FARM MUMBAI – 72

FAFECO DRG NO.: OG–06/250–50–10Tx21M/201

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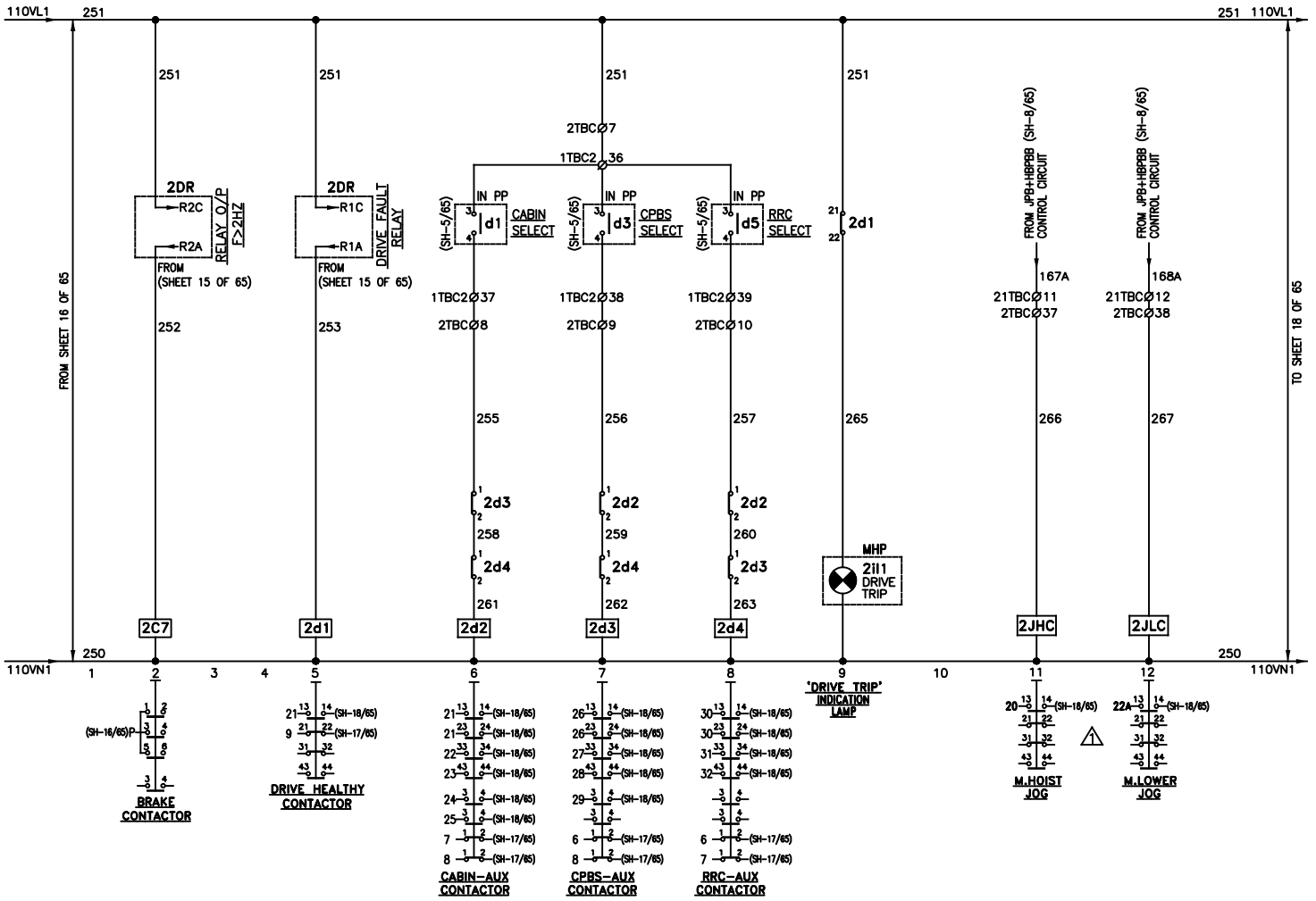

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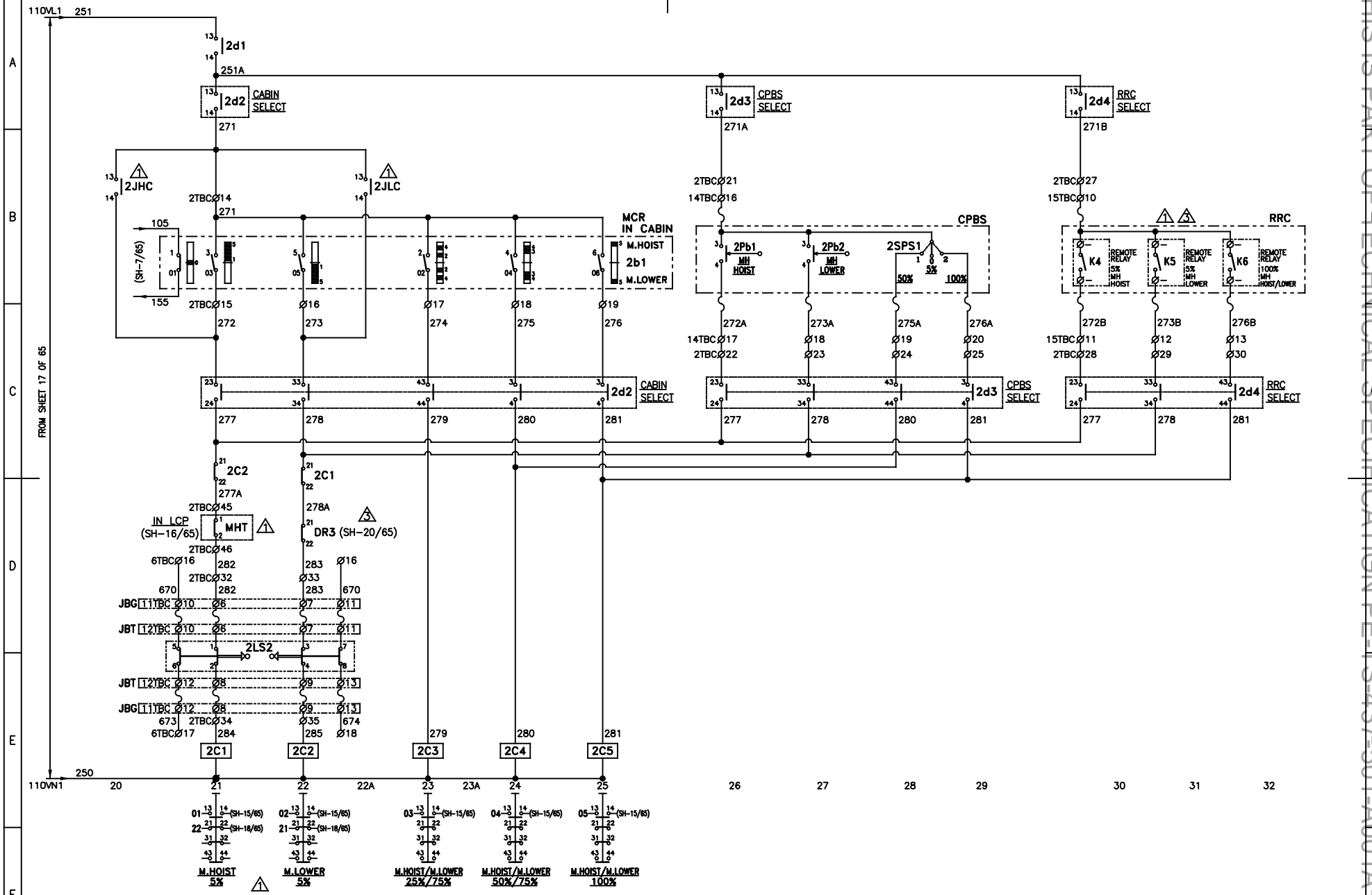

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NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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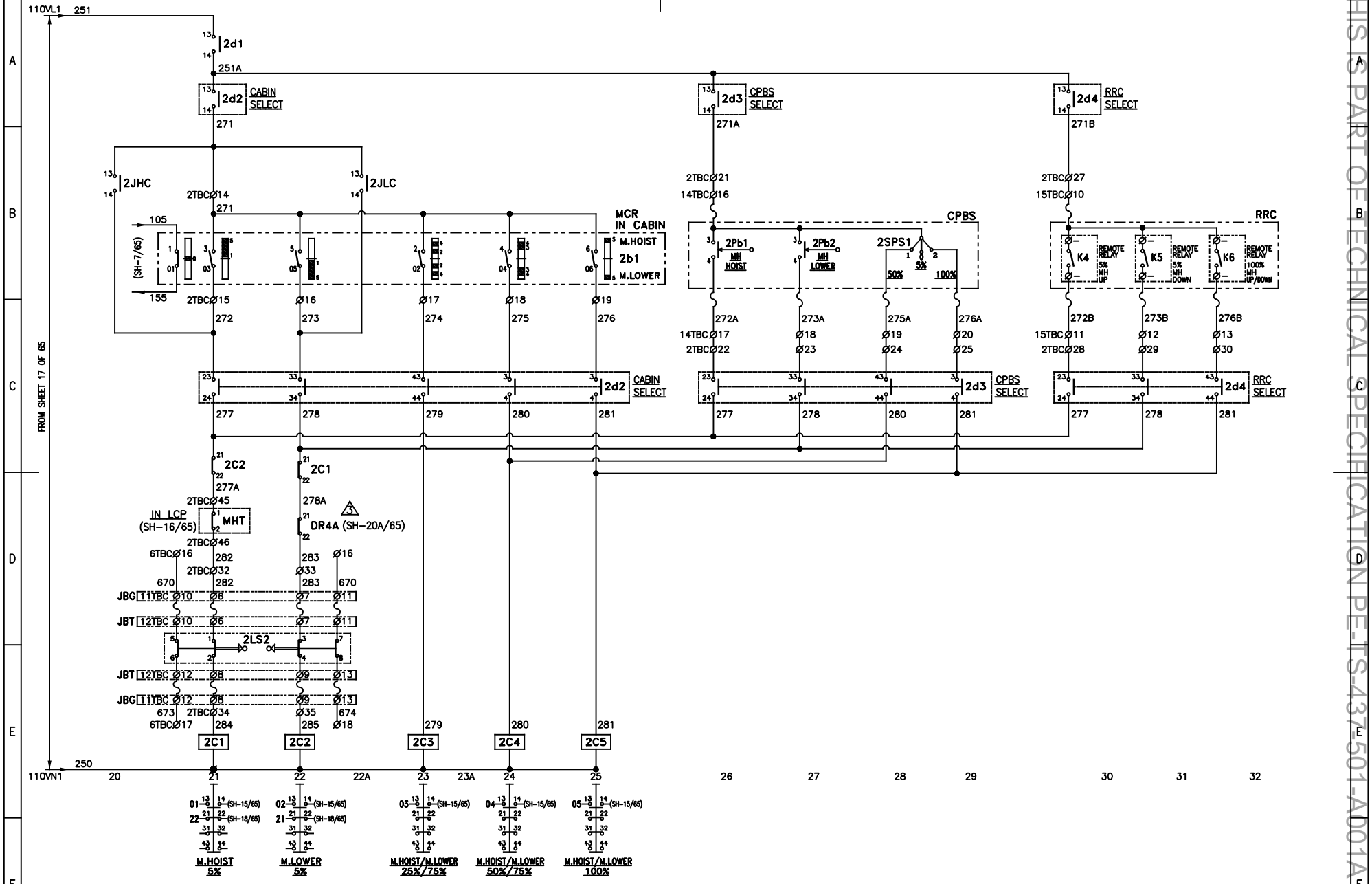

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				Ckd.	ABHAY
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NEW DELHI
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FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-2)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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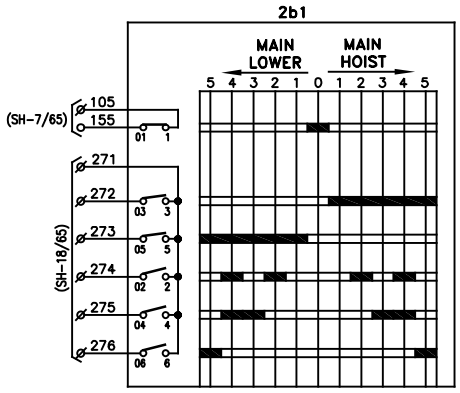

CONTROLLER SEQUENCE

MASTER CONTROLLER		CONTACTORS	2C1	2C2	2C3	2C4	2C5	2C7
MAIN HOIST		5	○				○	○
		4	○		○	○		○
		3	○			○		○
		2	○		○			○
		1	○					○
OFF		0						
MAIN LOWER		1		○				○
		2		○	○			○
		3		○		○		○
		4		○	○	○		○
		5		○			○	○

CONTACTORS SEQUENCE

○ CONTACTORS ENERGISED.

NOTE: FOR PUSH BUTTON OPERATION

PUSH BUTTON	SPEED	CONTACTORS 2C7	2C1	2C2	2C3	2C4	2C5
2Pb1	100%	○	○				○
	50%	○	○			○	
	5%	○	○				
③ OFF							
2Pb2	5%	○		○			
	50%	○		○		○	
	100%	○		○			○

CONTACTORS SEQUENCE

○ CONTACTORS ENERGISED

③ NOTE: FOR REMOTE OPERATION

RELAY K4:– FOR MH HOIST–5%
RELAY K5:– FOR MH LOWER–5%
RELAY K6:– FOR MH HOIST/LOWER–100%

				Prep.	DINESH	CLIENT	BHARAT HEAVY ELECTRICAL LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI
				Ckd.	ABHAY		
3	REVISED AS NOTED	DP	19.11.2019	APPR.	SMG		
Issue	Remarks	Name	Date	ALL DIMENSIONS ARE IN MM.		BHEL DRG NO. :	PE–V0–437–501–A517

FAFECO

DESCRIPTION: 250–50–10T x 21M POWER HOUSE CRANE (CRANE–1&2)

TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI – 72

FAFECO DRG NO.: OG–06/250–50–10Tx21M/201

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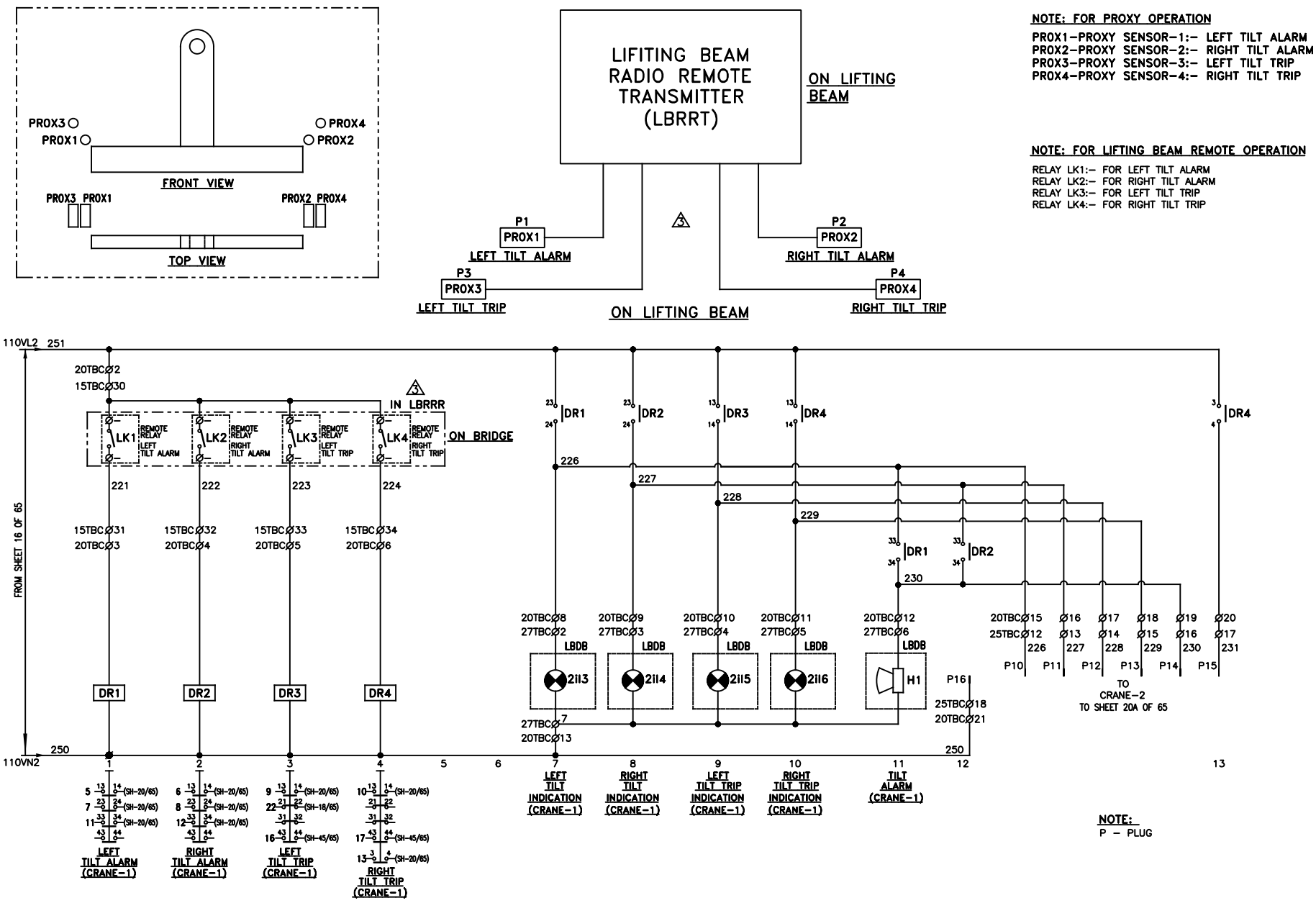

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POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI
BHEL DRG NO. : PE-V0-437-501-A517

FAFECO

DESCRIPTION: 250-50-10T x 21M POWER HOUSE CRANE (CRANE-1)
TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL

FURNACE & FOUNDRY EQUIPMENT CO.
CHANDIVALI FARM MUMBAI - 72
FAFECO DRG NO.: OG-06/250-50-10Tx21M/201

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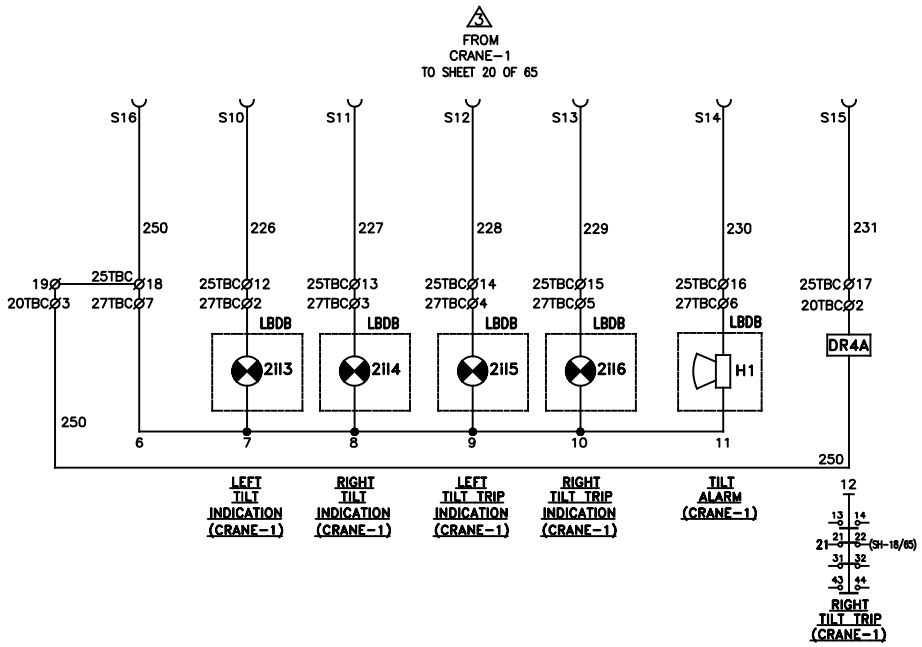
A3.dwg



NOTE:
S – SOCKET

				Prep.	DINESH	CLIENT	BHARAT HEAVY ELECTRICAL LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI	FAFECO	DESCRIPTION: 250–50–10T x 21M POWER HOUSE CRANE (CRANE–2)	FURNACE & FOUNDRY EQUIPMENT CO. CHANDIVALI FARM MUMBAI – 72	Sheet 20A / 65
				Ckd.	ABHAY					
3	REVISED AS NOTED	DP	19.11.2019	APPR.	SMG			TITLE : SCHEMATIC CIRCUIT DIAGRAM BOM OF MAIN HOIST PANEL	FAFECO DRG NO.: OG–06/250–50–10Tx21M/201	
Issue	Remarks	Name	Date	ALL DIMENSIONS ARE IN MM.		BHEL DRG NO. : PE–V0–437–501–A517				

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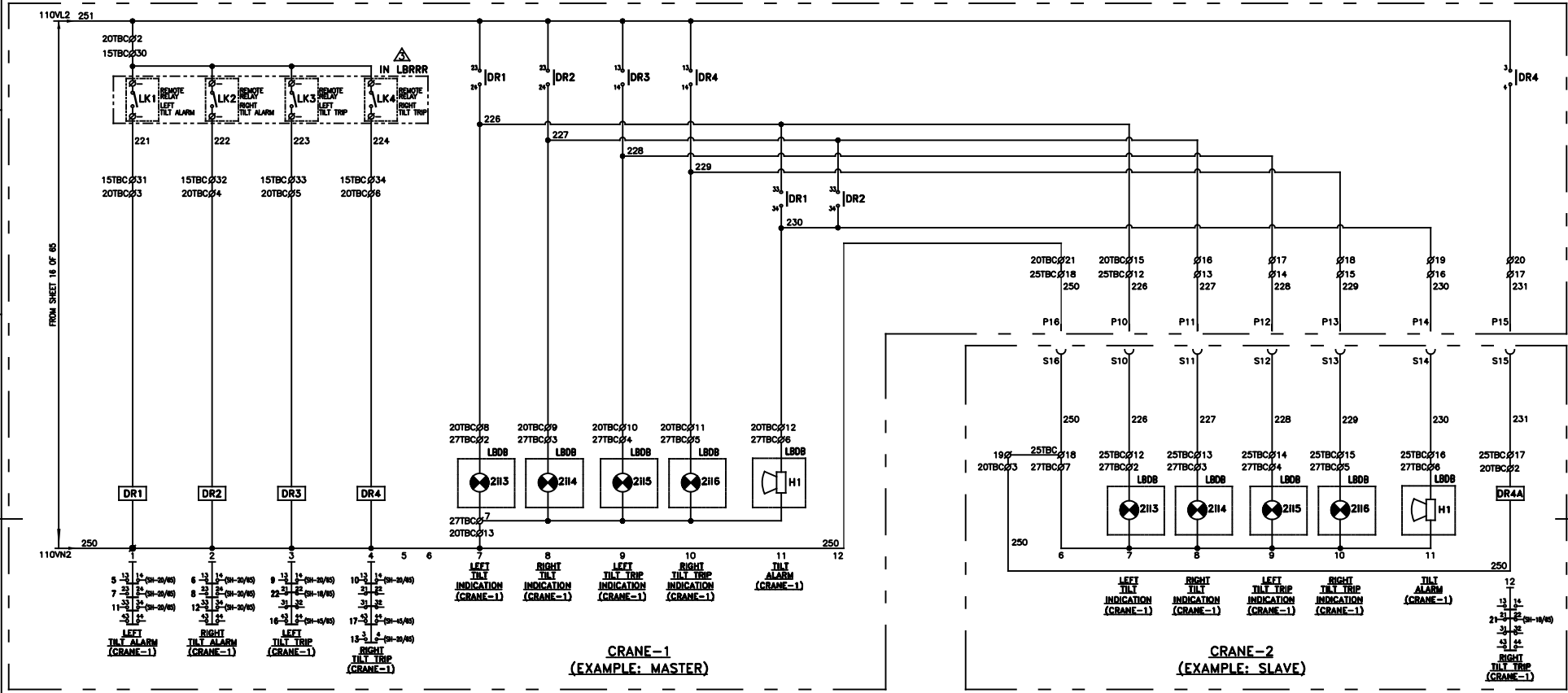
⚠5 TANDEM CONTROL CIRCUIT



TANDEM OPERATION

PLUG-P (ON CRANE-1)			SOCKET-S (ON CRANE-2)		
145	1	P1	S1	1	153
152	2	P2	S2	2	154
153	3	P3	S3	3	145
154	4	P4	S4	4	152
107	5	P5	S5	5	107
159	6	P6	S6	6	161
160	7	P7	S7	7	162
161	8	P8	S8	8	159
162	9	P9	S9	9	160
226	10	P10	S10	10	226
227	11	P11	S11	11	227
228	12	P12	S12	12	228
229	13	P13	S13	13	229
230	14	P14	S14	14	230
231	15	P15	S15	15	231
250	16	P16	S16	16	250

NOTE: FOR LIFTING BEAM REMOTE OPERATION

RELAY LK1:– FOR LEFT TILT ALARM
RELAY LK2:– FOR RIGHT TILT ALARM
RELAY LK3:– FOR LEFT TILT TRIP
RELAY LK4:– FOR RIGHT TILT TRIP

				Prep.	DINESH
				Ckd.	ABHAY
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