

2X250MW BHAVNAGAR TPS

TECHNICAL SPECIFICATION FOR LOW VOLTAGE SWITCHGEAR

BHEL DOCUMENT NO. : EPD-TS-CPBG-CC-18002, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE – 560012**

**2X250MW BHAVNAGAR TPS**

TECHNICAL SPECIFICATION

SPECIFICATION NO. : EPD-TS-CPBG-CC-18002

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 5/4/2018

SHEET : 1 OF 1

CONTENTS

Sl. No	Content	No. of pages
1	Instructions to bidders for preparing technical offers	1
2	Project Information	1
3	Scope of Supply & work	1
4	Annexure-A	4
5	Annexure-B	2
6	Annexure-C	1
7	Annexure-D	1
8	Approved Drawings	516

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

 BIDDER'S STAMP & SIGNATURE
 (REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS')

	2X250MW BHAVNAGAR TPS PROJECT INFORMATION	SPECIFICATION NO. : EPD-TS-CPBG-CC-18002
		VOLUME NO. :
		SECTION :
		REV NO. : 00 DATE: 5/4/2018
		SHEET :

PROJECT INFORMATION

Location : Village-Padva, Taluka Ghogha, Bhavnagar District, Gujarat.

Power Plant Type : 2x250MW Coal based

Nearest Railway station : Bhavnagar, 25kms form Power plant.

	2X250MW BHAVNAGAR TPS SCOPE OF SUPPLY & WORK FOR CONTRACT CLOSING	SPECIFICATION NO. : EPD-TS-CPBG-CC-18002
		VOLUME NO. :
		SECTION :
		REV NO. : 00 DATE: 03/04/2018
		SHEET : 1 OF 1

SCOPE OF SUPPLY & WORK

1. Scope of supply of materials as per Annexure-A
 - a) All the components shall be supplied as per Make, type & rating.
 - b) In case of non-availability of same components in market, prior approval from BHEL shall be taken before supply of components. Approval for equivalent components also to be taken from BHEL.
2. Site Modification as per Annexure-B
 - a) New Modules
 - i. Supply of new module of Unilec Make
 - ii. Supply & wiring of new components in the module.
 - iii. Necessary modification in the panel to be done in order to insert the new module.
 - iv. Complete Power wiring & Control Wiring of new module.
 - b) Change of Rating of modules without change in module height
 - i. Supply & Fixing of new components in the module.
 - ii. Power wiring change, if any.
 - c) Change of rating of modules with change in module height
 - i. Supply of new module of Unilec Make
 - ii. Supply & wiring of new components in the module.
 - iii. Control Components available in the existing modules to be used & wired in new module.
 - iv. Complete Power wiring & Control Wiring of new module.
 - d) Change in module type (Scheme change)
 - i. Supply of new module, if required.
 - ii. Supply & wiring of new components in the module
 - iii. Necessary modification in the panel to be done in order to insert the new module.
 - iv. Complete Power wiring & Control Wiring of new module.
3. Any miscellaneous jobs at site where only manpower is required - additional 10man-days to be considered.
4. Annexure-D shall be filled mandatorily.

Note:

- Supply of components for modules & wiring of modules shall be as per approved documents like general notes, datasheets, General Arrangements, Single line diagram, bill of material and Type-II co-ordination chart.
- New module required in existing panels shall be either Unilec make or equivalent, which is suitable for existing panels conforming to interchangeability of modules in existing panels.

2X 250 MW BHAVNAGAR

ANNEXURE-A

S. No.	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE	BRIEF SPECIFICATION
1	FUSE LINKS FOR DC FEEDERS					
i.	2A	Nos.	25			
ii.	6A	Nos.	100			
iii.	10A	Nos.	15			
iv.	16A	Nos.	15			
v.	25A	Nos.	30			
vi.	32A	Nos.	40			
vii.	40A	Nos.	10			
viii.	50A	Nos.	10			
ix.	63A	Nos.	10			
x.	100A	Nos.	15			
xi.	200A	Nos.	8			
xii.	315A	Nos.	8			
xiii.	400A	Nos.	5			
2	PUSH BUTTON					
i.	EMERGENCY STOP PUSH BUTTON	Nos.	130			PB STAY PUT MUSHROOM HEAD PRESS TO LOCK & KEY TO RELEASE OF L&T MAKE OR EQUIVALENT. PB SHALL BE SUITABLE FOR TYPE I A (EMG. STOP LPBS) OF UNILEC MAKE.
ii.	EMERGENCY STOP PUSH BUTTON & START PUSH BUTTON	Nos.	5			PB STAY PUT MUSHROOM HEAD PRESS TO LOCK & KEY TO RELEASE OF L&T MAKE OR EQUIVALENT. PB SHALL BE SUITABLE FOR TYPE I B (START & EMG. STOP LPBS) OF UNILEC MAKE.
iii.	EMERGENCY STOP PUSH BUTTON	Nos.	2			PB STAY PUT MUSHROOM HEAD PRESS TO LOCK & KEY TO RELEASE OF L&T MAKE OR EQUIVALENT. PB SHALL BE SUITABLE FOR TYPE I C (FLAME PROOF STOP) OF UNILEC MAKE.
3	PT FUSE FAILURE RELAY	Nos.	4			PTR-110V AC, AUX. SUPPLY 220V DC WITH 1NO+1NC CONTACTS, UVT92, ABB MAKE
4	TIME DELAY RELAY	Nos.	2			TIME DELAY RELAY, DELAY ON PICK UP, 0.1-1 SEC, AUX SUPPLY 220V DC WITH 3NO + 1 NC CONTACTS. ABB MAKE.
5	DC OVERVOLTAGE RELAY	Nos.	1			DC OVERVOLTAGE RELAY VAG11, MAKE: AREVA
6	POWER CONTACTOR	Nos.	2			IN TURBINE MCC 1KA & 2KA, CONTACTORS (OF 18A) ARE REQUIRED IN THE 3 PHASE HEATER MODULE, MAKE L&T.
7	SFU HANDLE	Nos.	2			HANDLE OF DOOR IS NOT PRESENT IN 1HA-17B, 1HA-17C OF 32A SFU.
8	HT METALLIC DOOR LOCK	Nos.	150			SUITABLE FOR FITTING IN LT SWITCHGEAR OF UNILEC MAKE.
9	DOOR LOCKS OF PLASTIC C-TYPE	Nos.	100			SUITABLE FOR FITTING IN LT SWITCHGEAR OF UNILEC MAKE.
10	DOOR LOCKS OF PLASTIC Z-TYPE	Nos.	100			SUITABLE FOR FITTING IN LT SWITCHGEAR OF UNILEC MAKE.

2X 250 MW BHAVNAGAR**ANNEXURE-A**

S. No.	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE	BRIEF SPECIFICATION
11	POWER CONTACTOR	Nos.	3			POWER CONTACTOR OF 265A OF L&T MAKE TO BE FITTED IN 1HA-17D, 1HA-17T & 1HA-17R
12	POWER CONTACTOR	Nos.	3			POWER CONTACTOR OF 70A OF L&T MAKE TO BE FITTED IN 1EA-09C, 1EA-09D & 1EA-10S.
13	AUXILIARY CONTACTOR	Nos.	3			AUXILIARY CONTACTOR (2NO +2 NC) SUITABLE FOR 110V AC OF L&T MAKE TO BE FITTED IN 1EA-09C, 1EA-09D & 1EA-10S.
14	AL GLAND PLATE	Nos.				FOR VARIOUS 1CORE CABLES, GLAND PLATE SHALL BE OF NON-MAGNETIC MATERIAL. REMOVABLE GLANDS PLATES OF THICKNESS 4.0 mm (NON-MAGNETIC MATERIAL) SHALL BE PROVIDED.
	700mm X 290mm	Nos.	15			
	340mm X 210mm	Nos.	20			
	500mm X 290 mm	Nos.	25			
15	DUMMY PLATE	Nos.	1			IN 2EA, 1 DUMMY PLATE TO BE FITTED. DIMENSIONS ARE: 150 x 550.
16	SEAL POT BLOWER (Module Type - DK21)	Nos.	1			SEAL POT BLOWER (90KW) SPARE FEEDER IN 1HA-17R. M/s UNILEC MAKE TROLLEY WITH 250A SFU MODULE TO BE SUPPLIED. DK21 SCHEME FOR REFERENCE IS ATTACHED ACCESSORIES SUCH AS CHANNEL RAIL, MAIL & FEMALE CONTACT FOR I/C AND O/G, SUPPORT, GASKET, SHROUD FOR SHUTTER, TROLLEY CONNECTOR BUSBAR FOR I/C & O/G, FRONT DOOR ETC. SHALL BE PART OF TROLLEY + MODULE. TROLLEY FRAME CRCA SHEET STEEL THICKNESS SHALL BE 2.0MM AND FOR DOOR IT SHALL BE 1.6MM. IN THIS REGARD REFER DETAIL AT ANNEXEXURE-B ALSO.
17	7.5kW DOL Starter Feeder, Scheme no. DK2 / 416	Nos.	4			M/s UNILEC MAKE TROLLEY TO BE SUPPLIED. SCHEME FOR REFERENCE IS ATTACHED ACCESSORIES SUCH AS CHANNEL RAIL, MALE & FEMALE CONTACT FOR I/C AND O/G, SUPPORT, GASKET, SHROUD FOR SHUTTER, TROLLEY CONNECTOR BUSBAR FOR I/C & O/G, FRONT DOOR ETC.
18	3.7kW DOL Starter Feeder, Scheme no. K 3 / 425	Nos.	4			
19	100A SFU O/G Feeder, Scheme no. E / 438	Nos.	1			
20	upto 5.5kW Dual Speed Bidirectional Motor Feeder (Module Type - DS)	Nos.	4			

2X 250 MW BHAVNAGAR**ANNEXURE-A**

S. No.	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE	BRIEF SPECIFICATION
21	Module Type - DW for 220V DC DB (0.05KW)	Nos.	2			SHALL BE PART OF TROLLEY + MODULE. TROLLEY FRAME CRCA SHEET STEEL THICKNESS SHALL BE 2.0MM AND FOR DOOR IT SHALL BE 1.6MM. IN THIS REGARD REFER DETAIL AT ANNEXEXURE-B ALSO.
22	Module Type - E (63A)	Nos.	16			
23	Module Type- DK2 (1.1 KW)	Nos.	2			
24	Module Type - E (16A)	Nos.	8			
25	Module Type - E (32A)	Nos.	10			
26	Module Type - X (6A)	Nos.	8			
27	Module Type - X (16A)	Nos.	8			
28	Module Type - X (100A)	Nos.	2			RATING OF DC SEAL OIL PUMP TO BE CONSIDERED AS 100A. FOR MAIN FEEDER SPARE OF DC EOP HAS BEEN CONSIDERED BY PSWR. THIS ADDITIONAL MODULE MAY PLEASE BE CONSIDERED AS SPARE OF DC SEAL OIL PUMP. IN THIS REGARD REFER DETAIL AT ANNEXEXURE-B ALSO.
29	Module Type - X (160A)	Nos.	4			RATING OF DC EMERGENCY OIL PUMP TO BE CONSIDERED AS 150A OR GREATER. THIS ADDITIONAL MODULE MAY PLEASE BE CONSIDERED AS SUPPLY FEEDER & SPARE OF DC EMERGENCY OIL PUMP. IN THIS REGARD REFER DETAIL AT ANNEXEXURE-B ALSO.
30	HRC Fuse					
	16A	Nos.	9			M/s L&T MAKE
	63A	Nos.	12			M/s L&T MAKE
31	Over Load Relay					M/s L&T MAKE
	0.3 - 0.5A (0.06KW)	Nos.	2			M/s L&T MAKE
	2 - 2.3 A	Nos.	4			M/s L&T MAKE
	3 - 5A (1.5KW)	Nos.	3			M/s L&T MAKE
	14-23A	Nos.	4			M/s L&T MAKE
32	Switch Fuse Unit					
	63A	Nos.	4			M/s L&T MAKE
33	Power Contactor					
	32A	Nos.	4			M/s L&T MAKE
34	Air Circuit Breaker					
	630 A	Nos.	2			M/s L&T MAKE. TG-DMCW C MOTOR FEEDERS BREAKER REPLACEMENT AND BOILER FILL PUMP DRIVE MOTOR FEEDER BREAKER REPLACEMENT.
35	Bus PT of R Phase	Nos.	1			M/s INDCOIL MAKE, PRIMARY: 415/√3, SECONDARY:110 /√3, 100 VA, INSULATION: E, CLASS: 1. TO BE FITTED IN BUS PT OF BOILER MCC 2HA SECTION-B.
36	Trip Coil of Air Circuit Breakers (1600A, 100VA)	Nos.	10			M/s L&T Make of Unit-2 of Bhavnagar TPP.

2X 250 MW BHAVNAGAR						
ANNEXURE-A						
S. No.	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE	BRIEF SPECIFICATION
37	Series Resistance (4K ohm, >=30W) of the Trip Coil of Air Circuit Breakers (1600A, 100VA)	Nos.	10			M/s L&T Make of Unit-2 of Bhavnagar TPP.
38	JAW Contacts of Air Circuit Breaker of 1600A	Set	1			Suitable for ACB (of 1600A) of M/s L&T Make.

(2 x 250MW BHAVNAGAR TPS)						
SITE MODIFICATION						
ANNEXURE-B						
SL NO	DESCRIPTION OF FEEDER	BOARD NAME, MODULE	KW/A GIVEN IN MCC / CABLE SIZE	REVISED KW/A RATING / CABLE SIZE	OLD MODULE POSITION	NEW MODULE POSITION
1	Oil supply unit / Hydraulic Power Unit of HP Bypass System	1KA, 2KA	-	7.5 KW / 3C X 25 sq.mm	-	1 New Modules to be inserted in both the boards. Scheme Type DK2.
2	Spare	1KA, 2KA	-	7.5 KW / 3C X 25 sq.mm	-	1 New Modules to be inserted in both the boards. Scheme Type DK2.
2	OW Sump Pump	OSA	1.1 / 3C X 2.5 sq.mm	1.5 / 3C X 2.5 sq.mm	01B, 09B	Scheme type same as per approved drawing, Rating Change
3	OW Separator Sump Pump	OSA	1.1 / 3C X 2.5 sq.mm	1.5 / 3C X 2.5 sq.mm	09R	Scheme type same as per approved drawing, Rating Change
4	Electrical Heat Tracing Panel	OSA	63 A / 3.5C X 25 sq.mm	100 A / 3.5C X 120 sq.mm	02B	Scheme type same as per approved drawing, Rating Change
5	Clean Lube Oil Transfer Pump	ODA	-	3.7 KW / 3C X 10 sq.mm.	-	1 New Modules to be inserted in both the boards. Scheme Type K3.
6	Dirty Lube Oil Pump	ODA	-	3.7 KW / 3C X 10 sq.mm.	-	1 New Modules to be inserted in both the boards. Scheme Type K3.
7	Drain Oil Lube Transfer Pump	ODA	-	3.7 KW / 3C X 10 sq.mm.	-	1 New Modules to be inserted in both the boards. Scheme Type K3.
8	Spare	ODA	-	3.7 KW / 3C X 10 sq.mm.	-	1 New Modules to be inserted in both the boards. Scheme Type K3.
9	Emergency Cooling Water to Spless Valve (BACW-95)	1KB, 2KB	0.18 KW / 3C X 2.5	0.06 KW / 3C X 2.5	33R	Scheme type same as per approved drawing, Rating Change
10	CW Supply Isolation Valve (BACW-01)	1KB, 2KB	1.2 KW / 3C X 2.5	0.52 KW / 3C X 2.5	30S	Scheme type same as per approved drawing, Rating Change
11	CW Return Isolation from Spless Valve to PH (BACW-03)	1KB, 2KB	1.2 KW / 3C X 2.5	0.52 KW / 3C X 2.5	32P	Scheme type same as per approved drawing, Rating Change
12	CW Return Isolation from Spless Valve to PH (BACW-96)	1KB, 2KB	0.18 KW / 3C X 2.5	0.09 KW / 3C X 2.5	33P	Scheme type same as per approved drawing, Rating Change
13	Sequence Trimming Device	1FA, 2FA	0.05 KW	0.05 KW	04W	Scheme to be revised.
14	Lightie Air Lock Feeder	1HA, 2HA	-	-	04W	Change of Scheme to Dual Speed Drive
15	SPACE HEATING TO 6.6KV SWITCHGEAR #1CA MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
16	SPACE HEATING TO 6.6KV SWITCHGEAR #1CB MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
17	SPACE HEATING TO 6.6KV SWITCHGEAR #2CA MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
18	SPACE HEATING TO 6.6KV SWITCHGEAR #2CB MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
19	SPACE HEATING TO 6.6KV SWITCHGEAR #0CA MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
20	SPACE HEATING TO 6.6KV SWITCHGEAR #0CB MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
21	SPACE HEATING TO 6.6KV SWITCHGEAR #0CC MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
22	SPACE HEATING TO 6.6KV SWITCHGEAR #0CD MODULE	ODA	-	32A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the board. Scheme Type E.
23	CONTROL FLUID PUMP-1 IN HPSU	1KA04S	7.5 KW / 3C X 10 sq.mm.	11 KW / 3.5C X 25 sq.mm.	1KA04S	Scheme type same as per approved drawing, Rating Change
24	CONTROL FLUID PUMP-2 IN HPSU	1KA11S	7.5 KW / 3C X 10 sq.mm.	11 KW / 3.5C X 25 sq.mm.	1KA11S	Scheme type same as per approved drawing, Rating Change
25	CONTROL FLUID PUMP-1 IN HPSU	2KA04S	7.5 KW / 3C X 10 sq.mm.	11 KW / 3.5C X 25 sq.mm.	2KA04S	Scheme type same as per approved drawing, Rating Change
26	CONTROL FLUID PUMP-2 IN HPSU	2KA11S	7.5 KW / 3C X 10 sq.mm.	11 KW / 3.5C X 25 sq.mm.	2KA11S	Scheme type same as per approved drawing, Rating Change
27	Spare	1KA	-	11 KW / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the boards. Scheme Type DK2.
28	Spare	2KA	-	11 KW / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the boards. Scheme Type DK2.
29	CONTROL FLUID CIRCULATING PUM P-1 IN HPSU	1KA01F	0.37 KW / 3C X 2.5 sq.mm.	1.1 KW / 3.5C X 25 sq.mm.	1KA01F	Temporarily resolution as provided to site is: "PEM Reply". Consider modules 1KA01C/23 and 2KA01C/23 to be inserted in module position 1KA01F/20 and 1KA013E/68. Same cable size as 3C X 2.5 sq.mm. to be used."
30	CONTROL FLUID CIRCULATING PUM P-2 IN HPSU	1KA13E	0.37 KW / 3C X 2.5 sq.mm.	1.1 KW / 3.5C X 25 sq.mm.	1KA13E	
31	CONTROL FLUID CIRCULATING PUM P-1 IN HPSU	2KA01F	0.37 KW / 3C X 2.5 sq.mm.	1.1 KW / 3.5C X 25 sq.mm.	2KA01F	Scheme type same as per approved drawing, Rating Change
32	CONTROL FLUID CIRCULATING PUM P-2 IN HPSU	2KA13E	0.37 KW / 3C X 2.5 sq.mm.	1.1 KW / 3.5C X 25 sq.mm.	2KA13E	Scheme type same as per approved drawing, Rating Change
33	Spare	1HA	-	32 A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the boards. Scheme Type E.
34	Spare	2HA	-	32 A / 3.5C X 25 sq.mm.	-	1 New Modules to be inserted in the boards. Scheme Type E.

(2 x 250MW BHAVNAGAR TPS)									
SITE MODIFICATION									
ANNEXURE-B									
35	Spare		1FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
36	Spare		1FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
37	Spare		1FA	-		16 A /2R X 1C X 35 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
38	Spare		1FA	-		16 A /2R X 1C X 35 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
39	Spare		2FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
40	Spare		2FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
41	Spare		2FA	-		16 A /2R X 1C X 35 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
42	Spare		2FA	-		16 A /2R X 1C X 35 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
43	Spare		0FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
44	Spare		0FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
45	Spare		0FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
46	Spare		0FA	-		6 A /2R X 1C X 10 sq.mm	-	-	1 New Modules to be inserted in the boards. Scheme Type X.
47	Spare		1EA	-		16A	-	-	1 New Modules to be inserted in the board. Scheme Type E.
48	Spare		2EA	-		16A	-	-	1 New Modules to be inserted in the board. Scheme Type E.
49	UNDER SLUNG CRANE FOR ID FANS		1HA16S	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
50	LIFTING HOIST FOR PA FAN2 MOTOR		1HA16P	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
51	LIFTING HOIST FOR PA FAN1 MOTOR		1HA04U	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
52	LIFTING HOIST FOR SA FAN2 MOT OR		1HA15T	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
53	LIFTING HOIST FOR SA FAN1 MOT OR		1HA04T	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
54	UNDER SLUNG CRANE FOR BLOWER R OOM		1HA16Q	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
55	LEVELING HOIST FOR RAPH		1HA06S	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
56	LEVELING HOIST FOR RAPH		1HA17R	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
57	UNDER SLUNG CRANE FOR ID FANS		2HA16S	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
58	LIFTING HOIST FOR PA FAN2 MOTOR		2HA16P	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
59	LIFTING HOIST FOR PA FAN1 MOTOR		2HA04U	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
60	LIFTING HOIST FOR SA FAN2 MOT OR		2HA15T	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
61	LIFTING HOIST FOR SA FAN1 MOT OR		2HA04T	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
62	UNDER SLUNG CRANE FOR BLOWER R OOM		2HA16Q	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
63	LEVELING HOIST FOR RAPH		2HA06S	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
64	LEVELING HOIST FOR RAPH		2HA17R	32A		63A / 3.5C x50 sq.mm			Rating of Supply feeders to be changed in specified module.
65	SEAL POT BLOWER		1HA17T	-		90KW / 3.5C X 240 sq.mm			1 New Modules to be inserted in the board. Scheme Type DK21.

	2X250MW BHAVNAGAR TPS TECHNICAL SPECIFICATION FOR LOW VOLTAGE SWITCHGEAR (ANNEXURE-C)	SPECIFICATION NO:EPD-TS-CPBG-CC-18002	
		VOLUME	
		SECTION	
		REV NO. 00	DATE :03/04/2018
		SHEET 1 OF 1	

ANNEXURE-C**ADDITION / DELETION UNIT PRICES**

SL.NO.	ITEM DESCRIPTION	UNIT PRICE
1		
2		
3		
4		
5		

NOTES:

- 1) UNIT PRICES OF ALL ELECTRICAL EQUIPMENT REQUIRED IN THE TENDER SHALL BE QUOTED.
- 2) THESE PRICSE SHALL BE VALID FOR A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE ORDER.

	2X250MW BHAVNAGAR TPS		SPECIFICATION NO:EPD-TS-CPBG-CC-18002	
	TECHNICAL SPECIFICATION FOR LOW VOLTAGE SWITCHGEAR (ANNEXURE-D)		VOLUME	
			SECTION	
			REV NO. 00	DATE :03/04/2018
			SHEET 1 OF 1	

ANNEXURE-D**SITE MODIFICATION CHARGES**

SL.NO.	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SKILLED TECHNICIAN (EXCEPT DAILY CHARGES)	2 VISITS		
2	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SKILLED TECHNICIAN	30 DAYS		
3	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	3 VISITS		
4	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SERVICE ENGINEER	15 DAYS		
			TOTAL	

NOTES:

- 1) AMOUNT PAYABLE FOR SKILLED TECHNICIAN PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (DAILY CHARGES AS PER SL. NO. 2 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)
- 2) AMOUNT PAYABLE FOR SERVICE ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 3 ABOVE + (DAILY CHARGES AS PER SL. NO. 4 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)
- 3) THESE PRICSE SHALL BE VALID FOR A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE ORDER.

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
2. TYPE OF PANEL :—
 - i) THE SWITCHGEAR/MCCs SHALL BE DOUBLE FRONT DRAWOUT TYPE
 - ii) DC DISTRIBUTION BOARD SHALL BE DOUBLE FRONT DRAWOUT TYPE
 - iii) AC OR DC FUSE BOARD SHALL BE FIXED WALL MOUNTED TYPE
 - iv) CONTROL TRANSFORMER FEEDER SHALL BE FIXED TYPE
 - v) ACB FEEDER SHALL BE FIXED TYPE HOWEVER ACB SHALL BE DRAWOUT TYPE.
3. TYPE OF MOUNTING :— : INDOOR, FLOOR OR WALL MOUNTING TYPE
4. CABLE ENTRY SHALL BE FROM BOTTOM ONLY UNLESS SPECIFIED OTHERWISE.
5. PANEL SHALL BE FABRICATED OUT OF SHEET STEEL HAVING THICKNESS AS FOLLOWS:—
 - i) SHEET SECTION OF FRAME/LOAD BEARING MEMEBERS—: MINIMUM 2.0 MM (CR)
 - ii) DOORS & COVERS :— : MINIMUM 1.6 MM (CR)
 - iii) OTHER INTERNAL PARTS :— : AS PER OUR STD. DESIGN
 - iv) BASE FRAME CHANNEL :— : ISMC-75 (75X40X5mm)
 - v) REMOVABLE GLAND PLATE FOR MULTI CORE :— : 3.0 MM (HR)
 - vi) REMOVABLE GLAND PLATE FOR SINGLE CORE :— : 4.0 MM (ALUMINIUM)
6. ALL BUS BAR SHALL BE HIGH CONDUCTIVITY ALUMINIUM ALLOY AS PER IS:5082, WITH 1.1KV GRADE HEAT SHRINKABLE PVC SLEEVES RED, YELLOW, BLUE COLOUR SHALL BE USED FOR PHASE AND BLACK COLOUR SHALL BE USED FOR NEUTRAL, HOWEVER DODB SHALL BE PROVIDED WITH RED COLOR PVC SLEEVE FOR +VE & BLUE PVC SLEEVE FOR -VE.
7. BUS BAR SIZE SHALL BE AS SHOWN IN GA DRAWINGS. RATING OF HORIZONTAL BUSES WILL BE IN LINE WITH INCOMER RATING AND VERTICAL BUSBAR FOR THE COMPARTMENT WILL COMMENSURATE WITH ALL OUTGOING FEEDERS.
8. EARTH BUS SHALL BE PROVIDED THROUGH OUT THE LENGTH OF PANEL AT BOTTOM. THE HORIZONTAL EARTH BUS SHALL PROJECTED OUT OF PANEL AND SHALL HAVE ATLEAST TWO HOLES FOR CUSTOMER EARTH CONNECTION. EARTH BUS SIZES SHALL BE MIN. 50x12 Sqmm GALVANISED IRON OR AS SPECIFIED OTHERWISE.
9. MAIN BUS CONNECTIONS SHALL BE PROVIDED WITH ANTI-OXIDE GREASE.
10. POWER BUSBAR JOINTS WILL BE BOLTED TYPE WITH SPRING WASHERS. BOLT & SP WASERS WILL BE CADMIUM PLATED OR ZINC PLATED.
11. MAIN HR BUS JOINTS AND TAP-OFF POINTS FROM HR TO VERTICLE SHALL BE SHROUDED.
12. BUS BAR SUPPORTS MATERIALS :— : SMC,DMC OR FRP MOULDED SUPPORT.
13. SYNTHETIC RUBBER GASKET (EPDM) SHALL BE PROVIDED TO MAKE PANELS DUST & VERMIN PROOF. CONFIRMING TO DEGREE OF PROTECTION MINIMUM IP 52 FOR RATING UPTO 1600A, AS PER IS 13947.HOWEVER PANEL HAVING BUSBAR RATING ABOVE 1600A SHALL HAVE DEGREE OF PROTECTION MINIMUM IP 42 ie. LOUVERS WITH FINE WIRE MESH OR PERFORATED SHEET SHALL BE PROVIDED AT FRONT & REAR DOOR OR COVER OF HORIZONTAL BUSBAR CHAMBER AND REAR DOOR OR COVER OF ACB PANEL.

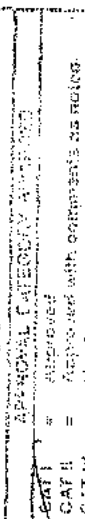
14. MINIMUM CLEARANCE BETWEEN HORIZONTAL & VERTICAL BUSBARS SHALL BE AS FOLLOWS
- i) PHASE TO PHASE _____: 25mm
- ii) PHASE TO EARTH _____: 19mm
- iii) FOR ALL OTHER COMPONENT, THE CLEARANCES SHALL BE AT LEAST 10mm, WHEREVER ABOVE IS NOT POSSIBLE EXCEPT FOR HORIZONTAL AND VERTICAL BUSBARS, INSULATION SHALL BE PROVIDED BY ANTI TRACKING SLEEVING OR BARRIERS. HOWEVER FOR HORIZONTAL & VERTICAL BUSBAR 25mm CLEARANCE SHALL BE MAINTAIN EVEN WHEN BUSBAR ARE INSULATED OR SLEEVED.
15. LIVE CONNECTION FROM VERTICAL BUSBAR UP TO SWITCH FUSE UNIT SHALL BE SHROUDED WITH METAL OR FRP SHROUD IN ORDER TO AVOID ACCIDENTAL TOUCH. BUSBAR IN MODULES SHALL ALSO BE INSULATED.
16. THE MINIMUM CLEARANCE OF 250mm SHALL BE MAINTAINED BETWEEN CONTROL TERMINALS BLOCKS & BOTTOM PLATE OF THE PANEL, ADJACENT ROWS OF TERMINAL BLOCKS SHALL BE SPACED NOT LESS THAN 150mm APART.
17. PANEL SHALL BE PAINTED AS FOLLOWS BY USING POWDER COATING PAINT MINIMUM THICKNESS OF PAINT SHALL BE 50 MICRONS
- i) PAINT SHADE _____: RAL 7036 (PLATINUM GREY)
- ii) PAINT FINISH _____: SEMI-GLOSSY
- iii) DRAWOUT TROLLEY _____: ELECTROPLATED ZINC AND YELLOW PASSIVATED
18. TEST VOLTAGE _____: INSULATION TEST 500V FOR POWER & CONTROL (S:8623 Part-1)
- _____: HIGH TEST VOLTAGE 2.5KV FOR 60 SECONDS FOR POWER AND 1.5KV FOR CONTROL
- _____: AS PER MAKE OF COMPONENT LIST.
19. MAKES OF COMPONENTS
20. EACH CABLE ALLEY SHALL HAVE ANTI CONDENSATION SPACE HEATER WITH SWITCH, THERMOSTAT & ILLUMINATION ARRANGEMENT. PLUG & SOCKET WITH SWITCH FOR CONNECTING HAND LAMP 240VC SINGLE PHASE SHALL BE PROVIDED IN EACH SHIPPING SECTION, (ON BOTH FRONT IN CASE OF DOUBLE FRONT)
21. CONTROL TERMINALS SHALL BE OF SLIDING TYPE FOR DRAWOUT AND DIN RAIL MOUNTED TYPE FOR FIXED MODULE.
22. ALL NAME PLATE SHALL BE OF 3-PLY LAMICOID, OR ANODISED AL. WITH WHITE LETTERS ENGRAVED ON BLACK BACKGROUND. HOWEVER COMPONENT NAME PLATE SHALL BE ENGRAVED OR PRINTED TYPE.
- i) PANEL NAME PLATE SHALL BE FIXED AT THE CENTRAL PANEL OF HORIZONTAL BUS BAR CHAMBER.
- ii) FEEDER NAME PLATE SHALL BE AS FOLLOWS:-
- 100
- | | | | |
|---|---|---|---|
| A | B | C | D |
|---|---|---|---|
- A= MODULE LOCATION
B= FEEDER RATING
C= MODULE TYPE(SCH. REF.)
D= FEEDER DESCRIPTION



DATE	DESCRIPTION OF CHANGE	DATE	SIGN	SCALE	NTS	NAME	SIGN	DATE	Manufacturer:-
						PPD	D.KHAR	03.02.12	UNILEC
						CHD	K.C.BHATT	03.02.12	UNILEC ENGINEER
						APD	K.C.BHATT	03.02.12	Unit-1, September Road, Industrial Area, Gurgaon-122 Unit-2 + Plot No.-159, Se- dha, Farid

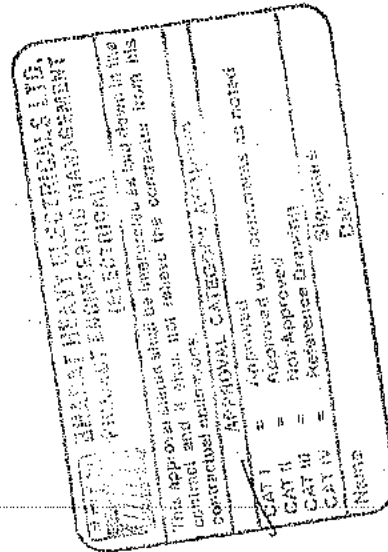
- vii) >55KW
————: COPPER WIRE OR ALU./CU. SOLID LINK FOR SUITABLE SIZE.

2. THE PAINT SHADE FOR ALL INDOOR EQUIPMENTS SHALL BE RAL 7036 AND FOR ALL OUTDOOR EQUIPMENT(NGR,LPBS ECT.) SHALL BE PROVIDED FOR POWER CABLES.
3. HEAVY DUTY CRIMPING TYPE LUGS SHALL BE PROVIDED FOR POWER CABLES.

[illegible]

SYSTEMS PARTICULARS:-**42. SYSTEM PARAMETERS:-**

- (a) SYSTEM VOLTAGE (AC) ——— 415V $\pm$ 10% 50Hz $\pm$ 5% (SOLIDLY GROUNDED) AC, 3PH, 3WIRE.
- (b) SYSTEM VOLTAGE (DC) ——— 220V NOMINAL $\pm$ 2% ISOLATED TYPED.
- (c) AUXILIARY SUPPLY VOLTAGE
- (i) ACB CONTROL SUPPLY ——— 220V DC
- (ii) AC CONTROL SUPPLY ——— 110V AC
- (iii) PANEL SPACE HEATER ——— 240V AC
- (iv) MOTOR SPACE HEATING ——— 240V AC
(FOR MOTOR $\geq$ 30KW & ABOVE) AS SHOWN IN CIRCUIT.
- (d) DESIGN AMBIENT TEMPERATURE ——— 50° C
- (e) MAXIMUM TEMPERATURE RISE OF THE HORIZONTAL, VERTICAL BUSBARS & MAIN BUS LINKS INCLUDING ALL POWER DRAWOUT CONTACTS WHEN CARRYING THE RATED CURRENT ALONG THE FULL RUN SHALL IN NO CASE EXCEED 55° C WITH SILVER PLATED JOINTS AND 40° C WITH ALL OTHER TYPE OF JOINTS OVER AN AMBIENT OF 50° C.
- (f) FAULT LEVELS 415V AC SYSTEM 50KA FOR 1 SEC.



CLIENT:- BHAVNAGAR ENERGY COMPANY LIMITED				DESCRIPTION		LT SWITCHGEAR	
CONSULTANT:- TATA CONSULTING ENGINEERS LTD.				DETAILS		GENERAL NOTES	
PROJECT:- 232500W LGNITE BASED TPP AT PADVA, DIST. BHAVNAGAR, GUJARAT				BHSL DRG. No. PE-YD-356-506-E001		REV:- R1	
MAIN CONTRACTOR:- BHARAT HEAVY ELECTRICALS LTD., POWER SECTOR PROJECTS ENGINEERING MANAGEMENT, INDIA				UCL DRG. No. J-567-100-01		REV:- R1	
						SHEET NO. 04 OF 05	

Manufacturer:-

DRN.	NAME	SIGN	DATE
PRP	D.KUMAR		03.02.12
CHKD	K.C.BHATTI		03.02.12
APPD	K.C.BHATTI		03.02.12
SCALE	INTS		
DESCRIPTION OF CHANGE	DATE	SIGN	
AS PER CLIENT COMM. MAIL DT. 02.02.12	03.02.12	D.KUMAR	

UNILEC
UNILEC ENGINEERS LIMITED
Unit-1, 1st Floor, Kivada Road, Baramulla
Industrial Area, Corporate-12061
Unit-2, 1st Floor, 166, Sector-1, Road
Dalt, Road

SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION
1		DRAWOUT TYPE AIR CIRCUIT BREAKER WITH RELEASES	9		BREAKER CONTROL SWITCH	22		NO VOLT RELAY	35		SPACE HEATER	36		POTENTIAL TRANSFORMER 415V/3/110V-C/3
2		DRAWOUT TYPE AIR CIRCUIT BREAKER WITHOUT RELEASES	10		SELECTOR SWITCH	23		NUMERICAL PROT.RELAY WITH TRIP CKT. SUPERVISION RELAY	37		CONTROL TRANSFORMER 415V/240V-AC	38		C.T SHORTING TERMINALS
3		SWITCH FUSE UNIT	11		BREAKER CLOSING / TRIPPING COIL	24		INV. TIME EARTH FAULT RELAY	39		MINIATURE CIRCUIT BREAKER	40		MOULDED CASE CIRCUIT BREAKER
4		3POLE POWER CONTACTOR	12		INDICATING LAMP	25		RESTRICTED EARTH FAULT RELAY	41		FUSE BASE WITH FUSE LINK	42		NEUTRAL LINK
5		OVER LOAD RELAY	13		CURRENT TRANSFORMER	26		LOCKOUT RELAY / MASTER TRIP RELAY	43		FIXED TERMINAL BLOCK	44		DRAWOUT TERMINALS (POWER)
6		POWER CONTACTOR COIL	14		STOP PUSH BUTTON	27		TRIP CKT. SUPERVISION RELAY (TCS)	45		DRAWOUT TERMINALS (CONTROL)	46		VOLTMETER SELECTOR SWITCH
7		AUX CONTACTOR	15		START PUSH BUTTON	28		EARTH FAULT RELAY	47		AMMETER SELECTOR SWITCH			
8		AMMETER	16		CURRENT TRANSDUCER	29		FUSE FAILURE RELAY						
9		VOLTMETER	17		VOLTAGE TRANSDUCER	30		MOTOR PROTECTION RELAY						
			18		TIME DELAY RELAY	31		AUX./MULTIPLICATION RELAY						
			19		SYNCHRO CHECK RELAY	32		ON DELAY TIMER						
			20		UNDER VOLTAGE RELAY	33		OFF DELAY TIMER						
			21		NO VOLT RELAY	34		MULTIFUNCTION METER						

NOTE:- SYMBOLS USED IN OUTER DOOR ONLY.

SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION
1		DRAWOUT TYPE AIR CIRCUIT BREAKER WITH RELEASES	9		BREAKER CONTROL SWITCH	22		NO VOLT RELAY	35		SPACE HEATER
2		DRAWOUT TYPE AIR CIRCUIT BREAKER WITHOUT RELEASES	10		SELECTOR SWITCH	23		NUMERICAL PROT.RELAY WITH TRIP CKT. SUPERVISION RELAY	37		CONTROL TRANSFORMER 415V/240V-AC
3		SWITCH FUSE UNIT	11		BREAKER CLOSING / TRIPPING COIL	24		INV. TIME EARTH FAULT RELAY	39		MINIATURE CIRCUIT BREAKER
4		3POLE POWER CONTACTOR	12		INDICATING LAMP	25		RESTRICTED EARTH FAULT RELAY	41		FUSE BASE WITH FUSE LINK
5		OVER LOAD RELAY	13		CURRENT TRANSFORMER	26		LOCKOUT RELAY / MASTER TRIP RELAY	42		NEUTRAL LINK
6		POWER CONTACTOR COIL	14		STOP PUSH BUTTON	27		TRIP CKT. SUPERVISION RELAY (TCS)	43		FIXED TERMINAL BLOCK
7		AUX CONTACTOR	15		START PUSH BUTTON	28		EARTH FAULT RELAY	44		DRAWOUT TERMINALS (POWER)
8		AMMETER	16		CURRENT TRANSDUCER	29		FUSE FAILURE RELAY	45		DRAWOUT TERMINALS (CONTROL)
9		VOLTMETER	17		VOLTAGE TRANSDUCER	30		MOTOR PROTECTION RELAY	46		VOLTMETER SELECTOR SWITCH
			18		TIME DELAY RELAY	31		AUX./MULTIPLICATION RELAY	47		AMMETER SELECTOR SWITCH
			19		SYNCHRO CHECK RELAY	32		ON DELAY TIMER			
			20		UNDER VOLTAGE RELAY	33		OFF DELAY TIMER			
			21		NO VOLT RELAY	34		MULTIFUNCTION METER			

SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION
1		DRAWOUT TYPE AIR CIRCUIT BREAKER WITH RELEASES	9		BREAKER CONTROL SWITCH	22		NO VOLT RELAY	35		SPACE HEATER
2		DRAWOUT TYPE AIR CIRCUIT BREAKER WITHOUT RELEASES	10		SELECTOR SWITCH	23		NUMERICAL PROT.RELAY WITH TRIP CKT. SUPERVISION RELAY	37		CONTROL TRANSFORMER 415V/240V-AC
3		SWITCH FUSE UNIT	11		BREAKER CLOSING / TRIPPING COIL	24		INV. TIME EARTH FAULT RELAY	39		MINIATURE CIRCUIT BREAKER
4		3POLE POWER CONTACTOR	12		INDICATING LAMP	25		RESTRICTED EARTH FAULT RELAY	41		FUSE BASE WITH FUSE LINK
5		OVER LOAD RELAY	13		CURRENT TRANSFORMER	26		LOCKOUT RELAY / MASTER TRIP RELAY	42		NEUTRAL LINK
6		POWER CONTACTOR COIL	14		STOP PUSH BUTTON	27		TRIP CKT. SUPERVISION RELAY (TCS)	43		FIXED TERMINAL BLOCK
7		AUX CONTACTOR	15		START PUSH BUTTON	28		EARTH FAULT RELAY	44		DRAWOUT TERMINALS (POWER)
8		AMMETER	16		CURRENT TRANSDUCER	29		FUSE FAILURE RELAY	45		DRAWOUT TERMINALS (CONTROL)
9		VOLTMETER	17		VOLTAGE TRANSDUCER	30		MOTOR PROTECTION RELAY	46		VOLTMETER SELECTOR SWITCH
			18		TIME DELAY RELAY	31		AUX./MULTIPLICATION RELAY	47		AMMETER SELECTOR SWITCH
			19		SYNCHRO CHECK RELAY	32		ON DELAY TIMER			
			20		UNDER VOLTAGE RELAY	33		OFF DELAY TIMER			
			21		NO VOLT RELAY	34		MULTIFUNCTION METER			

SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION
1		DRAWOUT TYPE AIR CIRCUIT BREAKER WITH RELEASES	9		BREAKER CONTROL SWITCH	22		NO VOLT RELAY	35		SPACE HEATER
2		DRAWOUT TYPE AIR CIRCUIT BREAKER WITHOUT RELEASES	10		SELECTOR SWITCH	23		NUMERICAL PROT.RELAY WITH TRIP CKT. SUPERVISION RELAY	37		CONTROL TRANSFORMER 415V/240V-AC
3		SWITCH FUSE UNIT	11		BREAKER CLOSING / TRIPPING COIL	24		INV. TIME EARTH FAULT RELAY	39		MINIATURE CIRCUIT BREAKER
4		3POLE POWER CONTACTOR	12		INDICATING LAMP	25		RESTRICTED EARTH FAULT RELAY	41		FUSE BASE WITH FUSE LINK
5		OVER LOAD RELAY	13		CURRENT TRANSFORMER	26		LOCKOUT RELAY / MASTER TRIP RELAY	42		NEUTRAL LINK
6		POWER CONTACTOR COIL	14		STOP PUSH BUTTON	27		TRIP CKT. SUPERVISION RELAY (TCS)	43		FIXED TERMINAL BLOCK
7		AUX CONTACTOR	15		START PUSH BUTTON	28		EARTH FAULT RELAY	44		DRAWOUT TERMINALS (POWER)
8		AMMETER	16		CURRENT TRANSDUCER	29		FUSE FAILURE RELAY	45		DRAWOUT TERMINALS (CONTROL)
9		VOLTMETER	17		VOLTAGE TRANSDUCER	30		MOTOR PROTECTION RELAY	46		VOLTMETER SELECTOR SWITCH
			18		TIME DELAY RELAY	31		AUX./MULTIPLICATION RELAY	47		AMMETER SELECTOR SWITCH
			19		SYNCHRO CHECK RELAY	32		ON DELAY TIMER			
			20		UNDER VOLTAGE RELAY	33		OFF DELAY TIMER			
			21		NO VOLT RELAY	34		MULTIFUNCTION METER			

SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION	SL.NO.	SYMBOL	DESCRIPTION
1		DRAWOUT TYPE AIR CIRCUIT BREAKER WITH RELEASES	9		BREAKER CONTROL SWITCH	22		NO VOLT RELAY	35		SPACE HEATER
2		DRAWOUT TYPE AIR CIRCUIT BREAKER WITHOUT RELEASES	10		SELECTOR SWITCH	23		NUMERICAL PROT.RELAY WITH TRIP CKT. SUPERVISION RELAY	37		CONTROL TRANSFORMER 415V/240V-AC
3		SWITCH FUSE UNIT	11		BREAKER CLOSING / TRIPPING COIL	24		INV. TIME EARTH FAULT RELAY	39		MINIATURE CIRCUIT BREAKER
4		3POLE POWER CONTACTOR	12		INDICATING LAMP	25		RESTRICTED EARTH FAULT RELAY	41		FUSE BASE WITH FUSE LINK
5		OVER LOAD RELAY	13		CURRENT TRANSFORMER	26		LOCKOUT RELAY / MASTER TRIP RELAY	42		NEUTRAL LINK
6		POWER CONTACTOR COIL	14		STOP PUSH BUTTON	27		TRIP CKT. SUPERVISION RELAY (TCS)	43		FIXED TERMINAL BLOCK
7		AUX CONTACTOR	15		START PUSH BUTTON	28		EARTH FAULT RELAY	44		DRAWOUT TERMINALS (POWER)
8		AMMETER	16		CURRENT TRANSDUCER	29		FUSE FAILURE RELAY	45		DRAWOUT TERMINALS (CONTROL)
9		VOLTMETER	17		VOLTAGE TRANSDUCER	30		MOTOR PROTECTION RELAY	46		VOLTMETER SELECTOR SWITCH
			18		TIME DELAY RELAY	31		AUX./MULTIPLICATION RELAY	47		AMMETER SELECTOR SWITCH
			19		SYNCHRO CHECK RELAY	32		ON DELAY TIMER			
			20		UNDER VOLTAGE RELAY	33		OFF DELAY TIMER			
			21		NO VOLT RELAY	34		MULTIFUNCTION METER			

This Drawing & Design is the property of Unilec Engineers Ltd. and cannot be used in any form or by any means without the prior written permission.

DATA SHEETS FOR SWITCHGEARS

Rev.	DESCRIPTION OF CHANGE	Date	PRPD.	CHKD.	APPD.
61	AS PER CLIENT COMMENTS	09.02.12	D. KUMARI	K.C. BHATT	K.C. BHATT

	TITLE DATA SHEET- C LOW VOLTAGE SWITCHGEAR	SPECIFICATION NO. PE-TS-356-506-F001	
		BHEL DOC. NO. : PE-V0-356-505-E000	
		UEL DOC. NO. : J567-601-01	
		REV NO.: R1	DATE: 09/02/2012
		PAGE 1 OF 23	

A. SWITCHGEAR**1.0 SYSTEM DESIGN DATA**

- 1.1 Design Ambient : 50°C
- 1.2 Relative Humidity
- a) Average : 85%
- b) Maximum : 100%
- 1.3 Max. System voltage for continuous operations : 440V
- 1.4 Rated frequency : 50Hz
- 1.5 One minute power frequency withstand voltage :
- a) Main circuit : 2.5kV.
- b) Aux. circuit : 1.5kV.
- 1.6 DC System fault level (220 V) : 15kA

2.0 APPLICABLE STANDARDS

Compliance to the standards indicated in Annexure I of Data Sheet A confirmed unless specifically mentioned otherwise in "Schedule of Deviations" : ☒ YES ☐ NO

3.0 CONSTRUCTIONAL FEATURES**3.1 GENERAL**

- 3.1.1 Switchgear type designation of manufacturer : Unilec- Uni Power
- 3.1.2 Operational Fronts :
☐ Double Front
☐ Single Front
☒ Both as per BOM

Name of Manufacturer : Unilec Engineers Limited,		Project : 2x250MW Lignite Based TPP,	
Gurgaon (Hr.)		at Padva, Bhavnagar, Gujarat	
Revision Number	0	3	
Signature Manufacturer	(ELECTRICAL)		
Date : 11.11.2011	This approval status shall be interpreted as laid down in the contract and it shall not release the contractor from his contractual obligations.		
APPROVAL CATEGORY AWARDED			
CAT I = Approved CAT II = Approved with comments as noted CAT III = Not Approved CAT IV = Reference only		Page 19 of 529 Signature <i>deved</i>	



TITLE

DATA SHEET - C **LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO.: PE-V0-356-506-E009

UEL DOC. NO.: J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 2 OF 23

3.1.3 Sheet metal type

ROLLING

THICKNESS

- | | | | | |
|----|-----------------------------|---|---|--------|
| a) | Non-load bearing covers | : | ☐ Hot ☒ Cold | 1.6 mm |
| b) | Non-load bearing partitions | : | ☐ Hot ☒ Cold | 1.6 mm |
| c) | Load bearing members | : | ☐ Hot ☒ Cold | 2.0 mm |
| d) | Frames | : | ☐ Hot ☒ Cold | 2.0mm |
| e) | Doors | : | ☐ Hot ☒ Cold | 1.6mm |
| f) | Withdrawable units | : | ☐ Hot ☒ Cold | 2.0mm |

3.1.4 Rating above which louvers are provided : 1600Amp.

3.1.5 Degree of Protection of switchboards with modules in service and all doors closed.

- | | | | |
|----|-----------------|---|------------------------------------|
| a) | Without louvers | : | Min. IP52 |
| b) | With louvers | : | Min. IP42 with Louvers above 1600A |

3.1.6 Method of power connection from busbars to module

- ☒ Rigid busbars
☒ Insulated conductor

3.1.7 Minimum size of primary power conductors

- | | | | |
|----|-----------|---|----------------------|
| a) | Copper | : | 4.0 mm ² |
| b) | Aluminium | : | As per General Notes |

3.1.8 Spare modules considered as per Data Sheet A / BOM

☒ YES ☐ NO

3.2 DRAWOUT MODULES**3.2.1 Type of execution of modules (functional unit)**

- | | | | |
|----|--|---|---|
| a) | Circuit breaker unit (Incoming & outgoing) | : | ☒ Withdrawable ☐ Fixed |
| b) | MCCB unit (Incoming) | : | N.A ☐ Withdrawable ☐ Fixed |

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)		Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar	
Revision Number	01	2	3
Signature Manufacturer			
Date : 11.11.2011			

CAT I = Approved
 CAT II = Approved with comments as noted
 CAT III = Not Approved
 CAT IV = Reference Drawing



TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 3 OF 23

- c) Switch-Fuse & Contactor (Incoming) : ☒ Withdrawable ☐ Fixed
- d) Switch or Switch-Fuse (Incoming) : ☒ Withdrawable ☐ Fixed
- e) MCCB unit (Outgoing) : N/A ☐ Withdrawable ☐ Fixed
- f) Contactor starter unit (Outgoing) : ☒ Withdrawable ☐ Fixed
- g) Switch-Fuse unit (Outgoing) : ☒ Withdrawable ☐ Fixed
- h) Incoming Voltage Transformer (VT) : ☒ Withdrawable ☐ Fixed
- i) BUS VT : ☒ Withdrawable ☐ Fixed
- j) Control Transformer : ☐ Withdrawable ☒ Fixed
- k) Space Heater : ☐ Withdrawable ☒ Fixed
- l) Alarm : ☒ Withdrawable ☐ Fixed
- m) DC Supply : ☐ Withdrawable ☒ Fixed

3.2.2 Rating upto which withdrawable units applicable, if specified in 3.2.1 b), d), e) and g) above. : 400Amp.

3.2.3 Facility for functional testing of withdrawable modules provided for:

- a) Incoming Circuit Breaker : ☒ YES ☐ NO
- b) Outgoing Circuit Breaker : ☒ YES ☐ NO
- c) Contactor controlled units : ☒ YES ☐ NO
- d) Bus - Couplers Circuit Bkr. Controlled : ☒ YES ☐ NO

3.3 BUSBARS & CONNECTIONS

3.3.1 Busbar material

- a) Phase & Neutral
i. Material : ☐ Copper ☒ Aluminium
- ii. Grade : High Conductivity Aluminium Alloy
As per IS 5082

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar Gujrat	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					





TITLE

DATA SHEET- C **LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO.: PE-V0-356-506-E009

UEL DOC. NO.: J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 4 OF 23

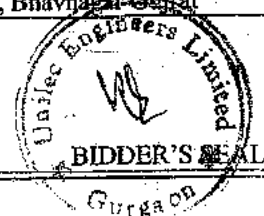
- b) Earth
- i. Material : ☐ Copper ☐ Aluminium
☒ Galvanised MS
- ii. Grade :
- 3.3.2 Support material : SMC, DMC & FRP
- 3.3.3 Fault Level : 50kA
- 3.3.4 Max. temperature for short time rating : 200°C
- 3.3.5 Short time current
- a) For switchboards fed thru ACB : 50kA, 1sec.
- b) For switchboards fed thru HRC Fuses : 50kA, 0.2sec.
- 3.3.6 Momentary rating : 105kA (peak)
- 3.3.7 Type of joints : ☐ Silver plated
☒ Non-silver plated
☐ Both
- 3.3.8 Temperature Rise
- a) Design ambient : 50°C
- b) Temp. rise (max.) for
- i. Silver plated joints : 55°C
- ii. Non-silver plated joints : 40°C
- 3.3.9 Whether HRPVC sleeving provided : ☒ YES ☐ NO
- 3.3.10 Whether shrouds on busbar tap offs provided : ☒ YES ☐ NO
- 3.3.11 Applicable method of colour coding for black PVC sleeving : Colour Band as per Table 1 of IS:11353
- 3.3.12 Busbar clearances in air (minimum)
- a) Phase-Phase : 25mm
- b) Phase-Earth : 19mm

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar District

Revision Number 0 1 2 3

Signature Manufacturer

Date : 11.11.2011





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 5 OF 23

3.3.13 Spacing between supports

3.3.14 Spacing between bus bars

Max. 660mm as per TTR
Min. 25mm (Phase to Phase)

3.4 SECONDARY WIRING AND TERMINALS

3.4.1 Voltage grade of wires

: 1100V

3.4.2 Conductor material of wire

a) Power wiring

: Copper

b) Control wiring

: Copper

3.4.3 Sizes of wires

a) Power wiring (min.)

: 4mm²

b) CT leads

: 2.5mm²

c) Other control wires

: 1.5mm²

3.4.4 Insulation material of wires

: PVC

3.4.5 Colour code of wires conforms to Section D

: ☒ YES ☐ NO

3.4.6 Type of lugs used for internal wiring

: Tinned Copper

3.4.7 Minimum Current rating of terminal block

: 16A

3.4.8 Is shrouding inherent feature for live parts of terminal block for -

a) Secondary isolating contacts

: ☐ YES ☒ NO

3.4.9 Number of ways per block of terminals

: As Per requirement

3.4.10 Standard mounting of terminal blocks

: Yes (Din Rail Mounted for fixed TB)

3.4.11 Whether terminals for CTs provided with shorting facility

: ☒ YES ☐ NO

3.4.12 Whether disconnectable link type short circuiting terminals provided for secondary injection

: ☒ YES ☐ NO

3.4.13 Spare Terminals as percentage of total terminals

: 20%

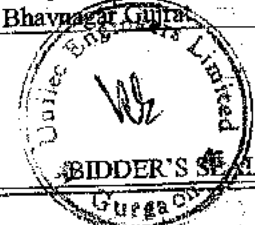
Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar Gujarat

Revision Number

Signature Manufacturer

Date : 11.11.2011

UNILEC ENGINEERS LIMITED
(ELECTRICALS)
(ELECTRICIAN)
This document shall be kept in the contract and it shall not be removed from his contractual obligations



CA-1 = Approved
CA-2 = Approved with comments
CA-3 = Not Approved
CA-4 = Rejected



TITLE

DATA SHEET- C **LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

JEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE

6 OF 23

3.5 AUXILIARY BUSES

3.5.1 Provision of following as applicable to various switchboards

- | | | | | |
|----|------------------------|---|---|---|
| a) | AC Control Bus | : | ☐ 240 V | ☒ 110 V |
| b) | DC Control Bus | : | ☒ 220 V | ☐ 110 V |
| c) | 24V AC Wdg. htg. Bus | : | N.A | ☐ YES ☒ NO |
| d) | 240V AC Space htg. Bus | : | ☒ YES | ☐ NO |
| e) | Alarm Bus | : | ☐ YES | ☒ NO |

3.6 CONTROLS, INDICATIONS & ALARMS

- | | | | | |
|-------|--|---|---|---|
| 3.6.1 | Means for simulation testing provided | : | ☒ YES | ☐ NO |
| 3.6.2 | Scope considered for interposing relays for remote command interface | : | ☐ Mounting & wiring only | ☒ Supply, mounting & wiring |

3.6.3 No. of contacts and rating at 230 V AC (make & carry) and 220 V DC (breaking)

As per approved Scheme

NO +NC

RATING (A)
(AC) (DC)

a) Air Circuit Breaker

- | | | | | | |
|------|------------------|---|------------------------------|----|----|
| i. | Internal use | : | 2NO+2NC | 5A | 2A |
| ii. | Purchaser's use | : | As per approved scheme 5A 2A | | |
| iii. | Releases | : | N.A | | |
| | A. Overload | : | N.A | | |
| | B. Short Circuit | : | N.A | | |
| | C. Under Voltage | : | N.A | | |
| | D. Earth Fault | : | N.A | | |

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar Gujarat

Revision Number

0

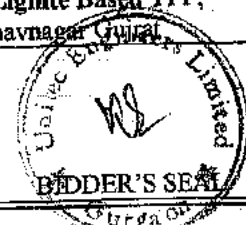
1

2

3

Signature Manufacturer

Date : 11.11.2011





TITLE

DATA SHEET - C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-508-E001

BHEL DOC. NO.: PE-V0-356-506-E003

UEL DOC. NO.: J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 7 OF 23

- b) MCCB : Not Applicable
- c) Switches : 1NO+1NC or 1C/O rating (as required)
- d) Power Contactors : 2NO+2NC rating (as required)
- e) Thermal Overload Relay : As per approved scheme
- f) Single Phasing Preventer : 1NO+1NC or 1C/O
- g) Push Button : 1NO+1NC
- h) Miniature Circuit Bkr. : 1C/O (if required)
- i) Control switches : Contact/Rating as per scheme requirement
- j) Selector switch : Contact/Rating as per scheme requirement
- k) Timer
- i. ON delay : 1 C/O or as per scheme requirement
- ii. OFF delay : 1 C/O or as per scheme requirement
- iii. Instantaneous : 1 C/O or as per scheme requirement

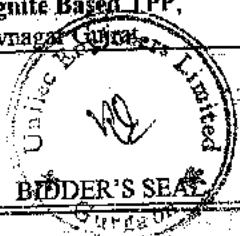
3.7 CABLING AND TERMINATIONS

- a) Cable Entry : ☒ BOTTOM ☐ TOP ☐ REAR
- b) Cable Sizes as per enclosed annexure II : ☒ YES ☐ NO
(Data Sheet A) considered
- c) Type of incoming connections : ☐ Bus Trunking ☐ Cable
from Transformer to PCC ☒ Bus Duct

3.8 EARTHING

- 3.8.1 Size of earth bus (min.) : Min. 300mm² GI (50x6mm GI)

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)		Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar, Gujarat	
Revision Number	0	Unilec Engineers Limited	3
Signature Manufacturer			
Date : 11.11.2011			



CAT I = Approved
 CAT II = Approved with comments as noted
 CAT III = Not Approved
 CAT IV = Reference
 Page 25 of 529
 Signature: [Signature]



TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 8 OF 23

3.9 LABELING

3.9.1 Inscriptions, material and locations as per specification confirmed, **unless** specifically mentioned otherwise in "Schedule of Deviations" : ☒ YES ☐ NO

3.9.2 Thickness of anodised aluminium sheet : As per General Notes

4.0 SWITCHGEAR MAIN ASSEMBLIES

4.1 AIR CIRCUIT BREAKERS

4.1.1 Rated voltage : 415 Volt

4.1.2 Maximum voltage at which circuit-breaker can operate continuously : 440 Volt

4.1.3 Number of Poles : ☒ Three ☐ Four

4.1.4 No. of breaks per pole : One

4.1.5 Clearances in air

a) Between phases : 25mm

b) Live parts to earth : 19mm

4.1.6 Symmetrical (RMS) interrupting capacity at rated voltage. : 50kA, 1Sec.

4.1.7 Rated breaking capacity at service voltage : 50kA, 1Sec.

4.1.8 Momentary making current : 105kA (peak)

4.1.9 Short time rating : 50kA for 1sec.

4.1.10 Short circuit performance category : P-2

4.1.11 Derating factor for operation under site conditions : No De-rating

4.1.12 Operating mechanism

a) Closing : ☒ Motor wound spring
: ☒ Manual

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)

Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar, Gujarat

Revision Number

0

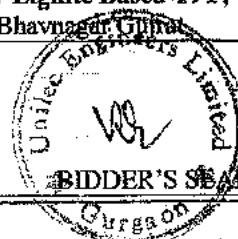
1

2

1703

Signature Manufacturer

Date : 11.11.2011





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 9 OF 23

- b) Tripping : ☐ Direct acting
☒ Shunt trip
☐ Both of above
- 4.1.13 Operation counter provided : ☒ YES ☐ NO
- 4.1.14 Auxiliary voltage for
- a) Spring charging motor : 220V DC
- b) Closing release coil : 220V DC
- c) Shunt trip coil : 220V DC
- 4.1.15 Limits of voltage for satisfactory operation of the following devices as %age of normal voltage
- a) Spring charging motor : 85 to 110% of U_c
- b) Closing release coil : 80 to 110% of U_c
- c) Shunt trip coil : 65 to 130% of U_c
- 4.1.16 Spring charging motor details
- a) Rating : 0.2kW
- b) Rated voltage : 220V
- c) Rated current : 0.91A
- d) Speed : 10000 rpm
- e) Insulation class : E or Better
- f) Spring charging time : 7sec. Approx.
- g) Max. temperature rise over specified ambient : As per IS:13947
- 4.1.17 Maximum temp. of the main contacts with rated continuous current : As per IS:13947
- 4.1.18 Type of main contacts : Fixed & Moving Type

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar-Gujarat	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 10 OF 23

- 4.1.19 Material of main contacts : Copper
- 4.1.20 Type of arcing contacts : Fixed & Moving Type
- 4.1.21 Material of arcing contacts : Copper
- 4.1.22 Whether contacts are silver plated : ☒ YES ☐ NO
- If yes,
- 4.1.23 Thickness of silver plating : 4-5 Microns
- 4.1.24 Contact pressure : As per IS : 13947
- 4.1.25 Maximum number of auxiliary contacts that can be fitted : 4NO+4NC
- 4.1.26 Whether NO & NC contacts interchangeable at site : ☐ YES ☒ NO
- 4.1.27 Maximum number of secondary isolating contacts that can be fitted : Max. 6NO+6NC
- 4.1.28 Power required for closing at
- a) Normal voltage : 50Watts
- b) 80% normal voltage : 60Watts
- 4.1.29 Power required for tripping
- a) Normal voltage : 30Watts
- b) 50% normal voltage : 70Watts
- c) Trip circuit consumption (With supervision lamp) : 30Watts
- 4.1.30 Are the circuit breakers trip free : ☒ YES ☐ NO
- 4.1.31 Type of release (where applicable) : Not Applicable

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar Gujarat

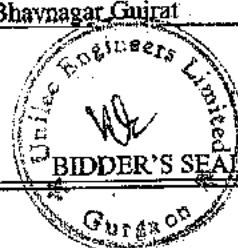
Revision Number

Signature Manufacturer

Date : 11.11.2011

0	1	2	3
0	1	2	3
0	1	2	3
0	1	2	3

CAT I = Approved
 CAT II = Approved with comments as noted
 CAT III = Not Approved
 CAT IV = Refer Page 28 of 529





TITLE

DATA SHEET - C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 11 OF 23

4.1.32 Provision of releases for specified function :

Release Not Applicable (For protection separate Relay will provided)

a) PCC incomer

- i. Overload : ☐ YES ☒ NO
- ii. Short Circuit : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO
- iii. Under Voltage : ☐ YES ☒ NO
If yes, With timer : ☐ YES ☒ NO
- iv. Earth Fault : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO

b) MCC incomer

- i. Overload : ☐ YES ☒ NO
- ii. Short Circuit : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO
- iii. Under Voltage : ☐ YES ☒ NO
If yes, With timer : ☐ YES ☒ NO
- iv. Earth Fault : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO

c) Outgoing Feeder

- i. Overload : ☐ YES ☒ NO
- ii. Short Circuit : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO
- iii. Under Voltage : ☐ YES ☒ NO
If yes, With timer : ☐ YES ☒ NO
- iv. Earth Fault : ☐ YES ☒ NO
If Yes, With timer : ☐ YES ☒ NO

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar-Gujarat

Revision Number

0

1

2

3

Signature Manufacturer

UNILEC ENGINEERS LIMITED
PROJECT ENGINEERING MANAGEMENT
(ELECTRICAL)

Date : 11.11.2011

This approval shall be interpreted as laid down in the contract and it shall not relieve the contractor from his

APPROVAL CATEGORY AWARD TO

CAT I = Approved

CAT II = Approved with reservation

CAT III = Not Approved

CAT IV = Defective Drawing



BIDDER'S SEAL



TITLE

DATA SHEET- C **LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 12 OF 23

d) Bus - Coupler

- | | | | | |
|------|--------------------|---|------------------------------|--|
| i. | Overload | : | ☐ YES | ☒ NO |
| ii. | Short Circuit | : | ☐ YES | ☒ NO |
| | If Yes, With timer | : | ☐ YES | ☒ NO |
| iii. | Under Voltage | : | ☐ YES | ☒ NO |
| | If yes, With timer | : | ☐ YES | ☒ NO |
| iv. | Earth Fault | : | ☐ YES | ☒ NO |
| | If Yes, With timer | : | ☐ YES | ☒ NO |

4.1.33 Release setting range

- | | | | |
|----|---------------|---|----------------|
| a) | Overload | : | Not Applicable |
| b) | Short circuit | : | Not Applicable |
| c) | Under Voltage | : | Not Applicable |
| d) | Earth Fault | : | Not Applicable |

4.1.34 Release time delay

- | | | | |
|----|---------------|---|----------------|
| a) | Short circuit | : | Not Applicable |
| b) | Under Voltage | : | Not Applicable |
| c) | Earth Fault | : | Not Applicable |

4.1.35 Min. recommended grading time between consecutive circuit breakers fitted with

- | | | | |
|----|------------------------|---|----------------|
| a) | Electromagnetic relays | : | Not Applicable |
| b) | Solid state releases | : | Not Applicable |

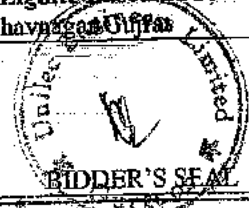
4.1.36 Means provided for remote indication of individual function for above releases

☐ YES ☒ NO

4.1.37 Whether following anti-pumping features provided

- | | | | | |
|----|------------|---|---|-----------------------------|
| a) | Mechanical | : | ☒ YES | ☐ NO |
| b) | Electrical | : | ☒ YES | ☐ NO |

Name of Manufacturer : Unilac Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar District	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					



Approved with comments
 Not Approved
 Approved
 Signature
 Date

	TITLE DATA SHEET- C LOW VOLTAGE SWITCHGEAR	SPECIFICATION NO. PE-TS-356-506-E001	
		BHEL DOC. NO. : PE-V0-356-506-E009	
		UEL DOC. NO. : J567-801-01	
		REV NO.: R1	DATE: 09/02/2012
		PAGE 13 OF 23	

4.1.38 Whether programmable secondary isolating contact provided : ☒ YES ☐ NO

4.2 CONTACTOR STARTER UNITS (DIRECT-ON-LINE)

4.2.1 Max. Motor rating upto which contactor starter considered : Less than 110 KW

4.2.2 Type of short circuit device : ☒ HRC Fuse ☐ MCCB

4.2.3 Locked rotor protection provided : NA ☐ YES ☒ NO

4.2.4 Type of co-ordination between SCPD & other starter components as per IS: 8544. : Yes (Type-2 Co-ordination)

4.2.5 Whether secondary isolating contacts are self-isolating self-aligning type : ☒ YES ☐ NO

4.3 SWITCH-FUSE UNITS

4.3.1 Breaking capacity at 110 % rated voltage and 0.3 power factor : As per IS:13947

4.3.2 Short time rating : 50kA with 0.2 sec.

4.4 MOULDED CASE CIRCUIT BREAKERS (MCCB) : Not Applicable

4.4.1 Application

a) Contactor Starter : Not Applicable

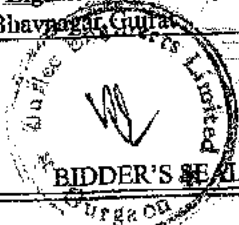
b) Other circuits : Not Applicable

c) If Yes for b)
Provided for rating upto : Not Applicable

4.4.2 Rated voltage : Not Applicable

4.4.3 Number of poles : Not Applicable

4.4.4 Derating factor for site ambient conditions : Not Applicable

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar, Gujarat	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					



TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 14 OF 23

- 4.4.5 Minimum clearances in air
 a) Between poles : Not Applicable
 b) Live parts to frame : Not Applicable
- 4.4.6 Construction materials of
 a) Frame : Not Applicable
 b) Main contacts : Not Applicable
 c) Arcing contacts : Not Applicable
- 4.4.7 Whether contacts are plated : ☐ YES ☐ NO
 If yes,
- 4.4.8 Material of plating : Not Applicable
- 4.4.9 Main contact pressure : Not Applicable
- 4.4.10 Maximum temperature rise over ambient for
 a) Main contacts : Not Applicable
 b) Other moulded parts : Not Applicable
- 4.4.11 Short time rating : Not Applicable
- 4.4.12 Rated short circuit duty : Not Applicable
- 4.4.13 Rated breaking capacity (rms) at 415 V : Not Applicable
- 4.4.14 Rated making current : Not Applicable
- 4.4.15 On/Off operation
 a) Manual : NA ☐ YES ☐ NO
 b) Remote power operated : NA ☐ YES ☐ NO
- 4.4.16 Releases provided
 a) Overload : NA ☐ YES ☐ NO
 b) Under voltage : NA ☐ YES ☐ NO
 c) Short circuit : NA ☐ YES ☐ NO
- 4.4.17 Whether MCCBs are suitable for use without Short Circuit and/or Overload release without impairing its function in any way : NA ☐ YES ☐ NO
- 4.4.18 Whether comparison of I Vs T plot of MCCB and fuse will automatically ensure discrimination between the two in S/C and O/L region : NA ☐ YES ☐ NO
 If no,
- 4.4.19 State the other consideration for achieving discrimination : Not Applicable
- 4.4.20 Type of coordination with the characteristics of other devices as per IS: 8544, when used as SCPD with contactor : NA ☐ a ☐ b ☐ c
- 4.4.21 Whether coordination indicated above verified by the test : NA ☐ YES ☐ NO

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar Gujarat

Revision Number

0

1

2

Signature Manufacturer

Date : 11.11.2011

BIDDER'S SEAL

Approved with comment
 Not Approved
 Reference Drawing
 Page 32 of 529 sheets
 Date



TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 15 OF 23

- 4.4.22 Whether MCCB is suitable for direct switching on to motor : NA [] YES [] NO
- If yes,
- 4.4.23 Utilization category as per IS: 2959 : Not Applicable
- 4.4.24 Whether shunt trip provided : Not Applicable [] YES [] NO
- If yes,
- a) Nominal voltage : Not Applicable
- b) Voltage variation range : Not Applicable
- c) Energisation power : Not Applicable
- 4.4.25 Whether solenoid closing operation provided : Not Applicable
- If Yes,
- a) Nominal voltage : Not Applicable
- b) Voltage variation range : Not Applicable
- c) Energisation power : Not Applicable

5.0 SWITCHGEAR COMPONENTS

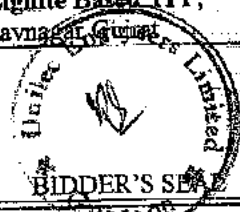
5.1 ISOLATING SWITCH

- 5.1.1 Rated voltage : 415Volt
- 5.1.2 No. of poles : 3Pole (AC) / 2Pole (DC)
- 5.1.3 Minimum thermal rating : 16A
- 5.1.4 Are switches suitable for breaking locked rotor current of the motor of maximum rating controlled by the switches : As per IS 13947
- 5.1.5 Derating factor for site ambient conditions : No De-rating
- 5.1.6 Utilization category for main contacts : AC-23A(for Motor feeder)
AC-22A(for Other feeder)
DC-22A(for DC feeder)
- 5.1.7 Temperature rise over ambient for main contacts when carrying rated current for site condition : As per IS 13947

5.2 POWER CONTACTORS

- 5.2.1 Short time rating : 200A to 4000A depend on Contactor rating.

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)		Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar, Gujarat	
Revision-Number	0	1	2
Signature Manufacturer			
Date : 11.11.2011			



	TITLE DATA SHEET- C LOW VOLTAGE SWITCHGEAR	SPECIFICATION NO. PE-TS-356-506-E001	
		BHEL DOC. NO. : PE-V0-356-506-E009	
		UEL DOC. NO. : J567-801-01	
		REV NO.: R1	DATE: 09/02/2012
		PAGE 16 OF 23	

- 5.2.2 Rated voltage of main contacts : 415V AC
- 5.2.3 Rated voltage of auxiliary
- a) AC : 110V, 240V
- b) DC : 220V
- 5.2.4 Coil voltage (nominal) :
☒ 110 V AC 50 Hz
☒ 220/240 V AC 50 Hz
☐ 110 V DC
☒ 220 V DC
- 5.2.5 Permissible supply voltage variation : $\pm 10\%$ of Rated Voltage
w.r.t. nominal coil voltage
- 5.2.6 Drop out voltage for coil : 65% of Rated Voltage
- 5.2.7 No. of poles for main contactor : 3Pole
- 5.2.8 Insulation class for winding : As per IS 13947
of electromagnet
- 5.2.9 Temperature rise over ambient : As per IS 13947
for coil winding
- 5.2.10 Minimum thermal rating when : 16A
used in power circuit
- 5.2.11 Utilization category
- a) Reversible motor : AC-4
- b) Non-reversible motor : AC-3
- 5.2.12 Type of hold-in mechanism :
☒ Electrically held
☐ Mechanical latch-in
- 5.3 **HIGH RUPTURING CAPACITY (HRC) FUSES**
- 5.3.1 Whether fuse mounted in the insulated carrier : ☒ YES ☐ NO
- 5.3.2 Rupturing capacity
- a) AC : 80kA
- b) DC : 25kA
- 5.3.3 Temperature rise over : As per IS 13703, Part-2
ambient at rated current

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)		Project : 2x250MW Lignite Based TPP, at Radva, Bhavnagar, Gujarat	
Revision Number	0	1	2
Signature Manufacturer			
Date : 11.11.2011			

APPROVAL CATEGORY

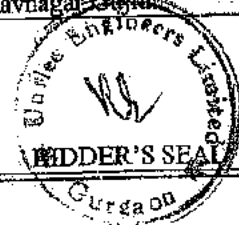
CAT I = Approved with comments

CAT II = Not Approved

CAT III = Pending Drawing

CAT IV = Page 38 of 629

Signature _____ Date _____





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO.: PE-V0-356-506-E009

UEL DOC. NO.: J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 17 OF 23

5.4 THERMAL OVERLOAD RELAY

- 5.4.1 Range : 80 to 120% of FLC or as per Type-2 Selection Chart
- 5.4.2 Resetting : ☒ Hand ☐ Self
☐ Both with changeover facility
- 5.4.3 Whether ambient compensated : ☒ YES ☐ NO
- 5.4.4 Single phasing prevention feature provided : ☒ YES ☐ NO
- 5.5 SINGLE PHASING PREVENTER (SPP) : Built in Thermal overload Relay
 (To be filled up where separate SPP is considered)
- 5.5.1 Applicable above motor rating : Not Applicable
- 5.5.2 Delay time : Not Applicable.
- 5.5.3 Setting (%age of FLC) : Not Applicable
- 5.5.4 Resetting : ☐ Hand ☐ Self

5.6 INSTRUMENTS AND METERS

- 5.6.1 Provision of ammeter for motor rating above : 30kW & above and as mentioned in SLD for critical drives
- 5.6.2 Voltmeter
- a) Shape : Square
 - b) size : 96mm x 96 mm
 - c) Accuracy class : 1.0
 - d) Voltage coil rating : 110V, for AC, 300V DC
 - e) Angle of deflection : 240 deg.
 - f) Scale length : 70mm
- 5.6.3 Ammeter
- a) Shape : Square
 - b) size : 96mm x 96 mm
 - c) Accuracy class : 1.0
 - d) Current coil rating : 1A
 - e) Angle of deflection : 240deg.
 - f) Scale length : 70mm

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar, Gujarat

Revision Number

0

1

2

3

Signature Manufacturer

Date : 11.11.2011





TITLE

DATA SHEET - C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-601-01

REV NO.: R1

DATE: 09/02/2012

PAGE 18 OF 23

5.6.4 Energy Meters

a)	Shape	:	Square
b)	size	:	96mm x 96 mm
c)	Accuracy class	:	0.5
d)	Current coil rating	:	1A
e)	Voltage coil rating	:	110V
f)	Angle of deflection	:	Not Applicable
g)	Scale length	:	Not Applicable

5.7 RELAYS

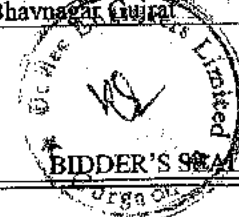
5.7.1	Type	:	Main Feeder Protection Relay : Numerical Type & all other Protection relay & Aux. Relay - Static or Electromagnetic Type.
5.7.2	Coil Rating	:	
a)	Current coil	:	1A
b)	Voltage	:	220V DC
5.7.3	Means for in-built testing provided	:	☒ YES ☐ NO
5.7.4	Minimum grading time recommended between consecutive breakers fitted with the relays	:	Within is Limit

5.8 CURRENT TRANSFORMERS

5.8.1	Secondary Rating	:	☒ 1 A ☐ 5 A
5.8.2	Output	:	Min. 10VA
5.8.3	Accuracy class (metering)	:	Class-1
5.8.4	Accuracy class (protection)	:	5P20
5.8.5	Accuracy limit factor (ALF)	:	20
5.8.6	Type of Primary winding	:	Up to 150A, Wound Primary & >150A Bar Primary Type
5.8.7	Primary current rating	:	As Per Single Line Diagram of respective Switch Boards
5.8.8	Instrument security factor	:	Not More the 5

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP,
at Padva, Bhavnagar Gujarat

Revision Number	0	1	2	3
Signature Manufacturer				
Date : 11.11.2011				





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 19 OF 23

5.8.9 Specific data for CTs required for differential Protection

- a) Knee point voltage (V_k) : As Per Single Line Diagram
 b) Exciting current at $V_k/2$: As Per Single Line Diagram
 c) Secondary resistance : As Per Single Line Diagram
 5.8.10 Short time rating : 50kA, for 1sec.
 5.8.11 Momentary current : 105kA
 5.8.12 Insulation material : Resin
 5.8.13 Class of insulation : Class -E or Better
 5.8.14 Max. temperature rise over ambient for the winding : As per IS:2705
 5.8.15 Whether capable of carrying rated primary current for 1 minute with the secondary winding open circuited : ☒ YES ☐ NO

5.9 VOLTAGE, CONTROL & WINDING HEATING TRANSFORMERS

5.9.1 Voltage Transformers

- a) System Earthing considered : ☒ Effective ☐ Non-effective
 b) Secondary terminal voltage (phase-phase) : 110V
 c) Insulation material : Resin
 d) Class of insulation : E or Better
 e) Accuracy class : 1 for Metering & 3P for Protection
 f) Output : As per Scheme requirement
 g) Winding configuration : As per Scheme requirement
 h) Over voltage factor
 i. continuous : 1.2
 ii. 30 seconds : 1.9
 i) Max. temperature rise of winding over ambient : As per IS

5.9.2 Control Transformers (for contactor operation)

- a) Rated Primary voltage(Phase-Phase) : 415V
 b) Taps : $\pm 5\%$ in step of 2.5%
 c) Minimum secondary terminal voltage AC(when primary voltage is minimum & transient current is maximum) : Not less the min. Pickup voltage of Contactor.
 d) Secondary terminal voltage : ☒ 110 V ☐ 240 V
 e) Whether separate control transformer considered for individual circuit : ☒ YES ☐ NO

Name of Manufacturer : Unilec Engineers Limited,
Gurgaon (Hr.)Project : 2x250MW Lignite Based TPP
at Padva, Bhavnagar, Gujarat

Revision Number

0

1

2

3

Signature Manufacturer

Date : 11.11.2011



CAT I = Approved
 CAT II = Approved with comments as noted
 CAT III = Not Approved
 CAT IV = Refer Page 37 of 529
 Signature
 Date



DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

PAGE 20 OF 23

- 5.12.2 Series resistor value used as economy ohms resistor or dropping resistor for supervision : Not Applicable for LED indication lamp

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar, Gujrat	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					



TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO.: PE-V0-356-506-E008

UEL DOC. NO.: J567-801-01

REV. NO.: R1

DATE: 09/02/2012

PAGE 21 OF 23

5.12.3 Circuit voltage

: ☒ 110 V AC
 [] 110 V DC
☒ 220 V DC

5.12.4 Lens colour as per Data Sheet A.

: ☒ YES [] NO

5.12.5 Diameter of lamp

: 22.5mm

5.12.6 Wattage consumption of lamp

a) With resistor : 1.5Watts
 b) Without resistor : 0.5Watts

5.13 PUSH BUTTONS

5.13.1 Voltage Grade

: 110V AC, 415V AC,

5.13.2 No. of Contacts

: (2NO + 2NC)

5.13.3 Function

: START STOP RESET

a) Colour of actuator : Green Red Blue
 b) Type of actuator head : S M S
 (S=Shrouded, M=Mushroom)
 c) Lockability : N N N
 (Y=Yes, N=No)

5.14 ANTI-CONDENSATION HEATERS

5.14.1 24 V motor winding heating

: Not Applicable

a) Applicable Rating(including & below)

: Not Applicable

b) Maximum space htg.
 current (%age of FLC)
 considered for the
 sizing of transformer

: Not Applicable

5.14.2 Panel space heating

a) Voltage : 240V AC
 b) Thermostat provided : ☒ YES [] NO
 c) If b) is yes, limit
 of adjustability of
 temp. within panel : 35 to 105°C
 d) If b) is no, the min
 temp. to be maintained : NA
 e) Separate provision for
 front and rear panels
 considered : ☒ YES [] NO

Name of Manufacturer : Unilec Engineers Limited,
 Gurgaon (Hr.)

Project : 2x250MW Lignite Based TPP,
 at Padva, Bhavnagar, Gujarat

Revision Number

0

1

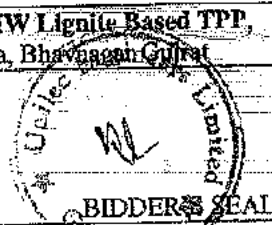
2

3

Signature Manufacturer

Date : 11.11.2011

Rev	0	1	2	3
Design				
Check				
Approved				
Signature				
Date				



Approved with comments as noted
 CAT B - Not approved
 CAT M - Not approved
 CAT V - Not approved
 Page 39 of 529
 Name: _____ Date: _____



TITLE

DATA SHEET - C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE

22 OF 23

5.15 GENERAL PURPOSE TIMERS

(Other than electromechanical & Electronic timers used in protection)

- 5.15.1 Coil voltage rating (AC) : ☐ 220 V ☒ 110 V
- 5.15.2 Limits of voltage variation : $\pm 10\%$
- 5.15.3 Time delay range : As per requirement
- 5.15.4 Type of delay mechanism : ☐ Pneumatic
☒ Electronic
☐ Electromechanical
- 5.15.5 Repeat accuracy : As per IS

6.0 PAINTING**6.1 Shade**

- a) Interior : RAL 7036
- b) Exterior : RAL 7036

6.2 Paint Finish

- a) Interior : ☐ Matt ☒ Semi-glossy
- b) Exterior : ☒ Semi-glossy ☐ Full-glossy

6.3 Paint thickness (min.) : 50microns

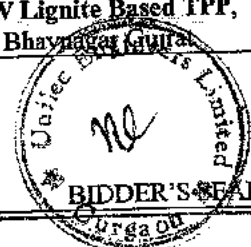
7.0 MAKE AND TYPE OF COMPONENTS

: As per Make of List
(UEL Document No. J567-700-01)

8.0 SPARES**8.1 O&M Spares**

- a) Period for which O&M Spares offered : 3years (Optional Item)
- b) Whether additional O&M offered (other than those indicated) : ☐ YES ☒ NO

Name of Manufacturer : Unilec Engineers Limited, Gurgaon (Hr.)				Project : 2x250MW Lignite Based TPP, at Padva, Bhavnagar (Gujarat)	
Revision Number	0	1	2	3	
Signature Manufacturer					
Date : 11.11.2011					





TITLE

DATA SHEET- C

LOW VOLTAGE SWITCHGEAR

SPECIFICATION NO. PE-TS-356-506-E001

BHEL DOC. NO. : PE-V0-356-506-E009

UEL DOC. NO. : J567-801-01

REV NO.: R1

DATE: 09/02/2012

PAGE 23 OF 23

8.2 Start-up spares

- a) Whether E & C spares as indicated in Annexure-IV of Data Sheet A considered for prices : ☒ YES ☐ NO
- b) Whether any additional start-up spares offered for purchaser's consideration : ☐ YES ☒ NO

9.0 DOCUMENTATION

Whether following furnished as per clause 12.3 Section D.

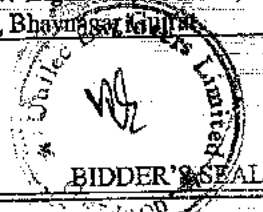
- a) Typical sectional drawing : ☒ YES ☐ NO
- b) Schematic drawings for each functional unit : ☒ YES ☐ NO
- c) Wire routing, termination and numbering details : ☒ YES ☐ NO
- d) Type test Certificates of switchboard, circuit-breakers and components : ☒ YES ☐ NO
- e) Final Quality Plans with signatures and seal on each sheet : ☒ YES ☐ NO
- f) Catalogues / Technical leaflets of switchboard and components : ☒ YES ☐ NO
- g) Bar chart of activities and their schedules : ☒ YES ☐ NO
- h) Billing schedule : ☒ YES ☐ NO

Name of Manufacturer: Unilec Engineers Limited,
Gurgaon (Hr.)Project: 2x250MW Lignite Based TPP,
at Padva, Bhavnagar District

Revision Number: 0 1 2 3

Signature Manufacturer

Date: 11.11.2011



MAKE OF COMPONENTS (SUB VENDER LIST) FOR LT SWITCHGEAR

TATA CONSULTING ENGINEERS LTD.,	
VENDOR DOCUMENT REVIEW STATUS	
☐ A Drawing approved as submitted. Proceed with fabrication/Construction.	
☐ B Drawing approved subject to comments noted Proceed with fabrication / construction considering our comments.	
☐ C Our comments are noted on this marked up print.	
☐ D Our comments are noted in memo attached to the forwarding transmittal form No.....	
☐ E Correct original of this drawing to reflect our comments and resubmit for approval.	
☐ F Correct original of this drawing to reflect our comments and resubmit for approval.	
☐ G Drawing of this category is not to be information on the drawing is noted.	
☐ H Drawing reviewed against all previous comments and other revisions highlighted and identified by the vendor.	
☐ I Drawing returned without review.	
☐ J Drawing returned without review.	

Approval conferred herein neither relieves Vendor/ Contractor of his contractual obligations and his responsibilities for correctness of dimensions, details, assembly fits, systems / performance requirements, conformity of Supplies with Indian statutory laws as may be applicable, nor does it limit the Purchaser's rights under the contract.

Reviewed by KP Date 26/05/12

	CLIENT :- BHAVNAGAR ENERGY COMPANY LIMITED		
	CONSULTANT :- TATA CONSULTING ENGINEERS LIMITED SHERIFF CENTRE, BANGALORE		
	PROJECT :- 2X250MW LIGNITE BASED TPP AT PADVA, DIST. BHAVNAGAR, GUJARAT		
	MAIN CONTRACTOR :- POWER SECTOR BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NOIDA		
	Manufacturer:- UNILEC ENGINEERS LIMITED UNIT-1 :- Begumpur Khatola Road, Behrampur Industrial Area, Gurgaon-122001 UNIT-2 :- Plot No.-168, Sector-3, Bawal Distt. Rawari		
DRN.	NAME	SIGN	DATE
PRPD.	D.KUMAR		21.11.11
CHKD.	K.C.BHATT		21.11.11
APPD.	K.C.BHATT		21.11.11
TITLE :-	MAKE OF COMPONENTS (SUB VENDER LIST) FOR LT SWITCHGEAR		
BHEL DRG.No.	PE-V0-356-506-E005		
UEL DRG.No.	J-567-700-01		
Rev.	DESCRIPTION OF CHANGE		
Date	PRPD.		
CHKD.	APPD.		
REV.-0			

S.NO.	COMPONENTS	MAKE	21	22	23	24	25	26	27	28
1.	AIR CIRCUIT BREAKERS	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER								
2.	AC POWER CONTACTOR	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER/C&S								
3.	AUX. CONTACTOR	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER/C&S								
4.	AMMETER (INDICATING)	AUTOMATIC ELECTRIC/IMP								
5.	BREAKER CONTROL SWITCH/SELECTOR SWITCH	KAYCEE/ALSTOM/GE-POWER								
6.	CURRENT TRANSFORMER	AUTOMATIC ELECTRIC/PRAYOG/SOUTHERN ELECTRICS/SIEMENS/KAPPA								
7.	VOLTAGE TRANSFORMER	AUTOMATIC ELECTRIC/PRAYOG/SOUTHERN ELECTRICS/SILKAANS/KAPPA/SIEMENS								
8.	CONTROL TRANSFORMER	AUTOMATIC ELECTRIC/SOUTHERN ELECTRICS/KAPPA/LOGICSTAT								
9.	WINDING HEATING TRANSFORMER	AUTOMATIC ELECTRIC/SOUTHERN ELECTRICS/KAPPA								
10.	CABLE GLANDS	COMET BRASS PRODUCT/BALIGA LIGHTING EQPT.								
11.	POWER CABLE LUGS	DOWELLS								
12.	DC POWER CONTACTOR	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER/C&S								
13.	DC SWITCH	KAYCEE/SIEMENS/GE-POWER								
14.	DIODES	USHA RECTIFIER/ RUTTONSHAW/ HIND								
15.	EARTH LEAKAGE CIRCUIT BREAKER (ELCB)	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER/INDO ASIAN								
16.	ELECTRONIC MOTOR PROTECTION RELAY (EMPR) INCLUDING EOCR	L&T/ABB/GE-POWER/AREVA/SIEMENS/SCHNEIDER/C&S								
17.	ENERGY METER	RISHABH(L&T)/IMP/SECURE/BHEL(EDN)								
18.	ETHERNET SWITCH	RUGGEDCOM/DELINK								
19.	FUSE BASE	L&T/GE-POWER/SIEMENS/SCHNEIDER/ABB								
20.	FUSE LINK	L&T/GE-POWER/SIEMENS/SCHNEIDER/ABB								
21.	ISOLATING SWITCH	KAYCEE/SALZER(L&T)/GE-POWER/SIEMENS/SCHNEIDER/ABB								
22.	INTERPOSING RELAY	OEN/JYOTI/ABB								

This Drawing & Design is the property of Unilec Engineers Ltd. & can not be used in any form or by any means without the prior written permission.

Manufacturer:-

UNILEC

UNILEC ENGINEERS LIMITED

Unit-1, Reganpur Road, Bhubaneswar

Industrial Area, Cuttack-751001

UNIT-2 : Plot No.-168, Sector-3, Bawal Distt. Rewari

CLIENT:- BHAVNAGAR ENERGY COMPANY LIMITED

CONSULTANT:- TATA CONSULTING ENGINEERS LTD.

PROJECT:- 2X250MW LIGNITE BASED TPP AT PADVA, DIST. BHAVNAGAR, GUJARAT

MAIN CONTRACTOR:- BHARAT HEAVY ELECTRICALS LTD., POWER SECTOR

DETAILS

BHEL DRG. No. J-567 -700- 01

DESCRIPTION

LT SWITCHGEAR

MAKE OF COMPONENTS(SUB VENDOR LIST)

BHEL DRG. No. J-567 -700- 01

REV.:- 0

REV.:- 0

This Drawing & Design is the property of Unilec Engineers Ltd. & can not be used in any form or by any means without the prior written permission.

S.NO.	COMPONENTS	MAKE
23,	INDICATING LAMPS (LED)	L&T/SIEMENS/SCHNEIDER/GE-POWER/RASS(C&S)/BCH/ABB
24,	MOULDED CASE CIRCUIT BREAKER (MCCB) AC	L&T/ABB/SIEMENS/SCHNEIDER
25,	MOULDED CASE CIRCUIT BREAKER (MCCB) DC	L&T/ABB/SIEMENS/SCHNEIDER/GE-POWER
26,	MULTIFUNCTION METER	RISHABH(L&T)/SCHNEIDER/SECURE/ABB
27	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)	L&T/ABB/SIEMENS/SCHNEIDER/AREVA
28,	MINIATURE CIRCUIT BREAKER (MCB)	L&T/ABB/SIEMENS/SCHNEIDER/C&S/GE-POWER/MDS
29,	PUSH BUTTONS	L&T/SIEMENS/SCHNEIDER/TECKNIC/BCH/ABB
30,	PROTECTION RELAYS (OTHER THAN INTERPOSING RELAY)	ABB/AREVA/SIEMENS
31,	AUX RELAYS/DC RELAY	ABB/AREVA/SIEMENS
32,	SWITCH FUSE UNIT	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER
33,	SYNCHROSCOPE	GEC-ALSTOM
34,	SWITCH/SOCKET (INDUSTRIAL TYPE)	CROMTON GREAVES/ANCHOR/BEST AND CROMPTON
35,	THERMOSTAT	ANCO/AUTOMATIC INSTRUMENTS
36,	TRANSDUCER	AE/RISHABH(L&T)/ABB
37,	THERMAL OVER LOAD RELAY	L&T/ABB/GE-POWER/SIEMENS/SCHNEIDER/TELEMECHANIQUE(SCHNEIDER)
38,	TIMER	L&T/BCH/ABB/TELEMECHANIQUE(SCHNEIDER)
39,	TERMINALS BLOCKS (FIXED)	CONNECTWEL/ELMEX/WAGO
40,	VOLTMETER	AE/IMP/RISHABH(L&T)
41,	LT BUSDUCT	UNILEC
42,	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	UNILEC/C&S/BCH/L&T/SCHNEIDER/SIEMENS/BALLIGA/JASPER ENGINEERS
43,	LOCAL PUSH BUTTON STATION (FLAME PROOF)	BALLIGA
44,	NEUTRAL GROUND CONDUCTOR	S R NARKHEDE/RSI SWITCHGEAR/LACHHMAN/BCH
45,	LOCAL MOTOR STARTER	UNILEC/L&T/TELEMECHANIQUE(SCHNEIDER)/C&S/SIEMENS/ABB

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN	SCALE	NTS	DRN.	NAME	SIGN	DATE	Manufacturer:-	CUSTOMER:-	DESCRIPTION	LT SWITCHGEAR
							D.KUMAR		21.11.11	UNILEC ENGINEERS LIMITED UNIL-1, Begunpur Khedi Road, Begunpur Industrial Area, Gurgaon-122001 UNIL-2, Plot No.-163, Sector-3, Bawel Distt. Rewari	CONSULTANT:- TATA CONSULTING ENGINEERS LTD. PROJECT:- 2X250MW LIGNITE BASED TPP AT PADVA, DIST.BHAVNAGAR, GUJARAT MAIN CONTRACTOR:- BHARAT HEAVY ELECTRICALS LTD., POWER SECTOR PROJECTS ENGINEERING MANAGEMENT, Noida	DETAILS BHEL DRG. No. PE-V0-356-E005 UEL DRG. No. J-567-700-01	MAKE OF COMPONENTS(SUB VENDOR LIST) REV:- 0 REV:- 0


Bhavnagar Energy Company Limited

A-42, MINAL RESIDENCY (OLD),
J. K. ROAD, GOVINDPURA,
BHOPAL - 462023 (M.P.)

Attn: Mr. S.G. Deshpande – G.M

Our Ref.: TCE.5403A-EL-K-078.

Date: 11-02-2012.

BHAVNAGAR ENERGY COMPANY LIMITED

TCE.5403A: Consulting Engineering Services for 2 x 250 MW Lignite Based Thermal Power Project, at Padva, Bhavnagar, Gujarat

BTG SYSTEM PACKAGE: TCE VIEWS ON VENDOR LIST / CREDENTIALS SUBMITTED BY BHEL - PEM

Dear Sir,

This is with reference to the BHEL - PEM e-mail dated 27-01-2012 submitting the vendor list / credentials for BECL/TCE review and approval. We have reviewed the same and our views are indicated below.

Sl. No.	Item	Name of the Vendor	TCE Views
1.	415V CURRENT, POTENTIAL & CONTROL TRANSFORMER	M/s INDCOIL Transformers Pvt Ltd, Thane	Acceptable.
2.		PRECISE Electricals, Thane	Acceptable.

The above Recommendation based on latest Vendor Appraisal / Feedback obtained from different projects.

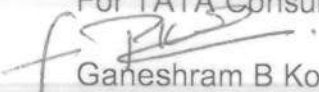
It may be noted that, the approval / Recommendation does not absolve BHEL - PEM responsibility in correctness of design, workmanship, guaranteed performance and other contractual obligations / responsibilities in terms of order / contract.

This is without any prejudice to the terms and conditions of the order.

BECL may review the same and indicate it to BHEL - PEM with a copy marked to TCE.

Assuring you of our best attention at all times.

Very truly yours,
For TATA Consulting Engineers Limited


Ganeshram B Kondur.
Project Electrical Engineer.

TATA CONSULTING ENGINEERS LIMITED

Janardhan Towers 3rd Floor No 2 Residency Road Bangalore 560 025
Tel 91 80 6638 4300 Fax 91 80 2227 4876 email mail@tce.co.in website www.tce.co.in
Registered Office Matulya Centre A 249 Senapati Bapat Marg Lower Parel (West) Mumbai 400 013



CC: Mr. S.K.JOSHI - GM
Bhavnagar Energy Company Limited
 C/o Gujarat Power Corporation Limited
 Block No. 8, 3rd Floor, Udyog Bhavan.
 Sector -11, Gandhinagar – 382017

TATA CONSULTING ENGINEERS LIMITED

Janardhan Towers 3rd Floor No 2 Residency Road Bangalore 560 025

Tel 91 80 6638 4300 Fax 91 80 2227 4876 email mail@tce.co.in website www.tce.co.in

Registered Office Matulya Centre A 249 Senapati Bapat Marg Lower Parel (West) Mumbai 400 013


Bhavnagar Energy Company Limited

A-42, MINAL RESIDENCY (OLD),
J. K. ROAD, GOVINDPURA,
BHOPAL - 462023 (M.P.)

Attn: Mr. S.G. Deshpande – G.M

Our Ref.: TCE.5403A-EL-K-081.

Date: 29-02-2012.

BHAVNAGAR ENERGY COMPANY LIMITED

TCE.5403A: Consulting Engineering Services for 2 x 250 MW Lignite Based Thermal Power Project, at Padva, Bhavnagar, Gujarat

BTG SYSTEM PACKAGE: TCE VIEWS ON VENDOR LIST / CREDENTIALS SUBMITTED BY BHEL - PEM

Dear Sir,

This is with reference to the BHEL - PEM e-mail dated 22-02-2012 submitting the vendor list / credentials for BECL/TCE review and approval. We have reviewed the same and our views are indicated below.

Sl. No.	Item	Name of the Vendor	TCE Views
1.	DC SWITCH	M/s L & T	Acceptable.

The above Recommendation based on latest Vendor Appraisal / Feedback obtained from different projects.

It may be noted that, the Approval / Recommendation does not absolve BHEL - PEM responsibility in correctness of design, workmanship, guaranteed performance and other contractual obligations / responsibilities in terms of order / contract.

This is without any prejudice to the terms and conditions of the order.

BECL may review the same and indicate it to BHEL - PEM with a copy marked to TCE.

Assuring you of our best attention at all times.

Very truly yours,
For TATA Consulting Engineers Limited

Ganeshram B Kondur.
Project Electrical Engineer.

TATA CONSULTING ENGINEERS LIMITED

Janardhan Towers 3rd Floor No 2 Residency Road Bangalore 560 025
Tel 91 80 6638 4300 Fax 91 80 2227 4876 email mail@tce.co.in website www.tce.co.in
Registered Office Matulya Centre A 249 Senapati Bapat Marg Lower Parel (West) Mumbai 400 013



CC: Mr. S.K.JOSHI - GM
Bhavnagar Energy Company Limited
C/o Gujarat Power Corporation Limited
Block No. 8, 3rd Floor, Udyog Bhavan.
Sector -11, Gandhinagar – 382017

TATA CONSULTING ENGINEERS LIMITED

Janardhan Towers 3rd Floor No 2 Residency Road Bangalore 560 025

Tel 91 80 6638 4300 Fax 91 80 2227 4876 email mail@tce.co.in website www.tce.co.in

Registered Office Matulya Centre A 249 Senapati Bapat Marg Lower Parel (West) Mumbai 400 013

COMPONENT SELECTION CHART(TYPE-2 CO-ORDINATION) FOR LT SWITCHGEAR

TATA CONSULTING ENGINEERS LTD. VENDOR DOCUMENT REVIEW STATUS

- ☐ A Drawing approved as submitted. Proceed with fabrication/Construction.
- ☐ B Drawing approved subject to comments noted considering our comments.
- ☐ C Our comments are noted on this marked up print.
- ☐ D Our comments are noted in memo attached to the forwarding transmittal letter etc.
- ☐ E Drawing is not suitable for execution. Drawing to reflect our comments and resubmit for review.
- ☐ F Drawing is not suitable for execution. Drawing to reflect our comments and resubmit for review.
- ☐ G Drawing is not suitable for execution. Drawing to reflect our comments and resubmit for review.
- ☐ H Drawing reviewed against our previous comments and other revisions highlighted and identified by the vendor.
- ☐ I Drawing reviewed without review.
- ☐ J Plans not enclosed.

Approved Contract has been neither relieves Vendor/Contractor of his contractual obligations and his respective duties for correctness of dimensions, details, quantities, weights, quantities, design, materials, fit, systems / performance, reliability, safety and any other applicable, nor does it limit the liability of the parties under the contract.

Reviewed by: *HP* Date: *25/02/12*

UNILEC ENGINEERS LTD.
PROJECT ENGINEERING MANAGEMENT

This approval shall not be interpreted as and claim in the contract and it shall not release the contractor from his contractual obligations.

APPROVAL CATEGORY: *Not Approved*

CAT I = Approved with comments as noted
CAT II = Not Approved
CAT III = Reference Drawing
CAT IV = Signature

Name: _____ Date: _____

CLIENT :- BHAVNAGAR ENERGY COMPANY LIMITED

CONSULTANT :- TATA CONSULTING ENGINEERS LIMITED
SHERIFF CENTRE, BANGALORE

PROJECT :- 2X250MW LIGNITE BASED TPP AT PADVA,
DIST. BHAVNAGAR, GUJARAT

MAIN CONTRACTOR :- POWER SECTOR
BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NOIDA

DRN.	NAME	SIGN	DATE
PRPD.	D. KUMAR		03.02.12
CHKD.	K.C. BHATT		03.02.12
APPD.	K.C. BHATT		03.02.12

Manufacturer:-
UNILEC ENGINEERS LIMITED
UNIT-1 :- Begunpur Khabela Road, Behrampur
Industrial Area, Gurgaon-122001
UNIT-2 :- Plot No.-168, Sector-3, Rowal Distt. Rewari

TITLE :-	COMPONENT SELECTION CHART(TYPE-2 CO-ORDINATION)
BHEL DRG. No.	PE-V0-355-506-E003
UCL DRG. NO.	J-567-100-03
APPD.	K.C. BHATT
CHKD.	K.C. BHATT
PRPD.	K.C. BHATT
Date	03.02.12
Rev.	DESCRIPTION OF CHANGE
R1	AS PER COMM.MAIL DT 02.02.12
Rev.	DESCRIPTION OF CHANGE

21 22 23 24 25 26 27 28

S.NO.	MOTOR RATING KW	MOTOR FLC	SWITCH RATING	FUSE RATING	CONTACTOR RATING AC-3/AC-4	OVER LOAD RATING	AMMETER RANGE
1.	0.08-0.09	0.18A	32A	4A	18A	0.3-0.5A	--
2.	0.12	0.24A	32A	4A	18A	0.3-0.5A	--
3.	0.15	0.57A	32A	4A	18A	0.45-0.75A	--
4.	0.18-0.19	0.75A	32A	4A	18A	0.6-1.0A	--
5.	0.25	0.9A	32A	4A	18A	0.6-1.0A	--
6.	0.37	1.2A	32A	6A	18A	0.9-1.5A	--
7.	0.55	1.6A	32A	6A	18A	1.4-2.3A	--
8.	0.75	2.1A	32A	8A	18A	1.4-2.3A	--
9.	0.9-1.1	2.7A	32A	10A	18A	2.0-3.3A	--
10.	1.3	3A	32A	10A	18A	2.0-3.3A	--
11.	1.5	3.5A	32A	16A	18A	3-5A	--
12.	1.8	4.8A	32A	16A	18A	4.5-7.5A	--
13.	2-2.25	5A	32A	16A	18A	4.5-7.5A	--
14.	2.6-3	6.4A	32A	20A	18A	4.5-7.5A	--
15.	3.7	7.9A	32A	20A	18A	6-10A	--
16.	4	8.5A	32A	20A	18A	6-10A	--
17.	4.5	9A	32A	25A	18A	6-10A	--
18.	5-6	11.2A	32A	32A	18A	9-15A	--
19.	7.5	14.8A	32A	32A	25A	9-15A	--
20.	9.3	19A	63A	50A	32A	14-23A	--
21.	10-11	22.0A	63A	63A	32A	14-23A	--
22.	12-13	24.0A	63A	63A	32A	20-33A	--
23.	15	29.0A	63A	63A	40A	20-33A	--
24.	18-18.6	35.0A	100A	80A	50A	30-50A	--
25.	20-22.5	40.0A	100A	80A	50A	30-50A	--
26.	26-29.9	47.0A	100A	100A	70A	30-50A	--

AT PRAJAPATI HEAVY ELECTRICALS LTD.
PROJECT: BHARAT HEAVY ELECTRICALS LTD., POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT, Noida

This drawing is the property of Prajapati Heavy Electricals Ltd. and shall not be used for any other project without the prior written permission of Prajapati Heavy Electricals Ltd.

APPROVAL: ☒ APPROVED
CAT I: ☒ Approved with comments as noted
CAT II: ☒ Not Approved
CAT III: ☒ Reference Drawing
Date: Signature:

NOTE:-

- 1:- SELECTION CHART IS BASED ON M/s L&T MAKE COMPONENTS.
- 2:- NORMAL MOTOR STARTING TIME (≤ 5 SECOND) IS ASSUMED.
- 3:- SELECTION CHART IS FOR NORMAL START STANDARD 3 PHASE SQUIRREL CAGE MOTOR WITH AVERAGE POWER FACTOR.
- 4:- 45KW & ABOVE MOTOR SHALL BE PROVIDED WITH CT OPERATED OVER LOAD.

REV. NO.	DESCRIPTION OF CHANGE	DATE	SIGN	SCALE	WTS	DRN.	NAME	SGN	DATE	Manufacturer:-	CLIENT:-	DESCRIPTION	COMPONENT SELECTION CHART (TYPE-2 CO-ORDINATION)
R1	AS PER COMM. MAIL DT 02.02.12	03.02.12	D. KUMAR				PRD. D. KUMAR		03.02.12	UNILEC ENGINEERS LIMITED Plot-4, Begunur, Kashi Road, Gurgaon-122001 INDIA Tel: 012-2611818, 2611819, 2611820 Fax: 012-2611818	CONSULTANT:- TATA CONSULTING ENGINEERS LTD. PROJECT:- AT PRAJAPATI, BHARAT HEAVY ELECTRICALS LTD., POWER SECTOR PROJECTS ENGINEERING MANAGEMENT, Noida	DETAILS	LT SWITCHGEAR
							CHD. K.C. BHATT		03.02.12			BHEL DRG. No.	PE-V0-356-506-E003 REV:- R1
							APPD. K.C. BHATT		03.02.12			UEL DRG. No.	J-387-100-03 REV:- R1
													SHEET NO. 02 OF 03