01.02.2024

CORRIGENDUM NO. 2

1. Organization Chain	Bharat Heavy Electricals Limited||EPD - Bangalore
2. Tender ID	2024_BHEL_32218_1
3. Tender Reference Number	12303795
4. Tender Title	SUPPLY OF LV SWITCHGEAR FGD FOR - Tuticorin Project
5. Corrigendum Type	Technical Corrigendum
6. Corrigendum Title	Corrigendum-2
7. Description	Technical Corrigendum

Ref: Corrigendum 2 for PR:12303795 for NTPL Tuticorin FGD (2 x 500MW) LT Switchgear

Date: 31.01.2024

CPBG Engineering is issuing corrigendum for Purchase Requisition: 12303795 for LT Switchgear for NTPL Tuticorin FGD (2 x 500MW) for the reasons as mentioned below.

Sl	Documents	Revision
1	Annexure I – Add Del list	Added components and ratings
2	Annexure C- Module wise BOM	Added components and revised the ratings in line with Technical Specification SBD-TS-CPBG-FGD-TUT, REV-01
3	Annexure 1 to 11 Board wise BOM	Revision of ratings and addition of component

UN-PRICED SCHEDULE WORKING SHEET

ANNEXURE-A

LT SWITCHGEAR FOR TUTICORIN (FGD PACKAGE)

Sl. No.	MATERIAL CODE	Boards	Qty	UNIT	Unit Rate including P&F Charges and Freight Charges upto destination (Quoted / Not Quoted)	Freight % (Included in Unit Rate) Eg. (Quoted / Not Quoted)	Freight % (Included in Unit Rate) To me mentioned (eg. 2.00%)	Total Value price as per applicable Annexure (Quoted / Not Quoted)	Applicable Annexure
10	ELFGDTUTCPJ12101	415V FGD SERVICE PMCC UNIT 1 # 1DF	1	EA					ANNEXURE-B1
20	ELFGDTUTCPJ12102	415V FGD SERVICE PMCC UNIT 2 # 2DF	1	EA					ANNEXURE-B2
30	ELFGDTUTCPJ12103	415V EMERGENCY MCC # 0DG	1	EA					ANNEXURE-B3
40	ELFGDTUTCPJ12104	415V FGD HVAC MCC # 0TA	1	EA					ANNEXURE-B4
50	ELFGDTUTCPJ12105	415V WWTP MCC # 0SA	1	EA					ANNEXURE-B5
60	ELFGDTUTCPJ12106	415V WS,HVAC,Compressed AIR MCC-0SB	1	EA					ANNEXURE-B6
70	ELFGDTUTCPJ12107	415V COMMON MCC # 0SC	1	EA					ANNEXURE-B7
80	ELFGDTUTCPJ12108	220V MAIN DCDB # 0FA	1	EA					ANNEXURE-B8
90	ELFGDTUTCPJ12109	415V FGD LHP/GHP PMCC-0DE	1	EA					ANNEXURE-B9
100	ELFGDTUTCPJ12110	415V MLDB FOR LHP&GHP WITH 2X100KVA TRAF	1	EA					ANNEXURE-B10
110	ELFGDTUTCPJ12111	415V WDB FOR LHP &GHP WITH 2X100KVA TRAF	1	EA					ANNEXURE-B11
120	ELFGDTUTCPJ12112	DC FUSE DB	4	EA					
130	ELFGDTUTCPJ12113	AC FUSE DB	2	EA					
140	ELFGDTUTCPJ12114	Mandatory spares for LT switchgear ANX-D	1	LOT					ANNEXURE-D
150	ELFGDTUTCPJ12115	COMMISSIONING SPARES-ANNEXURE-E	1	LOT					ANNEXURE-E
160	ELFGDTUTCPJ12116	TOOLS & TACKLES -ANNEXURE-F	1	LOT					ANNEXURE-F
170	ELFGDTUTCPJ12117	COMMISSIONING CHARGE FOR NR - ANNEXURE G	1	LOT		Not Applicable for Service			ANNEXURE-G
180	ELFGDTUTCPJ12118	SITE MODIFICATION CHARGES Annexure-H	1	LOT		Not Applicable for Service			ANNEXURE-H
190	ELFGDTUTCPJ12119	SITE MOD MATL@1% Total Exworks (SL 1-13)	1	LOT					Not applicable

NOTES:

1. SUMMATION OF ALL UNIT RATES OF MODULES SHALL BE EQUIVALENT TO TOTAL BOARD COST QUOTED, VARIANCE OF +/- 5% IS ACCEPTABLE. BEYOND 5% OFFER WILL NOT BE CONSIDER AS VALID OFFER. IN UNIT ADDITION-DELETION PRICES, PRICES QUOTED FOR COMPONENTS SHALL BE AS PER LIST PRICE OF CONCERNED MANUFACTURES. IF ANY ABNORMAL PRICES ON HIGHER SIDE OBSERVED OFFER MAY BE REJECTED.

2. ALL LT PCC/ MCC/ DBs SHALL BE SUPPLIED ALONGWITH THE INTEGRAL BASE FRAMES, CABLE GLANDS & LUGS AND TOOLS & TACKLES AS MENTIONED IN DIFFERENT SECTIONS. ALL FIXING NUTS & BOLTS TOGETHER WITH FOUNDATION BOLTS SHALL ALSO BE SUPPLIED.

3. ITEM WISE PRICES WITH DESCRIPTION AND RATING OF EACH ITEM COMPLYING TO LIST FURNISHED IN THE SCHEDULE OF UNIT PRICES SHALL BE FURNISHED IN SCHEDULE OF UNIT PRICE. PRICES SHALL BE FURNISHED IN SCHEDULE OF UNIT PRICE.

4. FOR DETAILED BOARD WISE BOM, REFER ANNEXURES.

5. FOR DETAILED MODULE WISE BOM, REFER ANNEXURE-C.

6.ADDITION/DELETION OF QUANTITIES SHALL BE APPLICABLE AT THE QUOTED PRICE.THE UNIT RATE OF SUPPLY OF ALL EQUIPMENTS & SERVICES QUOTED BY THE BIDDER SHALL BE FIRM FOR A VARIATION OF QUANTITIES , WHICH MAY BE TO THE EXTENT OF ±30% OF THE TOTAL CONTRACT VALUE DERIVED ON THE BASIS OF ORDERED QUANTITY. SUM OF INDIVIDUAL MODULE SHALL EQUAL TO BOARD PRICE.

a. COMPLETE DIMENSIONS OF ALL THE BOARDS INCLUDING NO OF PCC, MCC. GA DRAWING SHALL BE DULY SUBMITTED FOR ALL BOARDS.

b. DIMENSIONS OF EACH TYPE OF PANEL.

c. MODULE SIZE OF EACH TYPE OF FEEDER.

d. MINIMUM CLEARANCES REQUIRED ON ALL SIDES FOR EACH TYPE OF PANEL.

e. NO. of VERTICAL (including PCC, MCC etc.) of EACH PANLES TO BE GIVEN, ELSE YOUR OFFER WILL BE REJECTED..

7. DOUBLE COMPRESSION, NICKLE PLATED BRASS CABLE GLANDS & HEAVY DUTY LUGS OF NTPC APPROVED MAKE FOR EXTERNAL POWER, CONTROL & EARTHING CONNECTIONS AT SUPPLIED EQUIPMENT END AND FOUNDATION BOLT ARE IN THE SCOPE OF BIDDER. BIDDER TO QUOTE ALL EQUIPMENT WITH CABLE GLANDS, LUGS AND FOUNDATION BOLTS.

ANNEXURE-B1 REV 01

Name of the Board: 415V FGD SERVICE PMCC UNIT-1 # 1DF, 4000A

TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE (O/G)	2000A	2										
DAE (O/G)	630A	1										
DAE (O/G)	800A	2										
DAET BC	4000A	1										
DAET IC	4000A	2										
DK2	15KW	4										
DK2	3.7KW	10										
DK2	7.5KW	6										
DK21	18.5KW	4										
DK21	75KW	2										
E1 (O/G)	32A	7										
E1 (O/G)	63A	2										
E3 (O/G)	100A	16										
E3 (O/G)	400A	4										
E3 (O/G)	32A	119										
E3 (O/G)	400A	2										
E3 (O/G)	63A	5										
G1	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
ACB O/G PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B2,REV 01

Name of the Board: 415V FGD SERVICE PMCC UNIT-2 # 2D, 4000A

TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE (O/G)	2000A	2										
DAE (O/G)	630A	1										
DAE (O/G)	800A	2										
DAET BC	4000A	1										
DAET IC	4000A	2										
DK2	15KW	4										
DK2	3.7KW	10										
DK2	7.5KW	6										
DK21	18.5KW	4										
DK21	75KW	2										
E1 (O/G)	32A	7										
E1 (O/G)	63A	2										
E3 (O/G)	100A	16										
E3 (O/G)	400A	4										
E3 (O/G)	32A	119										
E3 (O/G)	400A	2										
E3 (O/G)	63A	5										
G1	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
ACB O/G PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B3,REV 01

Name of the Board: 415V EMERGENCY MCC # 0DG, 800A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE BC	800A	1										
DAE IC	800A	2										
DK2	11KW	4										
DK2	22KW	10										
DK2	3KW	10										
DK2	5.5KW	12										
DK2	7.5KW	2										
DK21	30KW	6										
DK21	45KW	12										
DK2E	5.5KW	10										
E3 (O/G)	100A	6										
E3 (O/G)	200A	2										
E3 (O/G)	32A	7										
E3 (O/G)	400A	6										
G2	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B4,REV 01

Name of the Board: 415V FGD HVAC MCC # 0TA, 630A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE BC	630A	1										
DAE IC	630A	2										
DK2	0.37KW	2										
DK2	0.55KW	2										
DK2	0.75KW	12										
DK2	1.1KW	13										
DK2	1.5KW	15										
DK2	2.2KW	18										
DK2	2.2KW'	8										
DK2	7.5KW	4										
E3 (O/G)	200A	4										
E3 (O/G)	32A	6										
EA1	32A	2										
EA3	32A	6										
G1	100VA	2										
J1	2KVA	2										
SH	2KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B5,REV 01

Name of the Board:415V WWTP MCC # 0SA , 400A
TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE BC	400A	1										
DAE IC	400A	2										
DK2	0.37KW	13										
DK2	0.55KW	8										
DK2	0.75KW	2										
DK2	1.1KW	4										
DK2	1.5KW	13										
DK2	15KW	4										
DK2	2.2KW	4										
DK2	3.7KW	6										
E1(O/G)	32A	12										
E3 (O/G)	100A	4										
E3(O/G)	32A	9										
E3(O/G)	63A	2										
G1	100VA	2										
J1	2KVA	2										
SH	3KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B6,REV 01

Name of the Board:415V WS,HVAC,Compressed AIR MCC # 0SB, 800A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE BC	630A	1										
DAE IC	630A	2										
DK2	0.37KW	5										
DK2	1.1KW	1										
DK2	1.5KW	5										
DK2	11KW	5										
DK2	2.2KW	6										
DK2	3.7KW	4										
DK21	30KW	4										
DM-PM	90KW	4										
E1 (O/G)	32A	9										
E3 (O/G)	200A	4										
E3 (O/G)	32A	29										
G1	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B7,REV 01

Name of the Board:415V COMMON MCC # 0SC, 2000A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE BC	2000A	1										
DAE IC	2000A	2										
DK2	0.5KW	4										
DK2	0.75KW	4										
DK2	1.1KW	6										
DK2	1.5KW	4										
DK2	11KW	14										
DK2	15KW	7										
DK2	18.5KW	11										
DK2	2.2KW	4										
DK2	22KW	6										
DK2	2KW	6										
DK2	3.7KW	7										
DK2	3KW	6										
DK2	5.5KW	20										
DK2	7.5KW	6										
DK21	37KW	6										
DK21	55KW	4										
DK21	75KW	6										
DM/PM	132KW	4										
E3 (O/G)	100A	10										
E3 (O/G)	32A	121										
E3 (O/G)	63A	7										
G1	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B8

Name of the Board: 220V MAIN DCDB # 0FA, 400A
TYPE OF CONNECTION: CABLE ENTRY BOTTOM
DOUBLE FRONT FIXED TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
CH	400A	2										
DB	400A	2										
DC	400A	3										
VM	NA	2										
X	32A	50										
X	400A	4										
X	63A	8										
MCC (SFFT)	As required	As required										
TOTAL												

ANNEXURE-B9,REV 01

Name of the Board: 415V FGD LHP/GHP PMCC #0DE, 2500A

TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
DAE OG	630A	3										
DAET BC	2500A	1										
DAET IC	2500A	2										
DK2	0.37KW	12										
DK2	0.55KW	6										
DK2	11KW	4										
DK2	2.2KW	6										
DK2	22KW	4										
DK2	3.7KW	4										
DK2	7.5KW	4										
DK2	9.3KW	4										
DK21	75KW	4										
DN1	2.2KW	6										
E3	100A	6										
E3	200A	8										
E3	32A	28										
E3	400A	8										
E3	63A	18										
G1	100VA	2										
J1	2KVA	2										
SH	5KVA	2										
ACB I/C PANEL	As required	As required										
ACB B/C PANEL	As required	As required										
MCC (DFDO)	As required	As required										
DUMMY PANELS	As required	As required										
Ethernet Switch		1										
TOTAL												

ANNEXURE-B10,REV 01

Name of the Board:415V MLDB FOR LHP &GHP WITH 2X100KVA DRY TYPE TRANSFORMER , 250A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
SINGLE FRONT FIXED TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
E3+TRAFO IC	100KVA / (400A MCCB PRIMARY + 400A MCCB SECONDARY)	2										
E3	63A	7										
E3	32A	6										
E3	100A	2										
VM	50VA	1										
SH	2KVA	1										
EM3 I/C	As required	As required										
EM3 B/C	As required	As required										
MCC (SFFT)	As required	As required										
TOTAL												

ANNEXURE-B11,REV 01

Name of the Board:415V WDB FOR LHP &GHP WITH 2X100KVA DRY TYPE TRANSFORMER , 250A

TYPE OF CONNECTION: CABLE ENTRY BOTTOM
SINGLE FRONT FIXED TYPE
FLOOR MOUNTED

Feeder type	Rating	Total feeders	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
E3+TRAFO IC	100KVA / (400A MCCB PRIMARY + 400A MCCB SECONDARY)	2										
E3	63A	12										
VM	50VA	1										
SH	2KVA	1										
EM3 I/C	As required	As required										
EM3 B/C	As required	As required										
MCC (SFFT)	As required	As required										
TOTAL												

MODULE WISE BOM

ANNEXURE-C REV 2

SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.	Comments	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	**DAET (I/C)**	**PMCC INCOMER OF 1600A, 2000A, 2500A, 3000A, 3200A, 4000A SHALL COMPRISE OF:**												
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL										
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	1											
		MCB 6A, 4P 415V AC	1											
		MCB 16A DP, 220V DC	1											
		MCB 6A DP, 220V DC	5											
		Indicating Lamp	13											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		CURRENT TRANSFORMER (PROTECTION)10VA, CL-PS	3											
		METERING CT 10VA,CLASS 0.5 ACCURACY	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3											
		KW TRANDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AMMETER	1											
		VOLTMETER	1											
		AMMETER SELECTOR SWITCH	1											
		VOLTMETER SELECTOR SWITCH	1											
		LOCKOUT RELAY HAND RESET TYPE	1											
		FUSE FAILURE RELAY	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTHH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL										
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		Auxillary breaker contact multiplication relay	1											
2	**DAE (I/C)**	**MCC INCOMER OF 630A, 800A, 1000A, 1250A, 1600A, 2000A SHALL COMPRISE OF:**												
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL										
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	1											
		MCB 6A, 4P 415V AC	1											
		MCB 16A DP, 220V DC	1											
		MCB 6A DP, 220V DC	5											
		Indicating Lamp	13											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		METERING CT 10VA,CLASS 0.5 ACCURACY	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3											
		KW TRANDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AMMETER	1											
		VOLTMETER	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		AMMETER SELECTOR SWITCH	1											
		LOCKOUT RELAY HAND RESET TYPE	1											
		FUSE FAILURE RELAY	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL										

		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •RESTRICTED EARTRH FAULT PROTECTION(64R) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		Auxilliary breaker contact multiplication relay	1											
3	DAET/DAE (B/C)	**PMCC/MCC BUSCOUPLER OF 630A, 800A, 1000A, 1250A, 1600A,2000A, 2500A, 3000A, 3200A,4000A SHALL COMPRISE OF:**												
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL										
		MCB 16A DP, 220V DC	3											
		MCB 6A DP, 220V DC	6											
		AUXILIARY CONTACTOR 2NO+2NC 220VDC	1											
		BREAKER CONTACT MULTIPLICATION RELAY	1											
		Indicating Lamp	13											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		METERING CT 10VA,CLASS 0.5 ACCURACY	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3											
		KW TRANDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AMMETER	1											
		VOLTMETER	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		AMMETER SELECTOR SWITCH	1											
		LOCKOUT RELAY HAND RESET TYPE	1											
		FUSE FAILURE RELAY	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTRH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL										
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		DC SOURCE SLECTION SWITCH	2											
4	DAEG(-1/C)	**EMERGENCY MCC INCOMER OF 800A, 1000A, 1250A, 1600A, 2000A, 2500A SHALL COMPRISE OF:**												
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL										
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2											
		MCB 6A, 4P 415V AC	1											
		MCB 16A DP, 220V DC	1											
		MCB 6A DP, 220V DC	5											
		Indicating Lamp	13											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-PS	3											
		METERING CT 10VA,CLASS 0.5 ACCURACY	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3											
		KW TRANDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AMMETER	1											
		VOLTMETER	1											
		Ammeter Selector Switch	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		LOCKOUT RELAY HAND RESET TYPE	1											
		FUSE FAILURE RELAY	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											

		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTRH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%) • DIFFERENTIAL PROTECTION (HIGH IMPEDANCE) • REVERSE POWER PROTECTION • DG NEUTRAL DISPLACEMENT • DG MONITORING	1	Numerical Relay shall be supplied by BHEL										
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		Auxilliary breaker contact multiplication relay	1											
5	DAE/DAE-TIE (O/G)	**OUTGOING BREAKER FEEDER OF 630A, 800A, 1000A, 1250A, 1600A, 2500A SHALL COMPRISE OF:**												
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC,4NO + 4NC CONTACTS OF POSITION/ CELL SWITCH. SPRING CHARGE LIMIT SWITCH WITH minimum 2NO + 2NC contacts.	1	ACB shall be supplied by BHEL										
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2											
		MCB 16A DP, 220V DC	1											
		MCB 6A DP, 220V DC	5											
		Indicating Lamp	10											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		METERING CT 10VA,CLASS 0.5 ACCURACY	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3											
		KW TRANDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter Selector Switch	1											
		LOCKOUT RELAY HAND RESET TYPE	1											
		FUSE FAILURE RELAY	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL										
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •ANTI PUMPING (94)												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		Auxilliary breaker contact multiplication relay	1											
6	DM /PM	**BREAKER CONTROLLED MOTOR ABOVE 90KW SHALL COMPRISE OF:**												
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, 4NO + 4NC AUXILIARY CONTACTS (FOR CUSTOMER USE), POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL										
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2											
		MCB 6A, 4P 415V AC	1											
		MCB 16A DP, 220V DC	1											
		MCB 6A DP, 220V DC	5											
		Indicating Lamp	10											
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3											
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3											
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3											
		KW TRANSDUCER	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		ENERGY METER	1											
		NEUTRAL LINK 32A	1											
		CONTROL TERMINALS(FIXED)	As required											
		CT SHORTING TERMINAL-STUD TYPE	As required											
		POWER TERMINAL	As required											
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF BREAKER MOTOR FDR-12A, 240VAC	1											
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1											
		TNC SWITCH	1											
		LOCAL REMOTE SWITCH	1											
		LOCKOUT RELAY HAND RESET TYPE	1											

		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION UNDER VOLTAGE • EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • LOCKED ROTOR PROTECTION CURRENT UNBALANCE PROTECTION • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%) •NEGATIVE SEQUENCE PROTECTION •RESTART INHIBIT PROTECTION	1	Numerical Relay shall be supplied by BHEL										
		• ANTI PUMPING • TRIP CIRCUIT SUPERVISION • NEGATIVE PHASE CURRENT(46) • THERMAL OVERLOAD (49) • PHASE OVER CURRENT (50/51) • EARTH FAULT (50N/51N) • LOCKED ROTOR (51LR) • NO OF STARTS PER HOUR (66) •BREAKER FAILURE (50BF) •UNDER VOLTAGE (27 FROM PT)												
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		Auxilliary breaker contact multiplication relay	1											
7	G1	**BUS PT MODULE FOR PCC / PMCC SHALL COMPRISE OF:**												
		6A, TP MPCB	1											
		MCB 6A, 4P 415V AC	1											
		1 PH POTENTIAL TRANSFORMER -415/ROOT3 /110/ROOT3, 50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		VOLTMETER SQ96, TAUT BAND, 240 DEGREE DIFF., ACC. CL +-2%	1											
		VOLTMETER SELECTOR SWITCH	1											
		NUMERICAL RELAY FOR BUS PT MODULE WITH UNDER VOLTAGE PROTECTION (27)	1	Numerical Relay shall be supplied by BHEL										
		FUSE FAILURE RELAY	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		AUXILIARY CONTACTOR	1											
		NEUTRAL LINK-32A	1											
		CONTROL TERMINALS(FIXED)	As required											
8	G2	**BUS PT MODULE FOR DG PCC SHALL COMPRISE OF:**												
		6A, TP MPCB	1											
		MCB 6A, 4P 415V AC	1											
		1 PH POTENTIAL TRANSFORMER -415/ROOT3 /110/ROOT3, 50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		VOLTMETER SQ96, TAUT BAND, 240 DEGREE DIFF., ACC. CL +-2%	1											
		VOLTMETER SELECTOR SWITCH	1											
		NUMERICAL RELAY FOR BUS PT MODULE WITH UNDER VOLTAGE PROTECTION (27)	1	Numerical Relay shall be supplied by BHEL										
		FUSE FAILURE RELAY	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		AUXILIARY CONTACTOR	1											
		NEUTRAL LINK-32A	1											
		CONTROL TERMINALS(FIXED)	As required											
9	VM	**BUS PT MODULE FOR MCC/ACDB SHALL COMPRISE OF:**												
		6A, TP MPCB	1											
		MCB 6A, 4P 415V AC	1											
		AUX. CONTACTOR 2NO+2NC CV. 415 V AC	2											
		VOLTMETER (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		RECTIFIER (AC TO DC),I/P-240V AC, O/P-220VDC	1											
		UNDER VOLTAGE PROTECTION (27)	1											
		FUSE FAILURE RELAY	1											
10 (A)	CONTROL SUPPLY (CS)	**EACH CONTROL SUPPLY OUTGOING SHALL COMPRISE OF:**												
		13A, TP MPCB	2											
		MCB 6A DP, 240V AC	2											
		MCB 16A DP, 240V AC	4											
		INDICATION LAMP	2											
		AUX. CONTACTOR , 2NO+2NC,CV. 110 V AC	4											
		NEUTRAL LINK-32A	6											
		CONTROL TERMINALS(FIXED)	As required											
		POWER TERMINALS	As required											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 2KVA	2											
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 110V AC	2											
10(B)	TEST SUPPLY (J2)	**EACH TEST SUPPLY OUTGOING SHALL COMPRISE OF:**												
		13A, TP MPCB	2											
		MCB 6A DP, 240V AC	2											
		MCB 16A DP, 240V AC	4											
		INDICATION LAMP	2											
		AUX. CONTACTOR , 2NO+2NC,CV. 110 V AC	4											
		NEUTRAL LINK-32A	6											
		CONTROL TERMINALS(FIXED)	As required											
		POWER TERMINALS	As required											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 2KVA	2											
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 110V AC	2											
10(C)	SPACE HEATER SUPPLY	**EACH SPACE HEATER SUPPLY OUTGOING SHALL COMPRISE OF:**												
		13A, TP MPCB	2											
		MCB 6A DP, 240V AC	2											
		MCB 16A DP, 240V AC	4											
		INDICATION LAMP	2											
		AUX. CONTACTOR , 2NO+2NC,CV. 240 V AC	4											
		NEUTRAL LINK-32A	6											
		CONTROL TERMINALS(FIXED)	As required											
		POWER TERMINALS	As required											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/240 V, 2KVA	2											
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 240V AC	2											
10(D)	MOTOR WINDING HEATING TRANSFORMER SUPPLY	**EACH MOTOR WINDING HEATING TRANSFORMER SUPPLY OUTGOING SHALL COMPRISE OF:**												
		13A, TP MPCB	2											
		MCB 6A DP, 240V AC	2											
		MCB 16A DP, 240V AC	4											
		INDICATION LAMP	2											
		AUX. CONTACTOR , 2NO+2NC,CV. 24 V AC	4											
		NEUTRAL LINK-32A	6											
		CONTROL TERMINALS(FIXED)	As required											
		POWER TERMINALS	As required											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/24V, 2KVA	2											
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 24V AC	2											
11	DB	**220V DC INCOMER FROM BATTERY SHALL COMPRISE OF:**												
		DC AMMETER WITH SHUNT AND CENTER ZERO along with selector switch	1											
		DC FUSE BOX WITH FUSE FAILURE MONITORING RELAY	1											
		LOAD VOLTAGE INDICATION	1											

		BUS VOLTAGE INDICATION	1											
		OVERLOAD ALARM TO DDCMIS	1											
12	DC	**220V DC BUS COUPLER SHALL COMPRISE OF:**												
		DOUBLE POLE 250V MCCB WITH 2NO+2NC AUXILIARY CONTACTS	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		LOAD VOLTAGE INDICATION	1											
		BUS VOLTAGE INDICATION	1											
		OVERLOAD ALARM TO DDCMIS	1											
13	CH	**220V DC INCOMER OF DCDB FROM CHARGER SHALL COMPRISE OF:**												
		Double pole, 250 V MCCB	1											
		INDICATING LAMP	2											
		DC VOLTMETER	1											
		DC AMMETER WITH SHUNT along with selector switch	1											
		CURRENT TRANSDUCER	1											
		BUS VOLTAGE INDICATION	1											
		LOAD VOLTAGE INDICATION	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		MCB 6A DP, 220V DC	2											
		OVERLOAD ALARM TO DDCMIS	1											
14	HD	**220V DC ISOLATING SWITCH/CIRCUIT BREAK MODULE SHALL COMPRISE OF:**												
		DOUBLE POLE 250V MCCB WITH REQUIRED AUXILIARY CONTACTS	1											
		BUS VOLTAGE INDICATION	1											
		LOAD VOLTAGE INDICATION	1											
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
		DC AMMETER WITH SHUNT along with selector switch	1											
		MCB 6A DP, 220V DC	2											
		OVERLOAD ALARM TO DDCMIS	1											
15	S	**220V DCDB BUS MODULE FOR METERING & PROTECTION SHALL COMPRISE OF:**												
		UNDERVOLTAGE RELAY (INSTANNANEOUS WITH SETTING OF 95% OF 240VDC. THE RESETTING OF RELAY SHOULD NOT BE MORE THAN 1.05)	1											
		OVERVOLTAGE RELAY(INSTANEOUS WHICH SHALL OPERATE AT 110% OF 240V DC. THE RESETTINGRATION SHOULD NOT BE LESS THAN .95)	1											
		EARTHFAULT RELAY (CAEM21 OR EQV.)	1											
		INDICATING LAMP	2											
		MCB 6A DP, 240V AC	1											
		MCB 6A DP, 220V DC	1											
		NEUTRAL LINK	1											
		DC VOLTAGE METER (0-300V)	1											
		VOLTMETER SELECTOR SWITCH	1											
		AUXILIARY CONTACTOR,2NO+2NC,CV 220AC	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	2											
		FUSE FAILURE PROTECTION												
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1											
16	X	**220V DC OUTGOING FEEDER SHALL COMPRISE OF:**												
		DOUBLE POLE 250V MCCB	1											
		DC AMMETER WITH SHUNT along with selector switch	1											
		OVERLOAD ALARM TO DDCMIS	1											
		MCB 6A DP, 220V DC	1											
		INDICATING LAMP	1											
		HRC FUSES	2											
17	CC	**ISOLATOR INCOMER WITH CONTACTOR UPTO 630A SHALL COMPRISE OF**												
		MCB 6A, 4P 415V AC	1											
		MCB 6A DP, 240V AC	1											
		Motorized MCCB TP	1											
		Auxiliary Switch for MCCB	1											
		INDICATING LAMP	3											
		SERVICE POSITION LIMIT SWITCH	2											
		TRIPLE POLE POWER CONTACTOR WITH COIL SUITABLE FOR 415V AC WITH 2NO+2NC AUX	2											
		AUXILIARY CONTACTOR 2NO+2NC ,CV 415V AC	2											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		AUX. CONTACTOR,2N0+2NC, CV 110 V AC	2											
		ADD ON AUX. CONTACTOR BLOCK,2NO+2NC	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		VOLTMETER (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1											
		AMMETER SELECTOR SWITCH	1											
		VOLTMETER SELECTOR SWITCH	1											
		4-20mA Dual o/p, Aux sup 240V AC, 1A, Current Transducer	1											
		TERMINAL BLOCKS	30											
18(A)	EM3 (I/C)	**INCOMER MCCB (NON MOTORIZED) FOR ACDB/MLDB/PDB FOR RATING from 100A UPTO 630A**												
		MCB 6A, 4P 415V AC	1											
		MCB 6A DP, 240V AC	1											
		MCCB TP	1											
		AMMETER	1											
		AMMETER SELECTOR SWITCH	1											
		VOLTMETER	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		Electronic Energy Meter Suitable for communication with RS485	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		AUX. SWITCH FOR MCCB-2C/O	2											
		ALARM SWITCH FOR MCCB-1C/O	1											
		SHUNT TRIP COIL 220VAC	1											
		EXTENDED ROTORY HANDLE	1											
		INDICATION LAMP	3											
		NEUTRAL LINK 32A	1											
		NEUTRAL LINK AS PER MCCB RATING	1											
		CONTROL TERMINALS	AS REQUIRED											
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED											
18(B)	EM3 (I/C)	**INCOMER MCCB (NON MOTORIZED) FOR ACDB/MLDB/PDB FOR RATING FOR RATING below 100A**												
		MCB 6A, 4P 415V AC	1											
		MCB 6A DP, 240V AC	1											
		MCCB TP	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		AMMETER SELECTOR SWITCH	1											
		VOLTMETER (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1											
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1											
		ELECTRONIC ENERGY METER SUITABLE FOR COMMUNICATION WITH MODBUS RS485	1											
		Multi-Function Energy Meter compliant with IEC 61850	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3											
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL										
		AUX. SWITCH FOR MCCB-2C/O	2											
		ALARM SWITCH FOR MCCB-1C/O	1											
		SHUNT TRIP COIL 220VAC	1											
		EXTENDED ROTORY HANDLE	1											
		INDICATION LAMP	3											
		NEUTRAL LINK 32A	1											
		NEUTRAL LINK AS PER MCCB RATING	1											
		CONTROL TERMINALS	AS REQUIRED											

		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED											
19	EM3 (B/C)	BUSCOUPLER MCCB (NON-MOTORIZED) FOR FOR ACDB/MLDB/PDB FOR RATING UPTO 630A												
		MCB 6A, 4P 415V AC	1											
		MCB 6A DP, 240V AC	1											
		Motorized MCCB TP	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		AMMETER SELECTOR SWITCH	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3											
		Current TRANSDUCER	1											
		AUX. SWITCH FOR MCCB-2C/O	2											
		ALARM SWITCH FOR MCCB-1C/O	1											
		SHUNT TRIP COIL 220VAC	1											
		EXTENDED ROTORY HANDLE	1											
		INDICATION LAMP	3											
		NEUTRAL LINK 32A	1											
		NEUTRAL LINK AS PER MCCB RATING	1											
		CONTROL TERMINALS	AS REQUIRED											
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED											
20	E/E3	TPN AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A												
		TP MCCB	1											
		OVER CURRENT PROTECTION	1											
		SHORT CIRCUIT PROTECTION	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter selector Switch	1											
		EXTENDED ROTORY HANDLE	1											
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED											
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1											
21	E2	DP AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A												
		DP MCCB	1											
		OVER CURRENT PROTECTION	1											
		SHORT CIRCUIT PROTECTION	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter selector Switch	1											
		EXTENDED ROTORY HANDLE	1											
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1											
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED											
22	E1	SP AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A												
		SP MCCB	1											
		OVER CURRENT PROTECTION	1											
		SHORT CIRCUIT PROTECTION	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter Selector Switch	1											
		EXTENDED ROTORY HANDLE	1											
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1											
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED											
23	DK2/PK2/ AK2	UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW (AU/BU/CU CONTROLLED FROM ATRS/DDCMIS/PLC SHALL COMPRISE OF:												
		MPCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1											
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	2											
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1											
		OVERLOAD RELAY,BUILT IN SINGLE PHASE PREVENTER FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	1											
		MOUNTING KIT FOR O/L RELAY	1											
		RESET CORD ACTUATOR	1											
		Indication lamp	4											
		NEUTRAL LINK-32A	1											
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED											
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
24	EA1	1-PHASE MCCB (NON MOTORIZED) CONTACTOR CONTROLLED FEEDER SHALL COMPRISE OF:												
		MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		MCB 6A DP, 240V AC	1											
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1											
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	2											
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1											
		Indication lamp	4											
		NEUTRAL LINK-32A	1											
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED											
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter selector switch	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
25	EA3	3-PHASE MCCB (NON MOTORIZED) CONTACTOR CONTROLLED FEEDER SHALL COMPRISE OF:												
		MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		MCB 6A DP, 240V AC	1											
		3P POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1											
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	2											
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1											
		Indication lamp	3											
		NEUTRAL LINK-32A	1											
		CONTROL TERMINALS (DRAWOUT)	As required											
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter Selector Switch	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
26(A)	DK21/PK21/ AK21	UNIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM DDCMIS/PLC/ATRS SHALL COMPRISE OF:												
		MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		MCB 6A DP, 240V AC	1											
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1											
		AUX. CONTACTOR,2NO+2NC CV. 110 V AC	2											
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1											
		OVERLOAD RELAY 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE WITH BUILT-IN SINGLE PHASE PREVENTER	1											
		RESET CORD ACTUATOR	1											
		Indication lamp	3											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter Selector Switch	1											
		NEUTRAL LINK	1											
		CONTROL TERMINALS (DRAWOUT)	50											
		CT SHORTING TERMINAL-STUD TYPE	18											

		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-110V AC (for 30KW and above)	1											
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1											
27	**DKE2****	**UNIDIRECTIONAL MOTOR FEEDER (ESSENTIAL) BELOW 18.5KW CONTROLLED FROM DDCMIS/PLC/ ATRS SHALL COMPRISE OF:**												
		MPCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		Mounting Kit	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CONTROL FUSE	4											
		Contorl Fuse base	4											
		NEUTRAL LINK	2											
		AUXILIARY CONTACTOR	2											
		CT FOR METERING	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1											
		Ammeter Selector Switch	1											
		INTERPOSING RELAY RE302 OR EQVT	2											
		MOTOR RESTART TIMER	1											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
28(A)	**DKE21****	**UNIDIRECTIONAL MOTOR FEEDER (ESSENTIAL) 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM ATRS/DDCMIS/PLC SHALL COMPRISE OF:**												
		3P MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CONTROL FUSE	8											
		Contorl Fuse base	8											
		NEUTRAL LINK	2											
		AUXILIARY CONTACTOR	2											
		CT FOR METERING	1											
		AMMETER SELECTOR SWITCH	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		INTERPOSING RELAY RE302 OR EQVT	2											
		MOTOR RESTART TIMER	1											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-110V AC (for 30KW and above)	1											
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1											
29	**K3**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW CONTROLLED FROM LPBS SHALL COMPRISE OF:**												
		3P MPCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		Mounting Kit	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		AUXILIARY CONTACTOR	1											
		INTERPOSING RELAY RE302 OR EQVT	2											
		CONTROL FUSE	1											
		Control fuse base	1											
		NEUTRAL LINK	1											
		NO. OF TERMINALS	25											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
30(A)	**K31**	**UNIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM LPBS SHALL COMPRISE OF:**												
		3P MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE SINGLE PHASE PREVENTER	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		AUXILIARY CONTACTOR	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		AMMETER SELECTOR SWITCH	1											
		INTERPOSING RELAY RE302 OR EQVT	2											
		CT FOR METERING	1											
		CONTROL FUSE	1											
		Control Fuse base	1											
		NEUTRAL LINK	1											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-110V AC (for 30KW and above)	1											
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1											
33	**DW**	**220V DC SOLENOID VALVE FEEDER SHALL COMPRISE OF:**												
		DOUBLE POLE 250V DC ISOLATING MCCB	1											
		220V DC POWER CONTACTOR	1											
		AUXILIARY CONTACTOR	1											
		NEUTRAL LINK	1											
		DIODE WITH PEAK INVERSE VOLTAGE OF 440V	1											
		COUPLING RELAY	1											
		Control fuse	2											
		Control fuse base	2											
		INDICATING LAMP	2											
		OVERLOAD ALARM TO DDCMIS	1											
		SHUNT WITH AMMETER along with Selector Switch	1											
34(A)	DN1	**BIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW**												
		(TP)MPCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	2											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		MOUNTING Kit	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CONTROL FUSE	4											
		Control fuse base	4											
		NEUTRAL LINK	1											
		AUXILIARY CONTACTOR	2											
		NO. OF TERMINALS (240V AC/24V DC)	60											
		INTREPOSING RELAY	3											
		SHORT CIRCUIT PROTECTION	1											

		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
34(B)	DN21	**BIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW**												
		(TP)MCCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	2											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		MOUNTING Kit	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CONTROL FUSE	4											
		Control fuse base	4											
		NEUTRAL LINK	1											
		AUXILIARY CONTACTOR	2											
		NO. OF TERMINALS (240V AC/24V DC)	60											
		INTREPOSING RELAY	3											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1											
		AMMETER SELECTOR SWITCH	1											
		CURRENT TRANSDUCER (AC),4-20mA, DUAL O/P,AUX.-110V AC	1											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-110V AC (for 30KW and above)	1											
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1											
35	K1	**UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW CONTROLLED FROM MCC SHALL COMPRISE OF:**												
		(TP)MPCB	1											
		AUX. CONTACT FOR MPCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1											
		MOUNTING Kit	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CONTROL FUSE	1											
		CONTROL FUSE BASE	1											
		NEUTRAL LINK	1											
		NO. OF TERMINALS	30											
		SHORT CIRCUIT PROTECTION												
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
36(A)	K11	**UNIDIRECTIONAL MOTOR FEEDER RATED FROM 18.5KW to 90KW CONTROLLED FROM MCC SHALL COMPRISE OF:**												
		(TP)MCCB	1											
		AUX. CONTACT FOR MCCB (1NO+1NC)	1											
		TRIPLE POLE POWER CONTACTOR	1											
		THERMAL O/L RELAY OF SUITABLE RANGE with SINGLE PHASE PREVENTER	1											
		THERMAL O/L RELAY RESET PUSH BUTTON	1											
		INDICATING LAMP	3											
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1											
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1											
		AMMETER SELECTOR SWITCH	1											
		CONTROL FUSE	1											
		CONTROL FUSE base	1											
		NEUTRAL LINK	1											
		NO. OF TERMINALS	50											
		Single Phase switch for motor Space Heater	1											
		SHORT CIRCUIT PROTECTION	1											
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1											
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1											
		LOCKABLE FLUSH MOUNTING SWITCH	1											
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-110V AC (for 30KW and above)	1											
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1											
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1											

					Annexure-D								
SLNO	Description	UNIT	QTY.	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
7	PMCC (1DF - 4000A, 2DF - 4000A, 0DE - 2500A)												
7.1	Sliding Main power contact (Fixed and moving) Complete assembly (of each make, type and rating)	sets	2 sets of each type make and rating for 4000A PMCCs, 2 sets of each type make and rating for 2500A PMCC										
7.2	Auxiliary contact assembly of breaker												
a.	Test position (of each type)	sets	3 sets of each type make and rating for 4000A PMCCs, 3 sets of each type make and rating for 2500A PMCC										
b.	Service position (of each type)	sets	3 sets of each type make and rating for 4000A PMCCs, 3 sets of each type make and rating for 2500A PMCC										
7.3	Closing and tripping coil (of each type)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC										
7.4	Spring charging motor (of each type)	nos.	2 nos of each type make and rating for 4000A PMCCs, 2 nos of each type make and rating for 2500A PMCC										
7.5	Arc chute for CBs (of each type)	nos.	5 nos of each type make and rating for 4000A PMCCs, 5 nos of each type make and rating for 2500A PMCC										
7.6	Arching contacts (for fixed) (of each rating)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC										
7.7	Arching contacts (for moving) (of each rating)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC										
7.8	Main bus bar supporting insulators (of each type)	nos.	10 nos of each type make and rating for 4000A PMCCs, 2 nos of each type make and rating for 2500A PMCC										
7.9	Dropper bus bar supporting insulators (of each type)	nos.	5 nos of each type make and rating for 4000A PMCCs, 5 nosts of each type make and rating for 2500A PMCC										
7.10	CTs	nos.	3 Nos of all possible ratings and ratios for 4000A PMCCs 3 Nos of all possible ratings to be repeated for 2500A PMCC										
7.11	PTs	nos.	3 Nos of all possible ratings and ratios for 4000A PMCCs 3 Nos of all possible ratings to be repeated for 2500A PMCC										
7.12	Meters												
a.	Voltmeter (of each type)	nos.	2 Nos of each types for 4000A PMCCs 2 Nos of all each type to be repeated for 2500A PMCC										
b.	Ammeter (of each type per board)	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs										
7.14	Auxiliary relays (of each type per board) and shall also include Earth Leakage, OV relay and UV relays if provided in board	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs										
7.15	Interposing relays (of each type)	nos.	2 Nos of each types for 4000A PMCCs 2 Nos of all each type to be repeated for 2500A PMCC										
7.16	Check synchronizing relay	nos.	1 No for 4000A PMCCs 1 No for 2500A PMCC										
7.17	MCB (of each rating)	no.	1 No of all possible ratings for 4000A PMCCs 1 No of all possible ratings to be repeated for 2500A PMCC										
7.18	Timers (of each type per board)	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs										
7.19	Misc. items												
a.	Push button with contact element (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC										
b.	Selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC										
c.	Voltmeter selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC										
d.	Ammeter selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC										
e.	Local-remote selector switch (of each type)	nos.	3 Nos of each type for 4000A PMCCs 3 Nos of each type to be repeated for 2500A PMCC										
f.	Indicating lamp of LED (LVGP type)	nos.	10 Nos of each type and colour for 4000A PMCCs 10 Nos of each type and colour to be repeated for 2500A PMCC										
g.	Terminal blocks	nos	10 Nos of each type for 4000A PMCCs 10 Nos of each type to be repeated for 2500A PMCC										
h.	Breaker Test / Service Limit switch	sets	5 sets of each type make and rating for 4000A PMCCs, 5 sets of each type make and rating for 2500A PMCC										
i.	Power and control circuit fuses (of each type) & Neutral links	Nos.	10 Nos of each type and rating for 4000A PMCCs 10 Nos of each type and rating to be repeated for 2500A PMCC										
j.	Control Transformer (of each rating)	no.	1 No of each rating for 4000A PMCCs 1 No of each rating to be repeated for 2500A PMCC										
7.2	Electronic overload relays with single phase preventors (of each type)	no.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC										
7.23	Phase sequence meter	nos.	2 Nos for 4000A PMCCs 2 Nos for 2500A PMCC										

SLNO	Description	UNIT	QTY.	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
7.24	MPCB (of each type and rating)	nos.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC										
7.25	MCCB (of each type and rating)	nos.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC										
8	**MCC (0DG - 800A, 0TA, 0SB - 630A, 0SA - 400A, 0SC - 2000A**												
8.1	Bus bar support insulators (of each type)	nos.	10 nos of each type shall be repeated for 800A, 630A, 400A, 2000A. Totally 40 quantities										
8.2	Current transformers (of each type & rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.3	Potential transformer 415/110V	Nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.4	Male contact of ACB (main and aux.)	sets	1 set of each type and rating for 800A, 1 set of each type and rating shall be repeated for 630A, 1 set of each type and rating shall be repeated for 400A, 1 set of each type and rating shall be repeated for 2000A										
8.5	Female contact of ACB (main and aux.)	sets	1 set of each type and rating for 800A, 1 set of each type and rating shall be repeated for 630A, 1 set of each type and rating shall be repeated for 400A, 1 set of each type and rating shall be repeated for 2000A										
8.6	Limit switch of ACB	nos.	3 Nos of each type and rating for 800A, 3 Nos of each type and rating shall be repeated for 630A, 3 Nos of each type and rating shall be repeated for 400A, 3 Nos of each type and rating shall be repeated for 2000A										
8.7	Spring charging motor of ACB	nos.	3 Nos of each type and rating for 800A, 3 Nos of each type and rating shall be repeated for 630A, 3 Nos of each type and rating shall be repeated for 400A, 3 Nos of each type and rating shall be repeated for 2000A										
8.8	Closing coil of ACB	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A										
8.9	Tripping coil of ACB	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A										
8.1	Breaker control switch	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A										
8.12	Electronic overload relays with single phase preventors (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.13	Auxiliary relays (of each type per board) and shall also include Earth Leakage, OV relay and UV relays if provided in board	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A										
8.14	Indicating Lamp assembly (LED LVGP type) (of each type & colour)	nos.	10 Nos of each type and colour for 800A, 10 Nos of each type and colour shall be repeated for 630A, 10 Nos of each type and colour shall be repeated for 400A, 10 Nos of each type and colour shall be repeated for 2000A										
8.15	Phase sequence meter	nos.	2 nos for 800A, 630A, 400A, 2000A (totally 8)										
8.16	MPCB (of each type and rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										

SLNO	Description	UNIT	QTY.	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
8.17	MCCB (of each type and rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.18	Single phase control transformer (415/110V) (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.19	Interposing relay (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.2	Push button with contact element (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
8.21	Meters (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A										
9	**ACDB/PDB/LDB/SLDB/Auxiliary PDB/Distribution Panels (To be repeated for each type & rating) 0FA - 400A, (MLDB & WDB)**												
9.1	Bus bar support insulators (of each type)	nos.	3 Nos for all possible types and ratings for 0FA, 3 Nos for all possible types and ratings for the other DBs.										
9.2	MCCB / SFU (of each rating)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs										
9.3	MCB (of each rating)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs										
9.4	Control switch - please include all possible types including ammeter selector switches, voltmeter selector switches, Local remote selector switches, etc (of each type)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs										

ANNEXURE-E

COMISSIONING SPARE

SL NO	DESCRIPTION	UNIT	QUANTITY	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	**Factory built assemblies (PCC/MCC/DB)**												
1.1	Busbar supports (Horizontal)	1 set of 3 ph	1										
1.2	Primary isolating contacts (Bus side) of each rating	1 set of 3 ph											
a)	100A		1										
b)	**250A**		1										
c)	400A		1										
1.3	Primary isolating contacts (Load side) of each rating	1 set of 3 ph											
a)	100A		1										
b)	**250A**		1										
c)	400A		1										
1.4	Secondary isolating contacts of each rating	1 set of 3 ph											
a)	100A		1										
b)	**250A**		1										
c)	400A		1										
1.5	Gaskets (each size)	Meter	10										
1.6	Fixed terminal (one way)	Nos	20										
1.7	Shrouds (for outgoing modules)												
	300mm	Nos	1										
	500mm	Nos	1										
	700mm	Nos	1										
	1000mm	Nos	1										
	2000mm	Nos	1										
1.8	Wire (for secondary wiring)												
	2.5mm2	Meter	100										
	1.5mm2	Meter	100										
1.9	Lugs (for secondary wiring)	Nos	100										
2	**Air circuit breaker (for each rating)**												
2.1	Shunt trip coil	Nos	5										
2.2	Spring charging motor (1 no for each rating)	Nos	1										
2.3	Closing coil	Nos	5										
2.4	Auxiliary switch	Nos	1										
3	**Isolating switch**												
3.1	Main contact kiot for each rating	1 set of 3 poles	1										
4	**Power Contactors**												
4.1	contactor coil of each rating	Nos	1										
4.2	contactor kit (main) for each rating	1 set of 3 poles	1										
5	**Auxiliary conatctors**												
5.1	Complete unit with 2NO+2NC contacts (1 no of each rating/ type)	Nos	1										
5.2	contactor coils												
a.	AC for each rating	set	1										
b.	DC for each rating	set	1										
6	**HRC fuse**												
6.1	Fuse base (each rating)	Nos	1										
6.2	Fuse link												
a.	Upto 40A (assorted ratings)	Nos	10										
b.	63A to 200A (assorted ratings)	Nos	10										
c.	250A to 400A (assorted ratings)	Nos	5										
7	**Push Buttons**												
7.1	Actuator contacts	Nos	5										
7.2	Element	Nos	5										
8	**Indicating Lamps**												
8.1	Complete unit	Nos	10										
8.2	Lens (assorted)	Nos	10										
9	**Others**												
9.1	Selector & control switch (each type)	Nos	1										
	AC Voltmeter (0-500V)	Nos	1										
	DC Voltmeter (0-300V)	Nos	1										
	TOTAL												

ANNEXURE-F

LIST OF TOOLS & TACKLES

S.No.	ITEM / COMPONENT	UNIT	QUANTITY	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	ACB RACKING HANDLE	Nos	20										
2	MODULE RACKING HANDLE	Nos	20										
3	FUSE PULLERS	Nos	15										
4	TROLLEY FOR ACB HANDLING	Nos	3										
5	TEST CABINET WITH COUPLING CABLES FOR TESTING THE BREAKER IN DRAWOUT	Nos	2										
	TOTAL												

ANNEXURE-G

COMMISSIONING CHARGES FOR NUMERICAL RELAYS AT SITE

SL.NO.	DETAILS	QUANTITY	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	1 VISITS										
2	LUMP SUM ALL INCLUSIVE PER NUMERICAL RELAY COMMISSIONING CHARGES	60 NOS										
TOTAL												

NOTES:

1) AMOUNT PAYABLE FOR SERVICE ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (PER NUMERICAL RELAY COMMISSIONING CHARGES AS PER SL. NO. 2 ABOVE X NO. OF RELAYS) (TO BE CERTIFIED BY BHEL SITE)

ANNEXURE-H

SITE MODIFICATION CHARGES

SL.NO.	DETAILS	QUANTITY	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SKILLED TECHNICIAN (EXCEPT DAILY CHARGES)	1 VISITS										
2	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SKILLED TECHNICIAN	4 DAYS										
3	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	1 VISITS										
4	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SERVICE ENGINEER	4 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)

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
1	**INCOMING FEEDER UNIT**											
a)	ACB Incomer to PCC/PMCC from Trafo. - Module Type DAET (I/C)											
	630A											
	800A											
	1000A											
	1600A											
	2000A											
	2500A											
	3200A											
	3500A											
	4000A											
b)	ACB Incomer to MCC - Module Type DAE/ DAEN/ AE (I/C)											
	630A											
	800A											
	1000A											
	1600A											
	2000A											
	2500A											
	3200A											
	4000A											
c)	MCCB (NON MOTORIZED) Incomer for MCC / ACDB – Module Type EM3 (I/C)											
	100A – Fixed Type											
	125A – Fixed Type											
	200A – Fixed Type											
	250A – Fixed Type											
	400A – Fixed Type											
	630A – Fixed Type											
	100A – Drawout Type											
	125A – Drawout Type											
	200A – Drawout Type											
	250A – Drawout Type											
	400A – Drawout Type											
	630A – Drawout Type											
d)	MCCB (NON MOTORIZED) Incomer for MCC / ACDB – Module Type E3 (I/C)											
	Upto 100A – Fixed Type											
	Upto 100A – Drawout Type											
e)	220V DCDB Incomer from charger - Module type CH (I/C)											
	150A – CH Fixed Type											
	200A – CH Fixed Type											
	400A – CH Fixed Type											
	630A – CH Fixed Type											
	800A – CH Fixed Type											
	1250A – CH Fixed Type											
	150A – CH Drawout Type											
	200A – CH Drawout Type											
	400A – CH Drawout Type											
	630A – CH Drawout Type											
	800A – CH Drawout Type											
	1250A – CH Drawout Type											
f)	220V DCDB Incomer from battery - Module type DB (I/C)											
	150A – DB Fixed Type											
	200A – DB Fixed Type											
	400A – DB Fixed Type											
	630A – DB Fixed Type											
	800A – DB Fixed Type											
	1250A – DB Fixed Type											
	150A – DB Drawout Type											
	200A – DB Drawout Type											
	400A – DB Drawout Type											
	630A – DB Drawout Type											
	800A – DB Drawout Type											
	1250A – DB Drawout Type											
g)	220V DC Fuse DB Incomer from DCDB - Module type H2											
	32A											
	50A											
	63A											
h)	AC MCCB DB Incomer– Module Type H3											
	32A											
	63A											
	125A											
i)	ACB Incomer to Emergency Board - Module Type DAEG/ DAEGN (I/C)											
	1600A											
2	**BUSCOUPLER UNIT**											
a)	ACB Buscoupler to PCC/PMCC/MCC from Trafo. - Module Type DAET/ DAE (B/C)											
	630A											
	800A											
	1000A											
	1600A											
	2000A											
	2500A											
	3200A											
	4000A											
b)	MCCB (MOTORIZED) Buscoupler for MCC / ACDB – Module Type EM3 (B/C)											
	Upto 63A – Fixed Type											
	125A – Fixed Type											
	160A – Fixed Type											
	200A – Fixed Type											
	250A – Fixed Type											
	400A – Fixed Type											
	630A – Fixed Type											
	Upto 63A – Drawout Type											
	125A – Drawout Type											
	160A – Drawout Type											
	200A – Drawout Type											
	250A – Drawout Type											
	400A – Drawout Type											
	630A – Drawout Type											
c)	220V DCDB Buscoupler - Module Type - DC											
	150A – DC Fixed Type											
	200A – DC Fixed Type											
	400A – DC Fixed Type											
	630A – DC Fixed Type											
	800A – DC Fixed Type											
	1250A – DC Fixed Type											
	150A – DC Drawout Type											
	200A – DC Drawout Type											
	400A – DC Drawout Type											
	630A – DC Drawout Type											
	800A – DC Drawout Type											
	1250A – DC Drawout Type											
d)	220V DCDB TIE - Module Type - HD											
	150A – HD Fixed Type											
	200A – HD Fixed Type											
	400A – HD Fixed Type											
	630A – HD Fixed Type											
	800A – HD Fixed Type											
	1250A – HD Fixed Type											
	150A – HD Drawout Type											
	200A – HD Drawout Type											
	400A – HD Drawout Type											
	630A – HD Drawout Type											
	800A – HD Drawout Type											
	1250A – HD Drawout Type											
e)	ACB BUSCOUPLER to Emergency Board - Module Type DAEG (B/C)											
	1600A											
3	**Outgoing ACB supply feeder - Module Type DAE/DAE-TIE (O/G)**											
	630A											
	800A											
	1000A											
	1600A											
	2000A											
	2500A											
	3200A											
4	**Outgoing ACB motor feeder - Module Type DM/PM (controlled from DDCMIS/BCU)**											
	90.1- 200KW											
5.1	**DOL Motor Starter - Unidirectional Drive(MPCB/MCCB CONTROLLED) - Drawout Type**											
a)	Module Type K2 (Controlled from LPBS)(MPCB WITH CONTACTORS)											
	Upto 5.5KW											
	5.6 - 7.0KW											
	7.1 - 13KW											
	13.1 - 18.5KW											
b)	Module Type K21 (Controlled from LPBS)(MCCB WITH CONTACTORS)											
	18.5 - 24KW											
	24.1 - 29.9KW											
	30.0 - 37.0KW											
	37.1 - 40KW											
	40.1 - 50.0KW											
	50.1 - 75KW											
	75.1 - 90KW											

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
	90.1 - 110KW											
c)	Module Type K3 (Controlled from LCP)(MPCB WITH CONTACTORS)											
	Upto 5.5KW											
	5.6 - 7.0KW											
	7.1 - 13KW											
	13.1 - 18.5KW											
d)	Module Type K31 (Controlled from LCP)(MCCB WITH CONTACTORS)											
	18.5 - 24KW											
	24.1 - 29.9KW											
	30.0 - 37.0KW											
	37.1 - 40KW											
	40.1 - 50.0KW											
	50.1 - 75KW											
	75.1 - 90KW											
	90.1 - 110KW											
e)	Module Type DK2/PK2/AK2 (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)											
	Upto 5.5KW											
	5.6 - 7.0KW											
	7.1 - 13KW											
	13.1 - 18.5KW											
f)	Module Type DK21/PK21/AK21 (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)											
	18.5 - 24KW											
	24.1 – 29.9KW											
	30.0 - 37.0KW											
	37.1 - 40KW											
	40.1 - 50.0KW											
	50.1 - 75KW											
	75.1 - 90KW											
	90.1 - 110KW											
g)	Module Type DK2E/PK2E/AK2E (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)											
	Upto 5.5KW											
	5.6 - 7.0KW											
	7.1 - 13KW											
	13.1 - 18.5KW											
h)	Module Type DK21E/PK21E/AK21E (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)											
	18.5 - 24KW											
	24.1 – 29.9KW											
	30.0 - 37.0KW											
	37.1 - 40KW											
	40.1 - 49.9KW											
	50 - 75KW											
	75.1 - 90KW											
	90.1 - 110KW											
6.1	**RDOL Motor Starter – Bidirectional Drive(MPCB/MCCB CONTROLLED) Drawout Type**											
a)	Module Type DN1/ PN1/ AN1 (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)											
	Upto 5.5KW											
	5.6 - 7.0KW											
	7.1 - 13KW											
	13.1 - 18.5KW											
a)	Module Type DN21/ PN21/ AN21 (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)											
	18.5 - 24KW											
	24.1 – 29.9KW											
	30.0 - 37.0KW											
	37.1 - 40KW											
	40.1 - 49.9KW											
	50 - 75KW											
	75.1 - 90KW											
7	**Outgoing MCCB/ SFU (NON MOTORIZED) controlled feeders**											
a)	Outgoing SFU controlled supply feeder - Module Type E3 (O/G)											
	upto 15.9A - Fixed type											
	16A - Fixed type											
	25A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	100A - Fixed type											
	125A - Fixed type											
	160A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	600A - Fixed type											
	upto 15.9A - Drawout type											
	16A - Drawout type											
	25A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
	100A - Drawout type											
	125A - Drawout type											
	160A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	600A - Drawout type											
b)	Outgoing MCCB controlled supply feeder - Module Type E3 (O/G)											
	16A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	125A - Fixed type											
	160A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	600A - Fixed type											
	16A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
	125A - Drawout type											
	160A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	600A - Drawout type											
c)	Double pole SFU controlled 1-ph feeder - E1 (O/G)											
	10A - Fixed type											
	16A - Fixed type											
	25A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	10A - Drawout type											
	16A - Drawout type											
	25A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
d)	Double pole MCCB controlled 1-ph feeder - E1 (O/G)											
	16A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	125A - Fixed type											
	16A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
	125A - Drawout type											
e)	1-Ph SFU controlled outgoing contactor feeder (EA1)											
	10A - Fixed type											
	16A - Fixed type											
	25A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	10A - Drawout type											
	16A - Drawout type											
	25A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
f)	1-Ph MCCB controlled outgoing contactor feeder (EA1)											
	16A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	16A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
g)	3-Ph SFU controlled outgoing contactor feeder (EA3)											
	10A - Fixed type											
	16A - Fixed type											
	25A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	125A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	600A - Fixed type											
	10A - Drawout type											
	16A - Drawout type											
	25A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											

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	125A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	600A - Drawout type											
h)	3-Ph MCCB controlled outgoing contactor feeder (EA3)											
	16A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	125A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	600A - Fixed type											
	16A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
	125A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	600A - Drawout type											
i)	3-Ph SFU controlled Contactor Changeover Between Two In Coming Supplies Module Type CC											
	16A - Fixed type											
	32A - Fixed type											
	63A - Fixed type											
	125A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	600A - Fixed type											
	16A - Drawout type											
	32A - Drawout type											
	63A - Drawout type											
	125A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	600A - Drawout type											
8	**1-Ph MCB controlled outgoing feeder (H1) from AC MCCB DB**											
	10A											
	16A											
9	**Outgoing MCCB feeders**											
a)	220V DC Outgoing MCCB feeder (X)											
	2A - Fixed type											
	4A - Fixed type											
	6A - Fixed type											
	10A - Fixed type											
	16A - Fixed type											
	25A - Fixed type											
	32A - Fixed type											
	50A - Fixed type											
	63A - Fixed type											
	100A - Fixed type											
	125A - Fixed type											
	200A - Fixed type											
	250A - Fixed type											
	400A - Fixed type											
	500A - Fixed type											
	630A - Fixed type											
	2A - Drawout type											
	4A - Drawout type											
	6A - Drawout type											
	10A - Drawout type											
	16A - Drawout type											
	25A - Drawout type											
	32A - Drawout type											
	50A - Drawout type											
	63A - Drawout type											
	100A - Drawout type											
	125A - Drawout type											
	200A - Drawout type											
	250A - Drawout type											
	400A - Drawout type											
	500A - Drawout type											
	630A - Drawout type											
10	**Common Auxiliary Module**											
a)	PT module											
i	Bus PT module for PCC/PMCC-G1 Type											
ii	Bus PT module for Emergency MCC-G2 Type											
iii	Bus PT DCDB-S Type											
iv	Bus PT module for MCC/ACDB-VM Type											
b)	Space heater and Power Socket - TT											
c.1)	110V AC control supply module – Type CS (consisting of 415/110V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
c.2)	240 V AC control supply module – type CS (consisting of 415/240V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
d.1)	110V AC control supply module – Type CS-A (consisting of 415/110V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
d.2)	240 V AC control supply module – type CS-A (consisting of 415/240V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
e)	240V AC motor space heater module											
f)	220V DC supply module (for receiving 220V DC supply)											
g)	24 V winding heating module											
h)	Alarm module											
i)	Test supply module											
J.1)	240 V AC Panel Space hetaing supply module – type SH (consisting of 415/240V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
J.2)	240 V AC Panel Space hetaing supply module – type SH-A (consisting of 415/240V control Trafo.)											
	1KVA											
	2KVA											
	2.5KVA											
	3KVA											
	5KVA											
	7.5KVA											
	10KVA											
11	**Empty Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar**											
a)	MCC Panel (Double Front Drawout Type)											
	250 / 250A											
	400 / 400A											
	630 / 630A											
	800 / 630A											
	1000 / 630A											
	1600 / 630A											
	2000 / 630A											
	2500 / 630A											

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	3000 / 630A											
	4000 / 630A											
b)	MCC Panel (Double Front Fixed Type)											
	250 / 250A											
	400 / 400A											
	630 / 630A											
	800 / 630A											
	1000 / 630A											
	1600 / 630A											
	2000 / 630A											
	2500 / 630A											
	3000 / 630A											
	4000 / 630A											
c)	220V DCDB Panel (Double Front Fixed type)											
	UPTO 630A (with 630A VBB)											
	1000A (with 630A VBB)											
	1600A (with 630A VBB)											
d)	220V DCDB Panel (Double Front Drawout type)											
	UPTO 630A (with 630A VBB)											
	1000A (with 630A VBB)											
	1600A (with 630A VBB)											
12	**Empty Panel With Horizontal & Vertical Busbar, Support & Auxiliary Busbar**											
a)	PCC Panel (Single Front Drawout Type)											
	1600 / 1600A											
	2000 / 2000A											
	2500 / 2500A											
	3000 / 3000A											
	4000 / 4000A											
b)	MCC Panel (Single Front Drawout Type)											
	250 / 250A											
	400 / 400A											
	630 / 630A											
	800 / 630A											
	1000 / 630A											
	1600 / 630A											
	2000 / 630A											
	2500 / 630A											
	3000 / 630A											
	4000 / 630A											
c)	MCC Panel (Single Front Fixed Type)											
	250 / 250A											
	400 / 400A											
	630 / 630A											
	800 / 630A											
	1000 / 630A											
	1600 / 630A											
	2000 / 630A											
	2500 / 630A											
	3000 / 630A											
	4000 / 630A											
d)	220V DCDB Panel (Single Front Fixed Type)											
	UPTO 630A (with 630A VBB)											
	1000A (with 630A VBB)											
	1600A (with 630A VBB)											
e)	220V DCDB Panel (Single Front Fixed Type)											
	UPTO 630A (with 630A VBB)											
	1000A (with 630A VBB)											
	1600A (with 630A VBB)											
13	**ACB Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar**											
	630 / 630A											
	800 / 630A											
	800 / 800A											
	1000 / 630A											
	1000 / 800A											
	1000 / 1000A											
	1600 / 630A											
	1600 / 800A											
	1600 / 1000A											
	1600 / 1600A											
	2000 / 630A											
	2000 / 800A											
	2000 / 1000A											
	2000 / 1600A											
	2000 / 2000A											
	2500 / 630A											
	2500 / 800A											
	2500 / 1000A											
	2500 / 1600A											
	2500 / 2000A											
	2500 / 2500A											
	3000 / 630A											
	3000 / 800A											
	3000 / 1000A											
	3000 / 1600A											
	3000 / 2000A											
	3000 / 2500A											
	3000 / 3000A											
	4000 / 630A											
	4000 / 800A											
	4000 / 1000A											
	4000 / 1600A											
	4000 / 2000A											
	4000 / 2500A											
	4000 / 3000A											
	4000 / 4000A											
14	**Dummy Panel**											
	UPTO 630A											
	800A											
	1000A											
	1600A											
	2000A											
	2500A											
	3000A											
	4000A											
15	**Unit Prices For Circuit Components**											
a)	Air Circuit Breaker without releases											
	630A MDO											
	800A MDO											
	1000A MDO											
	630A ACB, 3P, EDO, AC											
	800A ACB, 3P, EDO, AC											
	1000A ACB, 3P, EDO, AC											
	1250A ACB, 3P, EDO, AC											
	1600A ACB, 3P, EDO, AC											
	2000A ACB, 3P, EDO, AC											
	2500A ACB, 3P, EDO, AC											
	3200A ACB, 3P, EDO, AC											
	4000A ACB, 3P, EDO, AC											
	630A ACB, 4P, EDO, AC											
	800A ACB, 4P, EDO, AC											
	1000A ACB, 4P, EDO, AC											
	1250A ACB, 4P, EDO, AC											
	1600A ACB, 4P, EDO, AC											
	2000A ACB, 4P, EDO, AC											
	2500A ACB, 4P, EDO, AC											
	3200A ACB, 4P, EDO, AC											
	4000A ACB, 4P, EDO, AC											
	1250A ACB, 4P, MDO, DC											
b)	MCCB, 2NO+2NC AUX, FSC											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											
	150A											
	185A											
	265A											
	315A											
	400A											
	630A											
c)	MCCB, 2NO+2NC AUX, ASC											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											

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	150A											
	185A											
	265A											
	315A											
	400A											
	630A											
d)	MPCB 2NO+2NC											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											
	150A											
	185A											
	265A											
	315A											
	400A											
	630A											
e)	MCCB with LSIG release											
	200A											
	250A											
	300A											
	350A											
	400A											
	630A											
	MCCB - Motorized with LSIG release											
	200A											
	250A											
	300A											
	350A											
	400A											
	630A											
f)	POWER FUSE LINK FOR SFU (AC) - TPN											
	Upto 16A											
	25A											
	32A											
	63A											
	125A											
	250A											
	400A											
	630A											
g)	POWER FUSE LINK FOR SFU (DC) - DP											
	Upto 16A											
	25A											
	40A											
	50A											
	60A											
	80A											
	100A											
	200A											
	300A											
	400A											
	630A											
h)	SFU WITHOUT POWER FUSE LINK (AC) - TPN											
	Upto 16A											
	25A											
	32A											
	63A											
	125A											
	250A											
	400A											
	630A											
i)	SFU WITHOUT POWER FUSE LINK (DC) - DP											
	Upto 16A											
	25A											
	40A											
	50A											
	60A											
	80A											
	100A											
	200A											
	300A											
	400A											
	630A											
j)	HRC Fuse Links (Offset tag Type)											
	Upto 10A											
	16A											
	25A											
	32A											
	50A											
	63A											
k)	HRC Fuse DIN Type (Blade Contact)											
	Upto 10A											
	16A											
	20A											
	32A											
	36A											
	50A											
	63A											
	80A											
	100A											
	125A											
	160A											
	200A											
	250A											
	315A											
	400A											
	Control Fuse Link											
l)	Power contactor (AC)											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											
	150A											
	185A											
	265A											
	315A											
	400A											
m)	Power contactor (DC)											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											
	150A											
	185A											
	265A											
	400A											
n)	Fuse Base											
	UPTO 20A											
	32A											
	50/63A											
	100A											
	250A											
	400A											
	630A											
o)	Auxiliary contactor AC/DC											
i)	AC Aux. contactor											
	2NO + 2NC											
	3NO + 3NC											
	4NO + 4NC											
	6NO + 6NC											
ii)	DC Aux. contactor											
	2NO + 2NC											
	3NO + 3NC											
	4NO + 4NC											
	6NO + 6NC											
p)	Protection Relay											
	VAGM 23											
	CTU 12											
	CTU 32											
	VTT 11											
	VAG 11											
	VAA 11											

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	VAJHM 13											
	VAJHM 23											
	CDGM-12											
	CAG 12											
	CAG 34											
	CCUM 21											
	CDG 11											
	CDG 31											
	CDG 61											
	VDG 14											
	CDV 62											
	CAG 14											
	VAX 31											
	CAG 37											
	CAEM-21											
	VAG-21											
	VAJC-11											
	CTMM-501											
	MOTPRO											
	VAA21											
	VTT12											
	VTIG											
	VTU21											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, REF PROTECTION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION, 50, 50N, 51, 51N, 27, 98, 86, 25, 95, 30A, 30B, 64R											
	SEF NUMERICAL RELAY											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B, DG PROTECTION (Like Neutral Under-voltage-27N, Power Direction / Reverse Power (Islanding)-32, Negative Phase Sequence Over-current (Phase unbalance, reverse phase sequence) -46, , Negative Sequence Voltage -47, Ground Over-voltage trip or ground over-current trip-51G, Instantaneous Over-voltage trip (ferro-resonance)-59, Over-voltage trip-59T, Neutral over-voltage-59N, Over/Under Frequency trip-81O/ 81U etc.)											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & FUSE FAILURE, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 95, 30A, 30B											
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION-95, LOGIC, METERING FUNCTION & FUSE FAILURE-98, OVER LOAD PROTECTION, LOCKED ROTOR PROTECTION-14, RESTART INHIBIT PROTECTION-49, NEGATIVE SEQUENCE PROTECTION-46, 50, 50N, 51, 51N, 27, 86, 30A, 30B											
	Communicable type Numerical relay for O/C, E/F, TC Supervision on IEC-61850 protocol											
	Communicable type Numerical relay for O/C, E/F, Check Synchronization, TC Supervision on IEC-61850 protocol											
	Communicable type Numerical relay for Voltage control O/C, 3Phase O/C, Reverse power, Differential, Neutral Displacement, E/F, U/V, O/V protection, Check Synchronization, TC Supervision on IEC-61850 protocol											
	Communicable type Numerical relay for Under voltage, Over voltage etc. on IEC-61850 protocol											
	Communicable type Numerical relay for E/F protection for DCDB on IEC-61850 protocol											
	Communicable type Numerical relay for composite motor protection including TC Supervision on IEC-61850 protocol											
	Communicable type Numerical relay for Neutral Displacement on IEC-61850 protocol											
	Communicable type Numerical relay for O/C, E/F, TC Supervision on Modbus protocol											
	Communicable type Numerical relay for O/C, E/F, Check Synchronization, TC Supervision on Modbus protocol											
	Communicable type Numerical relay for Voltage control O/C, 3Phase O/C, Reverse power, Differential, Neutral Displacement, E/F, U/V, O/V protection, Check Synchronization, TC Supervision on Modbus protocol											
	Communicable type Numerical relay for Under voltage, Over voltage etc. on Modbus protocol											
	Communicable type Numerical relay for E/F protection for DCDB on Modbus protocol											
	Communicable type Numerical relay for composite motor protection including TC Supervision on Modbus protocol											
	Communicable type Numerical relay for Neutral Displacement on Modbus protocol											
	Numerical Check synchronising Relay											
	Check synchronising Relay Type-SKE11 or better											
	Guard Relay											
	NUMERICAL RELAY Over current and Earth fault											
	BATTERY EARTH FAULT RELAY, 1-7mA, NOMINAL VOLTAGE-220V DC, 1DV, 2NO SIR, FLUSH											
	OVERLOAD RELAY, NOMINAL VOLTAGE-220V DC, O/V VLTAGE SETTING-110%, 1NNV, 1NO+1NC S/R											
	UNDER VOLTAGE RELAY, NOMINAL VOLTAGE-220V DC, U/V SETTING-80%, AUX.-240V AC, 1/2NH, 1NO+2NC S/R											
	JAMING RELAY - CAG17											
q)	Bimetal Thermal O/L Relays											
i)	Thermal O/L relay with SPP - OLR											
	Upto 5.5KW											
	5.6 to 11KW											
	11.1 to 22KW											
	22.1 to 45KW											
	45.1 to 75KW											
	75 to 110KW											
ii)	**Heavy Duty** Thermal O/L relay with SPP - OLR											
	Upto 5.5KW											
	5.6 to 11KW											
	11.1 to 22KW											
	22.1 to 45KW											
	45.1 to 75KW											
	75 to 110KW											
r)	Timer (DC)											
	ON DELAY TIMER, 0.5-5SEC., 220V DC, 2NO+2NC											
	ON DELAY TIMER, 1.0-10SEC. 220V DC, 2NO+2NC											
	240VAC MTR RESTART CONTROL TIMER (.2-60SECS)											
	240VAC ON DELAY TIMER(1-10SECNS)WITH 1NO											
	220VDC ON DELAY TIMER(.5-5SECS) WITH 1NO											
	220VDC ON DELAY TIMER(0.5-5SECS)WITH 3NO											
	220VDC ON DELAY TIMER(1-10SECS) WITH 3NO											
s)	Meter											
	AC ammeter (Digital)											
	AC ammeter (Analog) linear scale											
	AC ammeter (Analog) compressed scale											
	DC ammeter (Digital)											
	DC ammeter (Analog)											
	AC voltmeter (Digital)											
	DC voltmeter (Analog)											
	Wattmeter (3 Phase)											
	Wattmeter (1 Phase)											
	TVM meter											
	DIGITAL ENERGY METER											
	Frequency meter											
	Synchroscope											
	Differential Voltmeter											
	Differential Frequency meter											
	Multifunction digital Energy meter with RS485 Port (0.2 Acc. Class)											
	Multifunction digital Energy meter with RS485 Port (0.5 Acc. Class)											
	Multifunction digital Energy meter with RS485 Port (1.0 Acc. Class)											
t)	Single Phase Preventor Relay											
u)	MCB											
	6A, 4P 415V AC											
	6A DP, 240V AC											
	10A DP, 240V AC											
	16A DP, 240V AC											
	32A DP, 240V AC											
	6A DP, 110V AC											
	10A DP, 110V AC											
	16A DP, 110V AC											
	32A DP, 110V AC											
	16A DP, 220V DC											
	6A DP, 220V DC											
	6A DP, 240V AC											
	10A SP, 240V AC											
	16A SP, 240V AC											
	32A SP, 240V AC											
	6A SP, 110V AC											
	10A SP, 110V AC											
	16A SP, 110V AC											
	32A SP, 110V AC											
	16A SP, 220V DC											
	6A SP, 220V DC											
v)	SWITCH & PUSH BUTTON											
	BREAKER CONTROL SWITCH, 16A,220V DC, 2CLOSE+2TRIP											
	DC ISOLATING SWITCH 16A,220V DC, DP, BASE MTG.											
	16A,240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG											
	25A,240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG											

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
	16A,240V AC SELECTOR SWITCH 2WAY, 2POLE, FLUSH MTG											
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG,											
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG											
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG											
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG.											
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE											
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE											
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG.LOCKABLE TYPE											
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG., LOCKABLE TYPE											
	AMMETER SELECTOR SWITCH											
	VOLTMETER SELECTOR SWITCH											
	TOGGLE SWITCH 5A, 240V AC											
	AC SWITCH SPST-5A,240V AC											
	10A, 220V DC SWITCH											
	Door Limit switch											
	Ammeter selector switch											
	Voltmeter selector switch											
	Synchronisation selector switch											
	Trip selector switch											
	Push Button											
	2NO + 2NC Shrouded											
	1NO + 1NC Shrouded											
	2NO + 2NC Mushroom head stayput											
	2NO + 2NC Lockable type											
w)	Indicating Lamp Assembly (LED Type)											
	240V AC-GREEN											
	240V AC-RED											
	240V AC- AMBER											
	110V AC-GREEN											
	110V AC-RED											
	110V AC- AMBER											
	220V DC-WHITE											
	220V DC-RED											
	220V DC-GREEN											
	220V DC-BLUE											
	220V DC- AMBER											
	63.5V AC-RED											
	63.5V AC-YELLOW											
	63.5V AC-BLUE											
x)	CT											
i)	Metering CT											
	Upto 75/1A											
	100/1A											
	125/1A											
	150/1A											
	200/1A											
	250/1A											
	300/1A											
	400/1A											
	500/1A											
	630/1A											
	800/1A											
	1000/1A											
	1250/1A											
	1600/1A											
	2000/1A											
	2500/1A											
	3000/1A											
	4000/1A											
ii)	Protection CT (5P20)											
	Upto 75/1A											
	100/1A											
	125/1A											
	150/1A											
	200/1A											
	250/1A											
	300/1A											
	400/1A											
	500/1A											
	630/1A											
	800/1A											
	1000/1A											
	1250/1A											
	1600/1A											
	2000/1A											
	2500/1A											
	3000/1A											
	4000/1A											
	630/5A											
	800/5A											
	1000/5A											
	1250/5A											
	1600/5A											
	2000/5A											
	2500/5A											
	3000/5A											
	4000/5A											
iii)	PS Class CT											
	1600/1A											
	2500/1A											
	3000/1A											
	4000/1A											
	1600/5A											
	2500/5A											
	3000/5A											
	4000/5A											
y)	Voltage Transformer											
i)	415/√3 : 110/√3V, 1ph, 50VA											
ii)	415/√3 : 110/√3V, 1ph, 100VA											
iii)	415/√3 : 240/√3V, 1ph, 50VA											
iv)	415/√3 : 240/√3V, 1ph, 100VA											
z)	Toggle switch (16A)											
aa)	Secondary Isolating Contact Block											
ab)	Control Terminal (Fixed)											
ac)	Thermostat											
ad)	CONTROL TRANSFORMER											
	415/240V,CL-E, 80VA											
	415/240V,CL-E, 100VA											
	415/240V,CL-E, 150VA											
	415/240V,CL-E, 200VA											
	415/240V,CL-E, 500VA											
	415/240V,CL-E, 1 KVA											
	415/240V,CL-E, 2KVA											
	415/240V,CL-E, 2.5KVA											
	415/240V,CL-E, 3KVA											
	415/240V,CL-E, 5KVA											
	415/240V,CL-E, 10KVA											
	415/110V,CL-E, 50VA											
	415/110V,CL-E, 100VA											
	415/110V,CL-E, 150VA											
	415/110V,CL-E, 200VA											
	415/110V,CL-E, 500VA											
	415/110V,CL-E, 1 KVA											
	415/110V,CL-E, 2KVA											
	415/110V,CL-E, 2.5KVA											
	415/110V,CL-E, 3KVA											
	415/110V,CL-E, 5KVA											
	415/110V,CL-E, 10KVA											
ac)	4-20mA Dual o/p, Aux sup 220V DC, 1A, Current Transducer											
	4-20mA Dual o/p, Aux sup 240V AC, 1A, Current Transducer											
	4-20mA Dual o/p, Aux sup 110V AC, 1A, Current Transducer											
	4-20mA Dual o/p, Aux sup 220V DC, VoltageTransducer, PTR 415/110V											
	4-20mA Dual o/p, Aux sup 240V AC, VoltageTransducer, PTR 415/110V											
	4-20mA Dual o/p, Aux sup 110V AC, VoltageTransducer, PTR 415/110V											
	4-20mA Dual o/p, Aux sup 220V DC, FrequencyTransducer, PTR 415/110V											
	4-20mA Dual o/p, Aux sup 220V DC, Input 0-75mV DC, Current Transducer-DC											
	4-20mA Dual o/p, Aux sup 240V AC, Input Voltage 0-220V DC, Voltage Transducer-DC											
ad)	4-20mA Dual Output kW transducer											
ae)	4-20mA Dual Output kVA transducer											
af)	4-20mA Dual Output PF transducer											
ag)	4-20mA Dual Output Frequency transducer											
ah)	Interposing relay RE 302 or Eqvt with freewheeling diode & LED											
ai)	Laptop PC alongwith software & hardware											
aj)	3 PIN SOCKET - 5A, 110V AC, 3PIN											

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ak)	THERMOSTATE, DIAL TYPE											
am)	SPACE HEATER											
an)	CFL WITH HOLDER											
ao)	NEUTRAL LINK											
	20A FOR CONTROL CKT. & POWER CKT. UPTO 25A MCCB RATING											
	32A FOR 50A MCCB RATING											
	63A FOR 100A & 125A MCCB RATING											
	125A FOR 250A MCCB RATING											
	250A FOR 400A & 500A MCCB RATING											
ap)	CASTLE KEY INTERLOCK FOR MCCB - 3LOCK+2KEY											
aq)	MECHANICAL INTERLOCK FOR POWER CONTACTOR											
	16A											
	25A											
	32A											
	63A											
	80A											
	115A											
	150A											
	185A											
	265A											
	315A											
	400A											
ar)	AUX. CONTACTOR											
	2NO+2NC, CV-220V DC											
	4NO, CV-220V DC											
	2NO+2NC, CV-240V AC											
	3NO+1NC, CV-240V AC											
	2NO+2NC, CV-110V AC											
	3NO+1NC, CV-110V AC											
	1NO + 1NC 240V AC											
	1NO + 1NC 110V AC											
	1NO + 1NC 220V DC											
	1NO 240V AC											
	1NO 110V AC											
	1NO 220V DC											
as)	ISOLATING TRANSFORMER-15kVA											
	ISOLATING TRANSFORMER-20kVA											
	ISOLATING TRANSFORMER-25kVA											
	ISOLATING TRANSFORMER-30kVA											
16	**Foundation Frame**											
a)	MCC panel											
	upto 1600A (SF)											
	2500A (SF)											
	3000A (SF)											
	4000A (SF)											
	upto 1600A (DF)											
	2500A (DF)											
	3000A (DF)											
	4000A (DF)											
b)	220V DCDB panel											
	SF											
	DF											
c)	PCC / PMCC panel											
	upto 1600A											
	2500A											
	3000A											
	4000A											
17	**Connection from PMCC/MCC panel to PMCC/MCC panel**											
	250A											
	400A											
	630A											
	800A											
	1000A											
	1600A											
	2500A											
	3000A											
	4000A											
18	**Cable Glands & Lugs:**											
a)	**Single Compression Cable Glands for cable sizes:**											
	2C X 2.5 Sq. mm.											
	3C X 2.5 Sq. mm.											
	5C X 2.5 Sq. mm.											
	7C X 2.5 Sq. mm.											
	12C X 2.5 Sq. mm.											
	16C X 2.5 Sq. mm.											
	2C X 10 Sq. mm.											
	2C X 16 Sq. mm.											
	2C X 25 Sq. mm.											
	2C X 35 Sq. mm.											
	2C X 50 Sq. mm.											
	2C X 70 Sq. mm.											
	2C X 95 Sq. mm.											
	3C X 2.5 Sq. mm.											
	3C X 10 Sq. mm.											
	3C X 16 Sq. mm.											
	3C X 25 Sq. mm.											
	3C X 35 Sq. mm.											
	3C X 50 Sq. mm.											
	3C X 70 Sq. mm.											
	3C X 95 Sq. mm.											
	3C X 150 Sq. mm.											
	3C X 185 Sq. mm.											

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	Quoted / Not-quoted	Unit Ex-Works Price including P&F Charges	Total Ex-Works Price including P&F Charges	Freight %	Unit Freight Amount	Total Freight Amount	Total Ex-Works Price including P&F Charges + Freight Amount	GST %	GST Amount	FOR Destination
	3C X 240 Sq. mm.											
	3.5C X 25 Sq. mm.											
	3.5C X 50 Sq. mm.											
	3.5C X 70 Sq. mm.											
	3.5C X 300 Sq. mm.											
	3.5C X 240 Sq. mm.											
	3.5C X 185 Sq. mm.											
	3.5C X 95 Sq. mm.											
	4C X 16 Sq. mm.											
	4C X 35 Sq. mm.											
	1C X 400 Sq. mm.											
	1C X 630 Sq. mm.											
b)	**Double Compression Cable Glands for cable sizes:**											
	2C X 2.5 Sq. mm.											
	3C X 2.5 Sq. mm.											
	5C X 2.5 Sq. mm.											
	7C X 2.5 Sq. mm.											
	12C X 2.5 Sq. mm.											
	16C X 2.5 Sq. mm.											
	2C X 10 Sq. mm.											
	2C X 16 Sq. mm.											
	2C X 25 Sq. mm.											
	2C X 35 Sq. mm.											
	2C X 50 Sq. mm.											
	2C X 70 Sq. mm.											
	2C X 95 Sq. mm.											
	3C X 2.5 Sq. mm.											
	3C X 10 Sq. mm.											
	3C X 16 Sq. mm.											
	3C X 25 Sq. mm.											
	3C X 35 Sq. mm.											
	3C X 50 Sq. mm.											
	3C X 70 Sq. mm.											
	3C X 95 Sq. mm.											
	3C X 150 Sq. mm.											
	3C X 185 Sq. mm.											
	3C X 240 Sq. mm.											
	3.5C X 25 Sq. mm.											
	3.5C X 50 Sq. mm.											
	3.5C X 70 Sq. mm.											
	3.5C X 300 Sq. mm.											
	3.5C X 240 Sq. mm.											
	3.5C X 185 Sq. mm.											
	3.5C X 95 Sq. mm.											
	4C X 16 Sq. mm.											
	4C X 35 Sq. mm.											
	1C X 400 Sq. mm.											
	1C X 630 Sq. mm.											
c)	**Cable Lugs for sizes:**											
	2.5 Sq. mm.											
	10 Sq. mm.											
	16 Sq. mm.											
	25 Sq. mm.											
	35 Sq. mm.											
	50 Sq. mm.											
	70 Sq. mm.											
	95 Sq. mm.											
	120 Sq. mm.											
	150 Sq. mm.											
	185 Sq. mm.											

NLC TAMIL NADU POWER LIMITED (NTPL)

FGD FOR NTPL TUTICORIN THERMAL POWER PROJECT(2X500MW)

TECHNICAL SPECIFICATION FOR

LOW VOLTAGE SWITCHGEAR

BHEL DOCUMENT NO. : SBD-TS-CPBG-FGD-TUT, REV-01

BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION
BANGALORE – 560012

CONTENTS:

1. INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1) Signed and stamped copies of the following shall be furnished by all the bidders as technical offer:

   a) Signed copy of "Contents"

   b) Signed copy of "Instruction to Bidders"

   c) Signed copy of unpriced "PRICE FORMAT"

   d) Signed copy of Annexure-B1 to B11, C , D , E , F , G , H , I

   e) No. of Verticals considered for each switchboard considering the no. of feeders mentioned in the load data and break-up of no. of verticals considered shall be provided i.e no. of breaker verticals and no. of MCC verticals. Bidder shall also furnish dimensions & weight of each switchboard.

   f) Technical deviations, if any, mentioning the clause and page no. of specification.

2) Two (2) copies of credentials required as per "PQR" shall be filed properly. One copy shall be submitted along with bid and second copy shall be submitted to CPBG during technical scrutiny.

3) Any confirmations/ comments with reference to technical specification shall be mentioned in mentioned in Deviation sheet and reply shall be sought in writing from BHEL. Any references mentioned elsewhere/ covering letter shall not be considered by BHEL.

4) Any confirmations/ comments regarding delivery schedules shall be furnished as part of commercial offer. Any references mentioned elsewhere/ covering letter shall not be considered by BHEL.

   Any changes made by the bidder in the module wise bill of material/ board wise load data/ any other document of technical specification will not be considered by BHEL until and unless it is mentioned in deviation sheet.

5) Bidders to quote for all line items of price format.

6) Bidder shall be responsible for obtaining any clarification with respect to NIT before quoting, in case, if any technical deviations are observed during technical scrutiny w.r.t NIT, bidder shall meet the technical requirements of NIT without any price implication to BHEL.

7) In case of any ambiguity in specification between various clauses, vendor should clearly mention the same in technical deviations, failing which decision of BHEL would be final during execution of the order and this shall not have any price impact to BHEL.

8) In case of non-submission of technical deviation sheet, it is understood that the bidder does not have any technical deviations and BHEL will proceed further with technical scrutiny, without any further query.

9) Vendor to complete the switchboard/ line item in all respects and offer same to BHEL for inspection, prior to offering the same to customer for inspection.

10) All the bidders meeting "PQR" criteria will be forwarded to customer for approval. Offers of only approved bidders will be technically evaluated. Customer reserves the right to approve/ reject any bidder, without citing any reason.

BIDDER'S STAMP & SIGNATURE

2. SCOPE OF ENQUIRY

1. This specification covers the design, manufacture, relay parameterization and site support, supply of networking hardware, site modification(if any), inspection and testing at manufacturer's works, proper packing and delivery to site of LV switchgear as mentioned in different sections of this specification for FGD FOR NTPL TUTICORIN THERMAL POWER PROJECT(2X500MW) .

2. It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to vendor's guarantee.

3. The general terms and conditions, instruction to tenderer and other attachment referred to elsewhere are hereby made part of the tender specification.

4. The tendered shall be responsible for and governed by all requirements stipulated hereinafter.

5. Deviations, if any should be brought out very clearly on deviation sheet enclosed with specification only. Otherwise it will be presumed that the tenderer's offer is in line with what has been stated/ asked for in this specification.

6. The offer should be complete with technical data, catalogues, brochures and drawings as applicable.

7. Qualification data: In order to be able to propose to the client the proven-ness of the equipments/ item offered, the bidder is required to elaborate details of experience, capabilities, reference list etc. in the offer.

8. The documents shall be in English language and MKS system of units.

3. PROJECT INFORMATION

VOLUME : II-A

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

NLC Tamil Nadu Power Limited (NTPL) is presently operating a thermal power plant having two units of 500 MW capacity each, in Tuticorin, Tamil Nadu.

The Contractor shall acquaint himself with the conditions prevailing at site by a visit to the site, before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained/ collected by the Contractor.

2.00.00 APPROACH TO SITE

The site is accessed by National Highway No. 7A adjacent to plant. Due South connecting Madurai. The nearest railway station is Port Trust Railway Yard at a distance of 1.0 km. Tuticorin sea port is located adjacent to the plant. Nearest airstrip is located at Pudukottai at a distance of 16.5 km. Nearest town is Tuticorin, which is located 5.5 km away from the plant and nearest city is Pallayamkottai, away from 60 km from the plant.

3.00.00 LAND

The site encompasses about 108 Ha, which is located at Tuticorin Taluk in Tuticorin district in the Southern Part of Tamil Nadu along the Bay of Munnar.
Latitude : $8^0$45'38.09"N
Longitude : $78^0$10'15.85"E

The natural land profile of the site 1.46 m above mean sea level.

4.00.0 SOURCE OF FUEL

The primary fuel for this plant is Coal. The Power plant will use coal from Talabira Mines and imported coal.

The daily coal requirement for 2x500 MW units is about 15360 tonnes (at TMCR). Annual coal requirement for the plant is around 4.48 MTPA.

BHARAT HEAVY ELECTRICALS LIMITED * NEW DELHI * PS-MKTG.

NLC INDIA LIMITED

5.00.00 **SOURCE OF WATER**

Main source of water of the plant is sea water, which shall be taken from the Bay of Munnar. The existing 2x 500 MW NTPL Tuticorin plant uses sea water based closed cooling system with Natural Draft Cooling Towers (NDCT). The sea water intake system comprises of gravity intake channels of a capacity 15000 m^3/hr. Out of this, around 9000 m^3/hr is fed as cooling tower makeup water through CT makeup pumps (2W+1S). Around 3000 m^3/hr sea water is utilized in the RO plant for utilization as service water, potable water, power cycle makeup and miscellaneous uses. The blow down from the Cooling tower back to sea is around 7000 m3/hr.

6.00.00 **DELETED**

7.00.00 **METEOROLOGICAL DATA**

7.01.00 For the purpose of equipment design, the following Meteorological data of site (as per IMD Tuticorin) shall be taken into consideration

a)	Ambient temperature	:	36.5 °C maximum 20.8 °C minimum
b)	Extreme Ambient temperature	:	36.4 °C maximum (Annual) 24.1 °C minimum (Annual)
d)	Relative humidity (i) Maximum (ii) Minimum (iii) Average	:	 82% 35% 57 to 68%
e)	Annual Rainfall	:	437 mm
f)	Wind load	:	In accordance with IS-875, Part-3
g)	Seismic Zone	:	Zone II as per IS: 1893 latest edition.
h)	Altitude	:	1.46 M above MSL

Note: For design of HVAC system bidder shall consider data from tender specification Vol-IIA, Sec-II, Cl 7.01.00

BHARAT HEAVY ELECTRICALS LIMITED PS-MKTG. NEW DELHI

NLC INDIA LIMITED NEYVELI

GENERAL PROJECT INFORMATION

1	Owner / Purchaser	NLC Tamil Nadu Power Limited (NTPL) (A Joint Venture Between NLC INDIA LIMITED and Tamil Nadu Electricity Board)
2	Project Name	NTPL Tuticorin Thermal Power Project
3	Capacity and Configuration	1000 MW [2 x 500 MW]
4	Owner's Consultant	Development Consultants Private Limited
5	Geographical Location	Latitude 8^{0}45'38.09"North Longitude 78^{0}10'15.85"East At Tuticorin Taluk in Tuticorin district in the Southern Part of Tamil Nadu along the Bay of Munnar, India
6	Access to site	
6.1	Nearest Airport	Nearest airstrip is located at Pudukottai at a distance of 16.5 km
6.2	Nearest port	Tuticorin sea port is located adjacent to the plant.
6.3	Nearest Railway Station	The nearest railway station is Port Trust Railway Yard at a distance of 1.0 km
6.4	Nearest Town	Nearest town is Tuticorin, which is located 5.5 km away from the plant and nearest city is Pallayamkottai, away from 60 km from the plant.
6.5	Nearest Highway	National Highway No. 7A adjacent to plant
7	Meteorological data	
7.1	Site Elevation	The natural land profile of the site 1.46 m above mean sea level
7.2	Ambient Temperature DBT	
i.	Maximum DBT	36.5 ^{0}C
ii.	Minimum DBT	20.8 ^{0}C
iii.	Performance DBT	27 ^{0}C
7.3	RELATIVE HUMIDITY	
i.	Maximum	82 %
ii.	Minimum	35 %

iii.	Performance	50%
7.4	Earthquake Zone	Zone II
7.5	Predominant Wind direction	East to West
7.6	Wind velocity	Civil/structural design will be done considering IS 875 part 3
7.7	Rainfall	
i.	Annual	437 mm
7.8	Availability of Raw Water	Main source of water of the plant is sea water, which shall be taken from the Bay of Mannar.

4. GTP OF LV SWITCHGEAR

SCHEDULE-IIIF/6

PCC/PMCC/MCC, ACDB & DCDB, DC STARTER

1.0 ASSEMBLY

1.1 Make :

1.2 Type :

1.3 Reference Standard :

1.4 Voltage (Nom./Max.) Volt :

1.5 Phase, Frequency No., Hz :

1.6 Short Circuit Rating

a) Interrupting Symmetrical KA :

b) Short time for 1 sec. KA $_{rms}$:

1.7 Insulation Level
1-min. 50 Hz Voltage withstand KV $_{rms}$:

1.8 Construction

a) Metal clad, air insulated,
Floor mounting Yes/No :

b) Suitable for mounting against
building wall Yes/No :

1.9 Enclosure

a) Degree of Protection :

b) Minimum thickness of
sheet metal mm :

1.10 PCC/PMCC/MCC fully assembled,
wired and tested at factory Yes/No :

2.0 CONSTRUCTION

2.1 Design

a) Completely compartmentalized :

b) Working height limits from floor
level mm :

2.2 Drawout features provided for

a) Circuit breaker with SERVICE, TEST and ISOLATED position Yes/No :

b) Voltage Transformers Yes/No :

c) Protective Relays Yes/No :

d) MCC module provided with service test & isolated position Yes/No :

2.3 Breaker Cubicle

a) Breaker cubicles restricted to bottom 2-tiers only Yes/No :

b) Working height limits from floor level mm :

c) Cubicle door can be closed with Breaker in isolated position Yes/No :

2.4 Control Compartment provided with individual front access door? :

2.5 PCC/PMCC/MCC section provided with

a) Removable back cover :

b) Full height cable chamber :

2.6 Horizontal wire way for inter panel wiring :

2.7 All meter, switch and relays flush mounted type Yes/No :

2.8 Minimum clear space required at

a) Front for breaker withdrawal mm :

b) Rear mm :

2.9 Vertical Section for

a) Overall Dimension (L x B x H) mm :

i. Incomer/Tie :

ii. Feeder/Motor :

b) Approximate Weight Kg :

3.0	BUSBAR		
3.1	Make		:
3.2	Material & Grade		:
3.3	Reference, Standard		:
3.4	Cross Sectional area sq.mm		
	a) Main Busbar	Ph/N	:
	b) Vertical Busbar	Ph/N	:
3.5	Continuous current (at site condition, 50 ^{0}C ambient & within cubicle)		
	a) Main bus bar	Amp	:
	b) Vertical bus bar	Amp	:
3.6	Maximum temperature rise over 50 ^{0}C		:
3.7	Short-time current for 1 sec.	KA $_{rms}$	:
3.8	Separate enclosure/phase barriers Sleeving/shrouding provided for		
	a) Main busbar		:
	b) Vertical droppers		:
	c) Circuit Breaker connections		:
3.9	Bus Connections		
	a) Silver plated		:
	b) Provided with anti- oxide grease		:
	c) Bimetallic connectors between dissimilar metals		:
3.10	Minimum clearance of bare busbar and connection		
	a) Phase to phase	mm	:
	b) Phase to ground	mm	:
3.11	Busbar support spacing	mm	:
3.12	Busbars colour coded	Yes/No	:

3.13 Bus Support Insulator

a) Make :

b) Type :

c) Reference Standard :

d) Voltage class KV :

e) Minimum Creepage Distance mm :

f) Cantilever Strength Kg/sq.cm :

g) Net Weight Kg :

4.0 CIRCUIT BREAKER

4.1 Make :

4.2 Type :

4.3 Reference Standard :

4.4 Rated Voltage KV :

4.5 Rated Frequency Hz :

4.6 No. of Poles No. :

4.7 Rated Currents :

a) Continuous (at site condition, 50 ^{0}C ambient & within cubicle) Amp. :

b) Short-time Current for 1 sec. KA $_{rms}$:

4.8 Maximum temperature rise over 50 ^{0}C ambient ^{0}C :

4.9 Rated Operating Duty :

4.10 Interrupting Capacity at rated Voltage and Operating duty

a) Symmetrical KA $_{rms}$:

b) Asymmetrical KA $_{rms}$:

4.11 Rated Making Current KA $_{peak}$:

4.12 Transient Recovery Voltage

a) Rate of Rise KV/ms :

b) Peak Voltage KV :

4.13 Insulation Level

1-minute 50 Hz voltage withstands KV rms. :

4.14 At 100% interrupting capacity

a) Opening time ms. :

b) Arcing time ms. :

c) Total tripping time ms. :

4.15 Total closing time ms. :

4.16 Number of breaks per pole :

4.17 Total length of breaks per pole mm :

4.18 Total length of contact travel mm :

4.19 Rate of Contact Travel

a) At tripping m/s :

b) At closing m/s :

4.20 No. of breaker operations permissible, without requiring inspection, replacement of contacts and other main parts :

a) At 100% rated current :

b) At 100% rated interrupting current :

4.21 Type of Contacts

a) Main :

b) Arcing :

4.22 Material of Contacts

a) Main :

b) Arcing :

	c)	Whether contacts are silver plated		:
	d)	Thickness of silver plating		:
4.23	Contact Pressure at no load		Kg	:
4.24	Minimum clearance in air -			
	a)	Between poles	mm	:
	b)	Between live parts & ground	mm	:
4.25	Type of arc control device?			:
4.26	Operating Mechanism			
	a)	Type		:
	b)	No. of breaker operations stored		:
	c)	Trip free or fixed trip?		:
	d)	Anti-pumping features provided?		:
4.27	Spring Charging Motor			
	a)	Rating	KW	:
	b)	Voltage	V	:
	c)	Permissible Voltage variation	%	:
4.28	Closing Coil			
	a)	Voltage	V	:
	b)	Permissible Voltage variation	%	:
	c)	Closing current at rated voltage	A	:
4.29	Tripping Coil			
	a)	Voltage	V	:
	b)	Permissible Voltage variation	%	:
	c)	Trip current at rated voltage	A	:
4.30	For trip circuit supervision can the tripping coil be connected in series with			:
	a)	Green lamps when breaker is open		:

b) Red lamps when breaker is closed :

4.31 Breaker/Cubicle Accessories

Accessories such as control switch, indication lamps, relays furnished as specified: Breaker/Breaker Cubicle provided with following :

a) Mechanical safety interlock :

b) Automatic safety shutter :

c) Emergency manual trip :

d) Mechanical ON-OFF indicator :

e) Manual spring charging device :

f) Manual operating handle :

g) Operation counter :

h) Charge/Discharge indication :

I) Cell switch with 4 NO+4 NC contacts:

j) Spare auxiliary switch with 6 NO+6 NC Contacts for interlock mounted on Stationary parts as specified :

4.32 Cell/Auxiliary Switch

a) Are switch contacts convertible type? :

b) Contact rating 220V DC

i) Make & Continuous Amp :

ii) Break (Inductive) Amp :

4.33 Net weight of the breaker Kg :

4.34 Impact load for foundation design (to include dead load plus impact values on opening at maximum interrupting rating) Kg :

4.35 Overall Dimension (LxBxH) mm :

4.36 Type test report on identical breaker Furnished :

5.0 CONTROL MODULE

5.1 Control Modules :

a) Fully drawout for PCC/PMCCs/ MCCs/SVB Yes/No :

b) Fixed type for DBs :

5.2 Power/Control disconnects silver plated for good contacts :

5.3 Drawout Modules of same type & rating are physically & electrically interchangeable :

5.4 Module sizes (L x D x H)

a) Incomer/Bus coupler/ Tie

3200 A Circuit Breaker	mm	:
2500 A Circuit Breaker	mm	:
2000 A Circuit Breaker	mm	:
1600 A Circuit Breaker	mm	:
1250 A Circuit Breaker	mm	:
800 A Circuit Breaker	mm	:
630 A Circuit Breaker	mm	:
400 A MCCB	mm	:
200 A MCCB	mm	:

b) Outgoing feeder with

2500 A Circuit Breaker	mm	:
1600 A Circuit Breaker	mm	:
1250 A Circuit Breaker	mm	:
800 A Circuit Breaker	mm	:
630 A Circuit Breaker	mm	:
400 A MCCB	mm	:

	200 A MCCB	mm	:
	100 A MCCB	mm	:
	63 A MCCB	mm	:
	32 A MCCB	mm	:

c) Motor feeder with ACB & starter units

800 A ACB	mm	:
400 A Starter	mm	:
300 A Starter	mm	:
160 A Starter	mm	:
100 A Starter	mm	:
63 A Starter	mm	:
63 A Starter reversing	mm	:
32 A Starter	mm	:
32 A Starter reversing	mm	:
16 A Starter	mm	:
16 A Starter reversing	mm	:

6.0 SWITCHES

6.1 Make :

6.2 Type :

6.3 Reference Standard :

6.4 Switch furnished with :

a) Operating handle :

b) Door interlock :

c) Provision for padlocking in ON & OFF Positions. :

6.5 Current Ratings at 50 ^{0}C ambient & within cubicle

a) :

b) :

c) :

d) :

e) :

f) :

6.6 Breaking current @ 415 V A.C. or 220 V D.C.

a) :
b) :
c) :
d) :
e) :
f) :

7.0 FUSE

7.1 Make :

7.2 Type :

7.3 Reference standard :

7.4 Rupturing capacity KA $_{rms}$ (sym) :

7.5 Continuous current at 50 ^{0}C ambient & within cubicle Amps :

7.6 Cut off currents KA peak :

7.7 Fuse characteristics furnished for various fuse ratings :

8.0 CONTACTORS

8.1 Make :

8.2 Type :

8.3 Reference standard :

8.4 Duty class :

8.5 Utilization category :

8.6 Operating Coil Voltage

a) Rated :

b) Pick-up :

c) Drop-out :

8.7 Continuous Current rating at 50ºC & within cubicle A :

8.8 Power Consumption

a) During closing VA :

b) After closing VA :

8.9 Auxiliary Contacts furnished per Contactor

a) Normally open (NO) :

b) Normally closed (NC) :

8.10 Aux. Contact rating

a) Make & Continuous Amp :

b) Break (Inductive) at -

i. 240 V A.C. Amp :

ii. 220 V D.C. Amp :

8.11 Time range of delayed dropout Contactors furnished Sec. :

8.12 Thermal Overload Relay & Single Phase Preventer

a) Temperature compensated? :

b) Hand Reset? :

c) No. & type of contacts :

d) Thermal overloads characteristics Furnished? :

e) Tolerance on current injection

1 - pole :

2 - pole :

3 - pole :

9.0 CONTROL & INDICATIONS

9.1 Push Buttons

a) Make :

b) Type & Cat. No. :

c) Contact rating

i) Make & Continuous Amp :
a) 240 V AC Amp :
b) 220 V DC Amp :

ii) Break (Inductive) Amp :
a) 240 V AC Amp :
b) 220 V DC Amp :

9.2 Lamps

a) Make :

b) Type & Cat. No. :

c) Watts/Voltage :

d) Series resistance in Ohm :

e) Lamp & Lens replace from front :

9.3 Selector Switch

a) Make :

b) Type & Cat. No. :

c) 3-position stayput type :

d) Contact rating at
i) Make & Continuous Amp :
a) 240 V AC Amp :
b) 220 V DC Amp :

ii) Break (indicative) Amp :
a) 240 V AC Amp :
b) 220 V DC Amp :

e) Key interlock furnished ? :

10.0 CURRENT TRANSFORMER

10.1 Make :

10.2 Type :

10.3 Reference Standard :

10.4 C.T. Ratios as per drawings? :

10.5 Rated frequency :

10.6 Class/ALF or ISF/VA burden furnished for :

a) Differential C.T. :

b) Relaying C.T. :

c) Metering C.T. :

10.7 Short-Circuit Withstand

a) Short-time current for 1 sec. KA rms.:

b) Dynamic current KA_{peak} :

10.8 Class of Insulation :

10.9 Temperature rise over 50 ^{0}C ambient :

10.10 Basic Insulation level KV_{rms} :

11.0 CONTROL TRANSFORMER

a) Make :

b) Ratio :

c) VA rating :

d) Taps available :

12.0 VOLTAGE TRANSFORMER

12.1 Make :

12.2 Type :

12.3 Reference Standard :

12.4 Voltage ratio :

12.5 Rated frequency :

12.6 Accuracy class :

12.7 VA burden :

12.8 Over Voltage factor

a) Continuous :

b) 30 seconds :

12.9 Class of Insulation :

12.10 Temperature rise over 50 ^{0}C ambient :

12.11 Basic Impulse Level Kv $_{peak}$:

12.12 Winding Connection

a) Primary :

b) Secondary :

12.13 Fuses

a) Continuous rating Amp. :

b) Symmetrical fault rating KA rms.:

13.0 RELAYS

13.1 Drawout type with built in test facilities :

13.2 Type of mounting? :

13.3 Reference Standard :

13.4 All relays furnished as per the drawings & Annexure :

13.5 All relevant relay leaflets and catalogue furnished? :

13.6 Relay Details Make Type Range

13.6.1 Incoming PCC/PMCC/MCC feeder

a) 3-Inverse time O/C relay for phase fault 51 :

b) 1-Inverse time O/C relay for earth fault 51N :

13.6.2 Motor feeder

a) 1-Motor protection relay 99 :

13.6.3 Lighting transformer feeder

a) 3-Inverse time O/C relays with high set Instantaneous unit for phase faults (50/51) :

b) 1-Instantaneous O/C relay for Earth fault 51N :

13.6.4 Outgoing feeder

a) 2-Inverse time O/C relay for phase fault 51 :

b) 1-Inverse time O/C relay for earth fault 51N :

13.6.5 Bus Transfer Scheme
device used for Bus Transfer scheme :

a) :

b) :

c) :

d) :

e) :

f) :

13.6.6 Miscellaneous relay

a) Antipumping relay 94 :

b) Trip supervision relay 74 :

c) Time delay relay 2 :

d) Under Voltage relay frequency compensate 27

i. 3-pole :

ii. 1-pole :

e) Auxiliary relay with 4 pairs of contacts

220 V DC Hand reset 86 :

220 V DC Self reset ..X :

24 V DC Self reset ..Y :

f) Auxiliary relay for alarm 30 :

g) Inverse time voltage neutral Displacement relay (1-pole) 64 :

14.0 METERS

14.1 Make :

14.2 Type :

14.3 Reference Standard :

14.4 Size :

14.5 Scale :

14.6 Accuracy class :

14.7 Meter Switch

a) Make :

b) Type :

c) Cat. No. :

15.0 SECONDARY WIRING

15.1 Type of Insulation :

15.2 Voltage grade :

15.3 Conductor material :

15.4 Conductor Size (Minimum)

a) Potential & Control Circuit :

b) Current Circuit :

15.5 Wires identified at both ends with markers? :

16.0 TERMINAL BLOCK

16.1 Make :

16.2 Type :

16.3 Cat. No. :

16.4 Voltage grade :

16.5 20% spare terminals furnished :

17.0 CABLE TERMINATION

17.1 Cable termination/connection furnished as specified :

17.2 Cable termination kit furnished

a) Make :

b) Type :

c) Complete with all accessories :

17.3 Cable entry provision from top and bottom Yes/No :

17.4 Cable Lugs

a) Type :

b) Material :

17.5 Cable Gland

a) Type :

b) Material :

c) With tapered washer :

d) With armour clamp :

17.6 Removable Gland Plate

a) Material for multicore cable :

b) Material for I/C cable :

c) Thickness of the plate :

18.0 BUSDUCT CONNECTION

18.1 Busduct connection suitable for -

a) Top entry Yes/No :

b) Side entry Yes/No :

18.2 Busduct connection as per drawing furnished Yes/No :

18.3 Average length assumed for bus duct :

19.0 GROUND BUS

19.1 Ground bus furnished :

19.2 Material :

19.3 Size :

20.0 NAME PLATE

20.1 Material :

20.2 Thickness :

20.3 Size for :

a) Panel :

b) Equipment/Device :

21.0 SPACE HEATER/PLUG SOCKET

21.1 Cubicle Heater

a) Thermostat controlled :

b) Wattage :

c) Voltage :

21.2 Plug Socket

a) Type :

b) Rating :

21.3 Motor Heater

a) Provision made for motor heater supply :

b) Separate contactor furnished :

c) If so, contactor rating :

21.4 Cubicle heater, motor heater & Plug socket circuit provided with Individual MCCB unit? :

22.0 A.C./D.C. SUPPLY

22.1 Isolating switch fuse unit for incoming Supply

a) A.C. - type & rating :

b) D.C. - type & rating :

22.2 Isolating switch fused unit at Each cubicle

a) A.C. - type & rating:

b) D.C. - type & rating :

23.0 TROPICAL PROTECTION

23.1 Any special treatment for tropical protection :

23.2 Screens are of corrosion resistant materials :

24.0 PAINTING

24.1 Finish -

a) Inside :

b) Outside :

25.0 NO.OF ACCESSORIES FURNISHED

25.1 Breaker lifting/handling truck :

25.2 Device for slow opening & Closing of breaker :

25.3 Test cabinet with coupling cables for testing the breaker :

25.4 Racking in/out handle :

26.0 DRAWINGS/DATA

26.1 Typical drawings furnished for :

a) General Arrangement :

b) Foundation Plan :

c) Breaker Control Schematic :

26.2 Bill of Material :

26.3 G.A. Drawing of each board Furnished Yes/No :

27.0 D.C. STARTER

27.1 Make :

27.2 Type :

27.3 Enclosure :

27.4 Degree of Protection :

27.5 Starter furnished with all materials and accessories as per drawing? :

27.6 Resistor -

a) Make :

b) Type :

c) Enclosure :

d) Degree of Protection :

5. TECHNICAL SPECIFICATION

VOLUME: II-F

SECTION-VI

415V PCC/PMCC/MCC, 415V AC AND 220V DC DB

CONTENTS

VOLUME: IIF

SECTION-VI

415V PCC/PMCC/MCC, 415V AC AND 220V DC DB

1.00.00 SCOPE

1.01.01 This specification is intended to cover design, engineering, manufacture, assembly, shop testing, inspection, packing, delivery to site, erection, testing and commissioning of following with all fittings and accessories for efficient & trouble free operation:-

i) 415V Power Control Centre (PCC)
ii) 415V Motor Control Centers (MCC)
iii) 415V Motor cum Power Control Centre (PMCC)
iv) 415V Distribution Boards (DB)
v) DC Distribution Board
vi) AC Fuse Board

1.01.02 The base channel frame with hardware and lifting angles.

1.01.03 One set of special tools and tackles.

1.01.04 Recommended spare parts for three (3) years of operation in addition to mandatory spares parts.

1.01.05 Mandatory spares as given in elsewhere.

1.01.06 All relevant drawings, data and instruction manuals.

2.00.00 GENERAL REQUIREMENTS

2.01.00 **Codes and Standards**

2.01.01 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

2.01.02 Equipment and material conforming to any other standard which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

2.01.03 The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.00.00 DESIGN CRITERIA

3.01.00 PMCC/ MCC/ DB

3.01.01 The PMCC will be used to supply auxiliary power for normal and start-up operation of FGD system.

The MCCs/DBs will be used to provide power, control and protection for 415/240V A.C. and 220V D.C. auxiliary services (Motors & Feeders) of FGD System.

3.01.02 For PMCC Duty involves direct-on-line starting of large induction motors and also under certain emergency conditions automatic transfer of loads from one source of supply to other.

Motor starting current varies from 6 to 8 times full load current at very low power factor (0.2 to 0.3) with maximum of 3 starts per hour.

For MCC/ DB Duty involves direct-on-line starting of large squirrel cage motors upto 110 KW. The starting current varies from 6 to 8 times rated current at very low power factor.

3.01.03 The equipment will be located in a hot, humid and tropical atmosphere, highly polluted at places with coal dust and/or fly ash.

3.01.04 Equipment ratings and quantities are detailed in the enclosed drawings and annexure. Equipment shall be furnished in strict compliance with the same.

3.01.05 For continuous operation at specified ratings, the temperature rise of various equipment/components shall be limited to the permissible values stipulated in relevant standards and/or this specification.

3.01.06 All equipment and components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the short-circuit currents listed in the annexure without any damage or deterioration of the materials.

3.01.07 Circuit breaker shall not produce any harmful over voltage during switching off induction motors. If required, surge protective devices shall be included in the scope of supply to limit over-voltage.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 **Construction**

4.01.01 The PMCCs/ MCCs/ DBs shall be indoor, metal-clad, air insulated, floor mounting type. All PMCCs/ MCCs shall be fully draw out type and DBs shall be fixed type. The design and construction shall be such as to allow extension at either end.

4.01.02 Unless otherwise noted, DB shall be of single front construction, front wired and front connected, suitable for mounting against the building wall. PMCCs/

MCCs shall be double front construction and suitable for floor mounting. Breaker panels of PMCCs/ MCCs shall be single front construction.

4.01.03 PMCC/MCC/DB enclosure shall be dust and splash proof, conforming to a degree of protection IP-52. Minimum thickness of sheet metal used shall be 2 mm.

4.01.04 The PMCC shall comprise a continuous line up of single/multi-tier cubicles. The installations of circuit breakers however shall be limited to the bottom two tiers only.

MCC/DB assembly shall comprise a continuous line up of dead front, free-standing vertical sections, housing the control modules in multitier formation.

All MCCs/ DBs shall be front wired and front connected.

4.01.05 The design shall be fully compartmentalized with metal/insulating partitions between compartments. The working height shall be limited within 450 mm to 1800 mm from floor level.

4.01.06 Each breaker/ control module shall be housed in a separate compartment, complete with an individual front access door. Each vertical section shall have a removable back cover.

All doors and covers shall be gasketed.

4.01.07 All switches, lamps and indicating instruments shall be flush mounted on the respective cubicle door whereas relays and other auxiliary devices may be mounted on a separate cubicle.

4.01.08 For single front assemblies a full height vertical cable chamber with cable supports shall be provided in each section to facilitate unit wiring. The chamber shall be liberally sized to accommodate all cables and shall have removable cover at the front for access.

4.01.09 A horizontal wireway, extending the entire length, shall be provided at the top for inter panel wiring.

4.01.10 Breaker cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position. The breaker can be operated both in service & test position with door closed.

4.02.00 **Bus and Bus Taps**

4.02.01 The main buses and connections shall be of high conductivity Aluminium/Aluminium alloy, sized for specified current ratings with maximum temperature limited to 85°c (Temperature rise based on maximum ambient temperature).

4.02.02 Vertical busbars shall be designed for minimum current rating of 200 A.

4.02.03 All bus connections shall be silver plated. Adequate contact pressure shall be ensured by means of two bolt connection with plain and spring washers and locknuts.

Bimetallic connector shall be furnished for connection between dissimilar metals.

4.02.04 Busbars and connections shall be fully insulated for working voltage with adequate phase/ground clearances. Insulating sleeves for busbars and shrouds for joints shall be provided.

Bus insulators shall be flame retardant, track-resistant type with high creepage surface.

4.02.05 Busbars shall be supported and braced to withstand the stresses due to maximum short circuit current and also to take care of any thermal expansion.

4.02.06 Busbars shall be colour coded for easy identification and so located that the sequence R-Y-B shall be from left to right, top to bottom or front to rear when viewed from the front of the assembly.

4.02.07 Bolted disconnect links shall be provided for all incoming and outgoing feeders for isolation of neutral, if necessary.

4.03.00 **Circuit Breaker**

4.03.01 Circuit Breaker shall be three poles, single throw, air break type with stored energy, trip free mechanism and shunt trip.

4.03.02 Circuit breakers shall be drawout type, having SERVICE, TEST & ISOLATED positions with positive indication for each position.

4.03.03 Circuit breakers of identical rating shall be physically and electrically interchangeable.

4.03.04 Circuit breakers marked E shall have motor wound spring charged mechanism and those marked M shall have hand operated spring charged mechanism.

4.03.05 For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open-close-open operation of the circuit breaker shall be possible after failure of power supply to the motor.

4.03.06 Mechanical safety interlock shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

4.03.07 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

4.03.08 Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter and mechanism charge/discharge indicator.

4.03.09 In addition to the auxiliary contacts required for normal breaker operation and indication, each breaker shall be provided with following for interlocking purpose :-

a. Position/cell switch with 4NO + 4NC contacts.

b. Auxiliary switch, with 6NO + 6NC contacts, mounted on the stationary portion of the switchgear and operated mechanically by a sliding level from the breaker in SERVICE position.

4.03.10 Limit/auxiliary switches shall be convertible type, that is, suitable for changing N.O. contact to N.C. and vice-versa.

4.04.00 **MCC/ DB Control Modules**

4.04.01 Draw-out type control module shall have self-aligning power/control disconnects. All disconnects shall be silver plated to ensure good contacts.

4.04.02 The design shall be such as to permit easy withdrawal/reinsertion of the unit with guide rails to ensure correct alignment.

4.04.03 Control Module shall house the control components for a circuit such as switch, fuse, contactors, relays, push buttons, lamps etc.

4.04.04 The equipment layout shall provide sufficient working space in between the components and subject to Owner's approval.

4.04.05 Various module/compartment sizes shall be multiple of one basic unit to facilitate modifications at site. Suitable provision for this purpose should also be incorporated in the vertical bus bars.

4.04.06 Drawout type control modules of same size and type shall be electrically and physically interchangeable.

4.05.00 **Switches**

4.05.01 Switches shall be triple pole, air break, AC23 motor duty for motor feeders and AC22 heavy duty for other feeders.

Motors duty switches shall be capable of safely making and breaking the locked rotor current of the associated motor circuit.

4.05.02 The switch shall have a quick-make, quick-break mechanism operated by a suitable external handle, complete with position indicator. This handle shall have provision for padlocking in ON and OFF position.

4.05.03 The compartment door shall be interlocked mechanically with the switch such that the door cannot be opened unless the switch is in OFF position. Means shall be provided for releasing this interlock at any time.

4.05.04 Switches shall be capable of withstanding the let-through fault current of back-up fuses or circuit breakers.

4.05.05 If two incoming switches are specified for any MCC/DB incomer, these switches shall be mechanically/key interlocked so as to ensure that only one switch can be closed at a time.

4.05.06 All incoming and outgoing feeders shall be provided with bolted disconnect link for isolation of neutral if necessary.

4.06.00 **Fuses**

4.06.01 Fuses shall be HRC, preferably link type, with a minimum interrupting capacity equal to the listed Short Circuit Current.

4.06.02 Fuses shall be furnished complete with fuse bases and fittings of such design as to permit easy and safe replacement of fuse element.

Visible indication shall be provided on blowing of the fuse.

4.06.03 Motor fuse characteristics and ratings shall be chosen to ride over starting period without blowing. The fuse on incoming feeder, if specified, shall be chosen to provide discrimination with motor/feeder fuses.

4.07.00 **Moulded Case Circuit Breaker**

4.07.01 Moulded Case Circuit Breaker shall be three pole, single throw, air break type having trip free mechanism with quick make quick break contacts. Moulded Case Circuit Breakers shall be used for feeders of MCC/MCCB Boards and for outgoing feeder from PMCCs.

4.07.02 Moulded case circuit breakers shall have current limiting design.

4.07.03 Moulded Case Circuit breakers of identical rating shall be physically and electrically interchangeable.

4.07.04 Moulded case circuit breakers shall be provided with 1 NO and 1 NC electrically separate auxiliary contacts.

4.07.05 MCCB used for 50 kW and above motor rating shall have additional E/F protection

4.08.00 **A.C. Starter**

4.08.01 **Contactors**

a. The contactors shall be three pole, air break type designed for duty class III - Category AC3 with non-bouncing silver/ silver alloy contacts.

b. Each contactor shall be provided with two (2) normally open and two (2) normally closed auxiliary contacts rated 10 A at 240V A.C.

c. Reversing contactors shall be electrically and mechanically interlocked.

d. Contactors with delayed dropout feature shall be provided for some essential auxiliaries if so detailed in the annexure. These contactors shall not dropout on power failure if the voltage is restored within 3 seconds.

4.08.02 **Protection**

a. Thermal overload relays shall be three element, positive acting, ambient temperature compensated with adjustable settings.

b. Single phase preventer relay shall be provided, preferably as an inbuilt feature of thermal overload.

c. Relays shall be manual reset type with one changeover contact. Resetting of relays shall be possible with compartment door closed.

d. Relays may be direct acting or C.T. operated, depending on current rating. C.T.s shall be included in the scope of supply.

e. Earth fault relays with adjustable settings and time delays fed from core balance CT shall be provided.

f. Numerical / Digital Motor protection relay with short circuit, over load, earth fault, locked rotor and unbalance (NPS) load protection functions shall be provided for motor rated above 90 kW.

4.09.00 **Control & Indication**

4.09.01 The circuit breaker shall be wired up for local & remote operation. Each breaker cubicle shall be equipped with following :-

4.09.02 One (1) TEST-NORMAL-TRIAL selector switch stay put type with pistol grip handle and key interlock for breaker marked 'E'.

4.09.03 Two (2) heavy duty, oil-tight, push buttons for TRIP & CLOSE.

4.09.04 Five (5) indicating lights on front of compartment :-

Breaker open	-	GREEN
Breaker closed	-	RED
Breaker charged	-	BLUE
Breaker Trip Circuit Healthy	-	WHITE

Breaker Trip - AMBER

4.09.05 Lamps shall be low watt, filament type with series resistor. Lamp and lens shall be replaceable from the front.

4.09.06 The general scheme of connections for control, interlock and protection is shown in the enclosed drawings. Detailed requirements of individual circuits will be intimated later to the successful Contractors, who shall develop and furnish the schemes accordingly.

4.09.07 Push button shall be heavy duty, oil tight, push to actuate type with integral escutcheon plate marked with its function.

4.09.08 Each push button shall have one (1) normally open and one (1) normally closed contacts rated 10 A at 240 V A.C.

4.09.09 One (1) NORMAL-TRIAL selector switch shall be provided for all motor feeders.

4.09.10 Lamps shall be LED type. LED lamps shall be made in accordance with InP technology (Aluminium Indium Gallium Phosphide Technology). The body shall be made of Poly Carbonate with unbreakable Lens. LED shall be protected by inbuilt fuse with surge suppressor or leakage voltage glow protection.

LED circuit shall be PCB mounted. Intensity shall be greater than 200 mcd. All Push Button lamp shall be as per LED indicating lamp.

4.09.11 For control supply the Contractor shall provide 415/110V, +/- 5% in steps of 2.5% control transformers with 100% standby arrangement. But for Service voltage it shall be 415V/240V AC.

4.10.00 **Meters**

4.10.01 All indicating instruments (96 x 96 mm) shall be switchboard type, with 250 degree scale, anti-glare glass and accuracy class of ± 2% full scale. Each meter shall have zero adjuster on the front.

4.10.02 Motor ammeter shall have an extended suppressed end-scale range to indicate starting current (6 to 8 times full load current).

4.10.03 Watt-hour meter shall be provided in drawout cases with built-in test facilities. Alternatively, they may have test block to facilitate testing of meter without disturbing C.T. or V.T. secondary connections.

4.11.00 **Current Transformer**

4.11.01 Current Transformers shall be cast-resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connection will be made.

4.11.02 Accuracy class of the current transformers shall be :-

a. Class PS for differential

b. Class 5P20 for other relaying.

c. Class 1.0, ISF < 5 for metering.

4.12.00 **Voltage Transformer**

4.12.01 Voltage transformers shall be cast-resin, drawout type and shall have an accuracy class of 1.0. Voltage transformer mounted on breaker carriage is not acceptable.

4.12.02 High voltage windings of voltage transformer shall be protected by current limiting fuses. The voltage transformer and fuses shall be completely disconnected and visibly grounded in fully drawout position.

4.12.03 Low voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the switchgear is energized.

4.13.00 **Relays**

4.13.01 Relays shall be numerical type of drawout design with built-in testing facilities. Small auxiliary relays may be in non-drawout execution.

4.13.02 Relays shall be rated for operation on 1A secondary current and 110V secondary voltage; number and rating of relay contacts shall suit the job requirements.

4.13.03 The Contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection, interlock and bus transfer scheme as broadly indicated in the annexures and drawings.

4.14.00 **Secondary Wiring**

4.14.01 The MCC/PMCC/DB shall be fully wired at the factory to ensure proper functioning of control, protection and interlocking schemes.

4.14.02 Fuse and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, push buttons and other devices shall be wired upto terminal blocks.

4.14.03 Wiring shall be done with flexible, 1100V grade, PVC insulated FRLS type switchboard wires with stranded Copper conductors of 2.5 mm^2 for control & current circuits and 1.5 mm^2 for voltage circuits.

4.14.04 Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per Contractor's wiring diagrams.

4.14.05 Wire terminations shall be made with crimping type connector with insulating sleeves. Wires shall not be spliced between terminals.

4.15.00 **Terminal Blocks**

4.15.01 Terminal blocks shall be 1100V grade, box-clamp type with marking strips similar to ELMEX 10 mm^2 or equal. Terminals for C.T. secondary leads shall have provision for shorting.

4.15.02 Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

4.15.03 Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

4.16.00 **Cable Terminations**

4.16.01 MCC/ DB shall be designed for cable entry both from top and bottom. PMCC shall be designed for cable entry from the bottom. Sufficient space shall be provided for ease of termination and connection.

4.16.02 Cables shall be PVC insulated, armoured, PVC overall sheathed with 2.5 mm^2 stranded Copper conductor for controls and motors upto 5.5 KW and stranded Aluminium conductor for rest-of power circuits as detailed in annexure.

4.16.03 All provisions and accessories shall be furnished for termination and connection of cables, including removable gland plates, cable supports, crimp type tinned Copper/Aluminium lugs, brass compression glands with tapered washer (Power Cables only) and Terminal blocks.

4.16.04 Gland plates shall be minimum - 4 mm thick. The gland plate and supporting arrangement for single core power cables shall be such as to prevent flow of eddy current.

4.17.00 **Bus Duct Connection**

4.17.01 Bus duct connections when specified on drawings/annexures shall be furnished along with transition panel if required. Bus duct connection shall be generally from the top.

4.17.02 All connecting bus work shall have the same continuous current rating as associated PMCC/ MCC/DB bus and shall be fully braced for the listed short circuit current.

4.17.03 All provisions such as matching flange and other accessories shall be furnished for connection to bus duct being supplied by others. Necessary details for this purpose will be furnished later.

4.18.00 **Ground Bus**

4.18.01 A Cu / Al ground bus rated to carry the maximum fault current, shall extend full length of the assembly.

4.18.02 The ground bus shall be provided with two-bolt drilling with G.I. bolts & nuts at each end to receive 50 x 6 mm G.I. flats.

4.18.03 All stationary units shall be directly connected to the ground bus for effective grounding.

The frame of each circuit breaker and drawout V.T. unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

The frames of drawout module shall be ground at all times except when the power disconnects are separated by a safe distance.

4.18.04 Wherever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus and connected thereto.

4.18.05 C.T. & V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing others.

4.19.00 **Nameplate**

4.19.01 Nameplate of approved design shall be provided for each cubicle, at the top of the assembly at each instrument & device mounted on or inside the cubicle.

4.19.02 The material shall be lamicoid or approved equal, 3 mm thick with white letter on black background.

4.19.03 The name plate shall be held self-tapping screws. Name plate size shall be minimum 20 x 75 mm for instrument/devices & 40 x 150 mm for panels.

4.19.04 Caution notice on suitable metal plate shall be affixed at the back of each vertical panel.

4.20.00 **Control supply for MCC modules**

4.20.01 Each motor feeder of MCC shall be provided with suitably rated 415/110V control transformer, for arranging control supply for the module. All the necessary auxiliary and main contactors shall be provided suitable for this control supply.

4.20.02 In test position module control supply shall be disconnected and provision shall be available to test the control circuit through test bus, obtained from separate control transformer provided for this purpose.

4.20.03 **Control supply for ACBs of PCC and PMCC modules**

a) Two 220V DC feeders shall be provided in each board for power supply of control, shunt tripping and annunciation purpose.

b) Control supply shall have supervision facility, alarm shall be provided for non-availability of any one of the control supply.

c) MCCBs/MCBs shall be provided on incoming sides of supplies. Control buses of two sections shall be connected through auto changeover scheme.

d) LEDs shall be provided for the indication purpose.

e) Isolation arrangement shall be provided on each panel to facilitate fault location and testing. Separate fuses shall be provided for spring charging motors, for indication lamps and for closing / Tripping circuits of each cubicle

4.20.04 **TEST Control Transformers**

For TEST control supply control transformers of adequate rating (min. 2 KVA rating) shall be provided.

For motor space heating supply, the transformers of adequate rating (min. 2 KVA rating) with 100% standby shall be provided.

All the control transformers shall be placed in spacious compartments to have proper air circulation and keep lower temperature of transformer and its module.

All the control transformers shall be provided with selector switch, fuses, indicating lamps. Each control transformer shall feed to its control buses of respective bus section during normal operation. In case of failure of one of the control transformer, provision shall be made to tap the control supplies from other bus section control transformer by auto changeover using aux. relays contacts/switch. Contractor has to develop scheme accordingly. This logic shall be made applicable for space heating and winding heating control transformer also.

All control transformer shall conform to IS: 12021.

Control transformer shall have OCTC tap range of ±5% in steps of 2.5% per tap.

4.21.00 **Space Heaters and Plug Sockets**

4.20.01 Each vertical section shall be provided with thermostat controlled space heater and 5A, 3 pin plug socket.

4.20.02 In addition, motor feeder 30 KW and above cubicle shall be wired-up for feeding the motor space heater through suitably rated breaker (or contactor) auxiliary "OFF" contact .

4.20.03 Cubicle heater, Motor heater, Plug-socket circuit shall have individual switch fuse units.

4.21.00 **A.C./D.C. Power Supply**

4.21.01 The following power supplies will be made available to each PMCC :

A.C. supply : Single feeder

D.C. supply : Double feeder

4.21.02 Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 4-pole, single throw for A.C. and 2-pole, double throw for D.C.

4.21.03 Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for A.C./D.C. supplies.

4.21.04 A.C. load shall be so distributed as to present a balance loading on three-phase supply system.

4.22.00 **Tropical Protection**

All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects & corrosion.

Screens of corrosion resistant material shall be furnished on all ventilating louvres to prevent the entrance of insects.

4.23.00 **Painting**

4.23.01 All steel surfaces shall be sand blasted, grounded and pickled as required to produce a smooth, clean surface free of scale, grease & rust.

4.23.02 After cleaning, the surfaces shall be given a phosphate coating followed by two coats of high quality primer and stoved after each coat.

4.23.03 PMCC/ MCCs/DBs shall be finished in light grey (IS:631) with two coats of synthetic enamel paint.

Sufficient quantity of touch-up paint shall be furnished for application at site.

4.23.04 Caution notice plate shall be affixed at the back of each vertical panel.

Minimum paint thickness of 65-75 microns for sheet thickness of 3 mm and 50 microns for sheet thickness of 2mm.

4.24.00 **Accessories**

4.24.01 The following accessories shall be furnished along with the switchgear :

a. Breaker lifting and handling truck.

b. Device for slow opening and closing of breaker.

c. Test cabinet with coupling cables for testing the breaker in drawout position.

d. Breaker racking in/out handle (if required).

5.00.00 TESTS

5.01.00 All equipment shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards.

5.02.00 **Routine Test**

The tests shall include but not necessarily limited to the following :-

a. Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of the equipment.

b. All wiring and current carrying part shall be given appropriate High Voltage Test.

c. Primary current & voltages shall be applied to all instrument transformers.

d. Routine test shall be carried out on all equipment such as circuit breakers, switch-fuse, contactors, relays meters etc.

5.03.00 **Test Witness**

All tests shall be performed in presence of Owner's representatives, if so desired by the Owner. The Contractor shall give at least seven (7) days advance notice of the date when tests are to be carried out shall be given.

5.04.00 **Test Certificate**

5.04.01 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Owner.

5.04.02 The equipment shall be despatched from works only after receipt of Owner's written approval of the test reports.

5.04.03 Type test certificate on any equipment, if so desired by the Owner, shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

6.00.00 SPECIAL TOOLS & TACKLES

6.01.00 A set of special tools & tackle which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.

6.02.00 The tools shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

7.00.00 SPARES

7.01.00 The Contractor shall quote and supply **mandatory spare parts** as per the tentative list. The final quantity shall be decided during placement of order.

7.02.00 Each list shall be complete with specification, make, identification number, unit rate, quantity etc.

8.00.00 DRAWINGS, DATA & MANUALS

8.01.00 Drawings, Data & Manuals shall be submitted in triplicate with the bid and in quantities and procedures as specified in General Conditions of Contract and/or elsewhere in the specification for approval and subsequent distribution after the issue of 'Letter of Intent'.

8.02.00 **To be submitted with the bid** :-

a. General arrangement drawing showing constructional features, space required in front for withdrawals, power & control cable entry points etc.

b. Typical foundation plan

c. Typical control schematic

d. Bill of materials

e. Type test reports on circuit breaker

f. Technical leaflets on :-

i) Circuit breaker
ii) Switch-fuse units
iii) Contactors
iv) Relays, meters, push buttons, selector switches etc.
v) Glands/terminals blocks

8.03.00 **To be submitted for Approval & Distribution:**

a. Outline dimensional drawing showing general arrangement, space requirements and bus duct/cable entry points.
b. Cross-section with parts list.
c. Foundation plan & loading.
d Consolidated bill of materials
e. Control schematics.
f. Diagrams.
g. Instruction manuals of MCC/DB and individual equipment.

The manual shall clearly indicate the installation method, check-up and tests to be carried out before commissioning of the equipment.

8.04.00 The Contractor may note that the drawings, data and manuals listed herein are minimum requirements only. The Contractor shall ensure that all other necessary write-ups, curves and information required to fully describe the equipment are submitted with his bid.

ANNEXURE-A

RATINGS & REQUIREMENTS

1.0 **GENERAL**

	Type	: Metal-clad, drawout (PMCC/MCC) Metal-clad, fixed (DB)	
	Service	: Indoor	
1.1	System	AC	DC
	Voltage	: 415V ± 10%	220V(+ 10% to -15%)
	Phase	: 3-phase and neutral	-
	Frequency	: 50 Hz +3 to -5%	-
	Combined voltage and frequency variation	: 10% (absolute sum)	-
	System grounding	: Solidly grounded Ungrounded	

1.2	Rated Current at 50°C ambient		
	Busbar	: To be decided by the Contractor	
	Circuit breaker	: - Do -	
	Switches	: 16A to 630A	
1.3	Short Circuit Rating	AC	DC
	Interrupting	: **(*) 50** KA	25** KA
	Short Time for 1 second	: **(*) 50** KA	25** KA
1.4	Hivoltage test for 1 minute (min.) : 2.5 KV		1.5 KV

** Indicative only ; actual value to be decided by the Contractor and to be substantiated by calculation .

1.5 A.C./D.C. Power Supply

Control Voltage for Circuit breaker : 220V DC (+ 10% to -15%)

ANNEXURE-A

	Control voltage for MCC modules	: 110V AC ± 5%, 1 Ph, 50 Hz +3 to -5%
	Service voltage	: 240V AC ± 10%, 1 Ph, 50 Hz +3 to -5%
2.0	**CIRCUIT BREAKER**	
2.1	Duty Cycle	: 0-3'-CO-3'-CO
2.2	Breaking Current	
	A.C. Symmetrical	: **(*) 50** KA
2.3	Making Current	: **(*) 105** KA Peak
2.4	Auxiliary Voltage	
	Closing	: 220V D.C. (85 - 110%)
	Tripping	: 220V D.C. (70 - 110%)
	Spring Charging	: 220V D.C. (85 - 110%)

ANNEXURE-B

MODULE SELECTION

A. MOTOR FEEDER (WITH MCCB)

Type	Motor Rating (kW)	MCCB Rating (A)	Contactor Rating (A)	Cable size
AU / AR	0 – 2.2	Note-2	16	3/C – 2.5 mm sq - Cu
BU / BR	2.3 – 3.7	-do-	16	3/C – 2.5 mm sq - Cu
CU / CR	3.8 – 5.5	-do-	32	3/C – 2.5 mm sq - Cu
DU / DR	5.6 – 7.5	-do-	32	3/C – 16 mm sq - Al
EU / ER	7.6 – 11	-do-	32	3/C – 16 mm sq - Al
FU / FR	11.1 – 22.5	-do-	80	3/C – 35 mm sq - Al
GU	22.6 – 37	-do-	80	3/C – 95 mm sq - Al
HU	37.1 – 45	-do-	95	3/C – 95 mm sq - Al
JU	45.1 – 75	-do-	140	3/C – 185 mm sq - Al
KU	75.1 – 90	-do-	225	2-3/C – 185 mm sq - Al
LU	90.1 - 110	-do-	265	2-3/C – 185 mm sq - Al

1. "U" stands for Unidirectional and "R" for Reversible drives
2. MCCB are to suitably selected maintaining Type-2 coordination as per IS: 13947
3. MCCB with E/F protection to be considered for motors above 50 kW.

B. OUTGOING FEEDER (WITH MCCB)

Type	MCCB Rating (A)	Cable size
AF	32	4/C – 16 mm sq - Cu
BF	63	4/C – 35 mm sq - Al
CF	100	3.5/C – 95 mm sq - Al
DF	200	3.5/C – 300 mm sq - Al
EF	400	4x1/C – 630 mm sq - Al
FF	630	7x1/C – 630 mm sq - Al
ACB	800	7x1/C – 630 mm sq - Al
ACB	1000/1250/1600	14x1/C – 630 mm sq - Al
ACB	2500	18x1/C – 630 mm sq - Al
ACB	3150	21x1/C – 630 mm sq - Al

ANNEXURE-C

Metering and Protection

The feeders shall have the following protections / metering required for the switchgear panels. The minimum protections / metering required for various typical feeders including ACB operated feeders are given below . For non ACB controlled feeders, the metering indicated shall be in-built.

1) ACB controlled feeders with numerical relays

A)	**Incomers**		
	Protections	**Metering (for remote)**	**Local Indication**
	Instantaneous over current protection 50	Current in all the three phases	Current in all the 3 phases
	IDMT over current protection 51	Voltage – Phase to phase, phase to neutral	Voltmeter with voltage selector switch
	Instantaneous earth protection 50N	kW	
	IDMT Earth fault protection 51N	kWH	
	Circuit breaker failure protection 50BF		
	Under voltage protection 27		
	Restricted earth fault protection 64R		
	Backup (Standby) earth fault protection 64S		
	Apart from above protection relays, each electrically operated breaker shall be provided with anti-pumping (94), lockout (86) and trip circuit supervision (95) relays. Lockout relay shall be a hand reset type and shall not be clubbed with numerical relay.		
	Check synchronizing 25 through relay mounted in bus coupler.		
B)	**Bus Couplers**		
	Protections	**Metering (for remote)**	**Local Indication**
	Instantaneous over current protection 50	Current in all the three phases	Current in all the three phases
	IDMT over current protection 51	Voltage – Phase to phase, phase to neutral	Voltmeter with voltage selector switch for Bus A
	Instantaneous earth protection 50N	kW	Voltmeter with

			voltage selector switch for Bus B
	IDMT Earth fault protection 51N	kWH	
	Circuit breaker failure protection 50BF		
	Under voltage protection 27		
	Check synchronizing 25		
	Apart from above protection relays, each electrically operated breaker shall be provided with anti-pumping (94), lockout (86) and trip circuit supervision (95) relays. Lockout relay shall be a hand reset type and shall not be clubbed with numerical relay.		
C)	**Motor Feeders (above 90KW)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Numerical Composite motor protection to cover a min. protections such as negative phase current (46), thermal over load (49), phase over current (50/51), earth fault (50N/51N), locked rotor (51LR), No. of starts per hour (66), breaker failure (50BF), under voltage (27 from PT)	Current in all the three phases	Current (Y phase) for feeders rated above 30 kW.
	Apart from above protection relays, each electrically operated breaker shall be provided with anti-pumping (94), lockout (86) and trip circuit supervision (95) relays. Lockout relay shall be a hand reset type and shall not be clubbed with numerical relay.	A, kW, kWH	
D)	**Outgoing Feeder (630A and above) (Breaker Operated)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Instantaneous over current protection 50	Current in all the three phases	Current (Y phase)
	IDMT over current protection 51	Voltage – Phase to phase, phase to neutral	
	Instantaneous earth protection 50N	kW	
	IDMT Earth fault protection 51N	kWH	
	Circuit breaker failure protection 50BF		
	Apart from above protection relays, each electrically operated breaker shall be provided with anti-pumping		

	(94), lockout (86) and trip circuit supervision (95) relays. Lockout relay shall be a hand reset type and shall not be clubbed with numerical relay.		

2) MCCB Controlled feeders rated below 630A.

A)	**Incomers (with motorized MCCB)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Over current protection	Current transducer (Y phase)	Current (Y phase)
	Short circuit protection		Voltmeter with voltage selector switch
B)	**Bus Couplers (with motorized MCCB)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Over current protection	Current transducer (Y phase)	Current (Y phase)
	Short circuit protection		
C)	**Outgoing Feeder (Below 630A) with MCCB (non-motorized)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Over current protection		Current (Y phase)
	Short circuit protection		
D)	**Incomers for ACDB/MLDB/PDB MCCB (non-motorized)**		
	Protections	**Metering (for remote)**	**Local Indication**
	Over current protection	Electronic energy meter with suitable communication protocol	Voltmeter with voltage selector switch
	Short circuit protection	Electronic energy meter suitable for communication with Modbus RS485.	

3) Other feeders

A)	**Bus PT / Line PT Modules**		
	Protections	**Metering (for remote)**	**Local Indication**
	Under voltage protection 27	Voltage – phase to phase, phase to neutral	
	Fuse failure protection		

B)	Motor feeders up to 18.5kW (MPCB with Contactors)		
	Protections	Metering (for remote)	Local Indication
	overload & short circuit protection.		
C)	Motor feeders above 18.5kW but upto 90KW (MCCB with Contactors)		
	Protections	Metering (for remote)	Local Indication
	Current measuring module and Overload, single phase preventer & short circuit protection.	Phase current (for motors of rating 30KW and above)	

4) DC System

A)	Incomer Breaker/MCCB		
	Protections	Metering (for remote)	Local Indication
	With indication only no protection with O/L alarm to BOP DDCMIS	Bus voltage	Load Voltage
			Bus Voltage
			Shunt with ammeter
B)	Outgoing Feeder		
	With indication only no protection with O/L alarm to BOP DDCMIS		Shunt with ammeter

Note: Fuse failure relay shall be provided on the secondary side of voltage transformer to monitor HV and LV fuses.

ANNEXURE-D

FITTINGS & ACCESSORIES

Each PMCC/ MCC shall be furnished complete with fittings and accessories as listed below :-

1. Operating mechanism complete with all accessories, fittings and tripping coil and closing coil, pole discrepancy feature, etc. as required.
2. Base frame and anchor bolts and nuts.
3. Auxiliary contacts and relays.
4. LOCAL/REMOTE Selector switch, TRIP/CLOSE Push Buttons.
5. Manual tripping devices with protective flap.
6. Mechanical ON-OFF indicator.
7. Operation counters.
8. Set of switch fuse units/MCCB for A.C. and D.C. supply.
9. Space heater with thermostat and ON-OFF switch.
10. Cubicle illumination lamp with ON-OFF switch.
11. 3 Pin 5A Socket with ON-OFF Switch.
12. Terminal blocks and internal wiring - lot as required.
13. Other standard accessories which are not specifically mentioned but supplied with breakers of similar type and rating for efficient and trouble-free operation.
14. Bimetallic terminal connectors.

ANNEXURE – D

RATINGS AND REQUIREMENTS OF LIGHTING TRANSFORMER

Type	:	Dry type, encapsulated VPI with nomex insulation
KVA rating (Minimum)	:	100 KVA
Voltage rating	:	415 V/415 V
Cooling	:	AN
P.V. Impedance	:	0.04 $\pm$ 10%
Voltage control	:	Off load tap switch/link with change of $\pm$ 5% in step of 2.5% tapping full capacity.
Vector Group	:	Dyn11
Class of Insulation	:	F (155^0C)
Maximum Temperature rise over 50 Deg C. ambient in winding by resistance	:	90^0C
Neutral	:	Solidly grounded.

The secondary neutral of the transformer shall be brought out for getting a grounded 4 wire supply. Each transformer shall be routine tested and one transformer shall be type tested in accordance with relevant standard.

The transformer shall be liable for rejection if the tolerance on the quoted values of losses, impedance, temperature rise, etc. exceeds the specified values of relevant standard.

The transformer shall be mounted inside sheet steel enclosure, which shall be an integral part of Lighting Distribution Board.

2.11.05 **HV Switchgear (11kV and 3.3kV)** - Complete with breakers, busbars, instrument transformers, numerical relays, meters, transducers, interposing relays, terminal blocks, dummy panels, bus trunking & accessories for balance of plant loads. All 11 KV / 3.3kV switchgears to be provided with manual / auto closing of bus coupler and manual / auto live changeover with check synchronizing and other synchronizing equipment. The short circuit rating of 11 KV switchgear and its associated equipment shall be designed for 40KA for 3Sec and that of 3.3KV HT switchgear and its associated equipment shall be designed for 40KA for 3Sec. Numerical relays with dual redundant IEC 61850 ports, manageable switches / RTUs for establishing communication with PLC shall also be considered as per requirement. Numerical relay network shall be on IEC 61850 protocol. Accordingly all numerical relays shall be connected to the respective panel redundant Ethernet switches through suitable communication cable (RJ45). The groups of numerical relays shall be connected to the PLC. Multifunction meters (MFM) shall be connected in a loop to form RS485 network with Modbus or any industry standard open protocol. The RS485 network of MFMs shall be connected to industrial grade RS485 to TCP/IP converter via serial port. The RS485 to TCP/IP converter shall be connected to the respective panel redundant ethernet switches and further to the EMS. Redundant ethernet switches for respective HT SWGRs as indicated above shall be provided by the contractor and shall be housed in separate network panel which shall be either wall mounted or standalone as decided during detail engineering & further to be hooked up to Main Plant DDCMISs. A marshalling panel shall be provided on each bus of 3.3kV switchgear for interfacing with BOP.

2.11.06 **LV Switchgear (415V)** complete with breakers / contactors, busbars, instrument transformers, numerical relays, meters, transducers, interposing relays, terminal blocks, dummy panels, bus trunking & accessories for catering the loads of FGD package. All 415V PCC/ PMCC/MCC to be provided with manual / auto closing of bus coupler and auto/manual live changeover with check synchronizing. A marshalling module shall be provided on each bus of LV Switchgear for interfacing with PLC. Control of incomers and bus-coupler breakers of LV switchgears shall be possible from the PLC. The check synchronizing relay shall be housed in the respective switchboards. Dummy panels shall be integral part of the LV switchgear and of same size. Emergency MCC shall cater to the emergency loads of FGD package.

2.11.07 **Segregated Bus Ducts** – 3.3kV side of 11kV / 3.3kV Auxiliary Transformer will be connected with the associated switchgears through segregated-phase bus duct with required bends, supporting structures with related civil work. Phase Cross over, if required in 11kV/3.3kV shall be accommodated at the switchgear end in the rear dummy panel.

2.11.08 **Non-Segregated Bus Ducts** – Non-segregated Bus Duct (NSPBD) between 415V Service Transformer to LV service PCC/PMCC for FGD package with required bends, supporting structures with related civil work. Phase Cross over, if required in 415V systems shall be accommodated at the switchgear end in the rear dummy panel.

The auxiliary power supply system & equipment shall be designed for a voltage & frequency variations as given below under worst operating conditions:

AC System

(a)	Voltage variation	±10%
(b)	Frequency variation	+5% to -5%
(c)	Combined voltage & frequency variation	10% (absolute sum)

DC System

(a)	Voltage variation	-15% to +10%

4.07.00 All equipment covered under this contract shall be so designed as to withstand & work continuously with the above mentioned variation in AC/DC supplies without any deterioration in performance.

4.08.00 The system shall consist of required Service transformers and associated 11kV/3.3kV/415V switchgears to cater to FGD loads. The contractor shall mark out his own design as per the system requirement and the actual distribution shall be arranged by him as per load centre to be approved by the Owner. Any additional feeder requirement during detailed engineering shall be arranged by the contractor without any price implication.

4.09.00 All 11kV, 3.3kV buses shall have facility for auto/manual changeover facility. All 415V switchgears fed from transformers shall be provided with live manual changeover. Auto changeover to the reserve supply source shall be arranged for all 415V switchgears/MCCs to prevent the loss of unit or to ensure the equipment safety.

4.10.00 Design fault level shall be 50kA for 415V system. For higher voltage systems it shall be 40kA for 11kV systems and 3.3kV systems.

4.11.00 The nominal voltage of DC system shall be 220V for control, protection, annunciation and DC drives.

4.12.00 CT & PT secondary wiring shall be color coded i.e. wires or sleeves or ferules of Red, Yellow, Blue & Black colors shall be provided for respective phases & neutral.

4.13.00 The connections of CT secondary circuits shall be through drop out type links.

4.14.00 To minimize inventory of spare parts and ease of maintenance all 11kV & 3.3kV and 415V switchgear being supplied by package vendor shall be of same make (voltage wise).

4.15.00 For the purpose of design of equipment/systems, an ambient temperature of 50°C shall be considered. The equipment shall operate in a highly polluted (with dust and fly ash) and highly corrosive environment.

4.16.00 Contractor shall provide fully compatible electrical system, equipment, accessories and services for the entire station/plant in his scope as well as those specifically required by the Owner.

4.17.00 Areas where flammable and combustible liquids, gases, and dusts are handled and stored shall be classified for the purpose of determining the minimum criteria for design and installation of electrical equipment to minimize the possibility of ignition. The criteria for determining the appropriate classification are as specified in the relevant codes and standards.

4.18.00 Electrical equipment in areas classified as hazardous shall be constructed and installed in accordance with the requirements of the appropriate codes and standards.

4.19.00 **System Particulars**

Description	220 kV System	11kV System	3.3kV System	415V System	415V System (Lighting & Welding System)	240V System	220V DC System
Nominal Voltage	220kV	11kV	3.3kV	415V	415V	240V	220V
Highest System Voltage	245kV	12kV	3.6kV	457V	457V	264V	242V
Number of Phases (Conductor)	Three (3)	Three (3)	Three (3)	Three (3)	Four (4)	Two (2)	Two (2)
Frequency	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz	NA
Voltage Variation	±5%	±10%	±10%	±10%	±10%	±10%	+10% to –15%
Frequency Variation	±5%	±5%	±5%	±5%	±5%	±5%	NA
Combined Voltage & Frequency Variation	10%	10%	10%	10%	10%	10%	NA
Neutral Earthing	Solidly Grounded	Resistance Grounded	Resistance Grounded	Solidly Grounded	Solidly Grounded	Solidly Grounded	Un-grounded
Design Fault Level to be adopted	40kA for 3 second	40kA for 3 second	40kA for 3 second	50kA for 1second	20kA for 1second	9kA	25kA for 1second $$

Note: $$ denotes fault level at DCDB level shall be 25kA while at DLDB level fault level shall be 9kA.

outgoing tie feeders rated 630A & above and motor feeders rated above 90kW shall be equipped with air circuit breakers of fault interrupting capacity of 50KA rms. Incomers / bus- couplers, outgoing tie feeders rated up to 630A and motor feeders rated up to 90kW shall be equipped with motorized MCCB.

5.21.02 All the boards shall be sectionalized.

5.21.03 Not more than 2 out of 3 ACBs can be closed at a time unless at the time of planned short time paralleling through synchro check.

5.21.04 Under normal mode of operation each incoming source shall be connected to the respective bus sections with bus coupler open.

5.21.05 During the normal mode of operation if there is a loss of normal source to any bus-section, slow bus auto changeover shall be initiated to first trip the normal incomer connected to this section and further close the bus coupler to extend power from healthy bus section.

5.21.06 Restoration of normal operating condition shall be through planned manual changeover through synchro check paralleling or manual dead bus closing. Incase parallel running between two sources prolong over a set time, an alarm shall be generated and the last ACB to close shall be opened.

5.21.07 The AC control supply voltage for motors rated 90kW & below shall be 110V AC. For this purpose each motor feeder of PMCC/MCC shall be provided with suitable rated 415/110V Control Transformer. Separate control transformer for test bus supply shall be provided for each bus section.

5.21.08 All circuit breakers shall have 220V DC control.

Draw-out Type PMCC

- 415V FGD PMCC-1
- 415V FGD PMCC-2

Fixed Type Distribution Boards

- DCDB
- Power Distribution Board (PDB)
- Main Lighting Distribution Boards (MLDB)
- Emergency Main Lighting Distribution Board (EMLDB)
- DC Lighting Distribution Board (DCLDB)

5.21.09 Any other PCC/PMCC/MCC/DB required as per the distribution of load and for any other system which is part of mechanical system under FGD package.

5.22.00 **Protection Philosophy**

5.22.01 Single comprehensive Numerical type protective relays of latest generation shall be provided to isolate the faulty equipment and system as early and as expeditiously possible. All numerical relays shall communicate with PLC through Open protocol (IEC 61850). Protection requirement for individual equipment have been elaborated under respective switchgear sections.

5.23.00 **LV Power Supply**

LV power supply feeders shall have moulded case circuit breaker (MCCB) for over current & short-circuit protection.

5.24.00 **Operation and Control Philosophy**

5.24.01 **Auxiliary Power supply system control**

a) All controls, indications, measurements, annunciation and sequential event logging for all drives shall be provided in PLC.

b) Control of all 415V incomer and bus coupler breakers of PCC / PMCC / MCC shall be done from PLC.

5.24.02 **Interface with PLC**

a) Control, monitoring, measurement, annunciation of complete electrical system supplied under this contract shall be possible from the PLC system.

b) All relevant data shall be made available to the PLC by the Contractor.

5.24.03 **Control**

a) All the electrical drives shall be generally controlled (starting, stopping and sequencing) from the FGD control room through the PLC. Remote position, service position, breaker healthiness, permissive for interlocks, status of emergency stop Push button etc., shall be considered as minimum inputs to the PLC.

b) Control of incomers and bus-coupler breakers of LV Switchgear shall be possible from the PLC. Check synchronizing relay shall be housed in the respective switchboards. Provision shall be made in PLC based system for selection of only one breaker at a time for synchronizing. The synchronizing selection shall also activate the check synchronizing relay provided in the respective switchgear panels.

c) Control of all breakers/contactors from PLC based control system shall be done through interposing relays. These interposing relays shall be available in the respective switchgear panels. Any auxiliary relay required for linking with PLC shall also be provided. Interposing relays shall be plug-in type.

d) No hard-wired switch is envisaged near the motor or control desk for selection of motors. Selection of motor is only through software through mouse click.

5.24.04 **Monitoring**

a) Indication-Status of breakers / vacuum contactors, position of Local/Remote selector switches, spring charged indication etc.

b) Abnormal conditions of LV System: -

- Breaker auto trip, individual protective relay operation, trip circuit failure, DC supply failure, bus under voltage, VT fuse failure. Successful/Unsuccessful changeover of 415V supplies.

c) Single line diagram showing voltage, current, frequency, MW and MVAR flows, breaker positions shall be available on CRT.

d) Trending facility shall be provided for all analogue parameters. Separate Transducers shall be considered for this.

5.24.05 **Measurement**

Multi-functional Transducers, if any required for giving analogue input to PLC system from LV modules shall be provided in the switchgear modules.

Sl No	Feeder Description	CRT
a)	Incoming feeders of LV Switchgears & MCCs rated 630A and above.	Voltage (All phases)
		Current (All phases)
		KW, KWH
b)	Incomer feeder of LV MCC rated below 630A	Current Y phase
c)	Bus coupler of LV switchgears & MCC rated 630A and above.	A (All phases)
d)	Bus coupler of LV MCC rated below 630A	Current Y phase
e)	LV Buses	Voltage (All phases)
f)	Outgoing feeder of LV Switchgear and MCC rated 630A and above.	Voltage (All phases)
		Current (All phases)
		KW, KWH
g)	Outgoing feeder of LV MCC rated below 630A	NIL
h)	Motor feeder rated above 90kW	Current (All phases)
		KW, KWH
i)	Critical drive feeder rated above 18.5kW upto 90kW	Current Y phase
j)	Motor feeder rated up to 18.5kW	NIL
k)	Incomer of ACDB/MLDB/PDB/MCCB	Voltmeter with voltmeter selector switch.
		Electronic energy meter with communication port suitable for IEC-61850 protocol. Electronic energy meter suitable for communication with protocol Modbus RS 485 is also acceptable.

5.24.06 **Event Logging**

Event logging shall be provided for all manual operations and relay operations as detailed below: -

a) Status of each ACB of all equipment being controlled

b) Close and open commands

c) Each protective relay, trip relay, alarm relay operation. Event logging for each phase shall be provided wherever applicable (e.g. fuse fail alarm, etc.).

Event logger shall be a part of the PLC based control system.

PLC based control system shall be directly interfaced with numerical relays for digital / analogue signals through open protocol IEC 61850. All sequence of event recorder (SER) signals shall be with time stamping in PLC based control system.

5.24.07 **Synchronizing**

LV Switchboards / MCC incomer and bus coupler breakers shall have facility for dead bus and synchronizing closure through PLC based control system.

5.25.00 **Motors**

5. 25.01 Motors rated up to and including 160kW shall be connected to 415V, 50Hz AC supply. Motors rated above 160kW up to and including 750kW shall be connected to 3.3KV, 50Hz supply. Motors rated above 750kW shall be connected to 11kV, 50Hz supply.

5. 25.02 All LT motors of S1 duty cycle shall conform to minimum efficiency performance standards (MEPS) of IE3 mentioned in IS: 12615. All HT motors shall have efficiency and power factor higher than 90% and 0.83 power factor respectively. For crane motors S4 duty with 40% cyclic duration factor shall be considered. Motors operating through variable frequency drives shall be suitable for inverter duty.

5. 25.03 The motor name-plate rating at 50°C shall have at least 15% margin for HT & LT system over the input power requirement of the driven equipment at rated duty point and also covering the 10% margin on maximum load demand of the driven equipment under entire operating range, including voltage and frequency variations, unless stated otherwise in driven equipment specification or in general electrical specification.

5. 25.04 All motors shall have Class F insulation with temperature rise limited to Class-B.

5.26.00 **Selection of Cables**

5.26.01 HV & MV cables and LV power cables shall be selected on the basis of current carrying capacity, short circuit rating and permissible voltage drop.

a) While sizing power cables, following aspects shall be considered: -

i) Ground / ambient air temperature.
ii) Depth of laying
iii) Power cables laid in touching formation for multicore cables and in trefoil formation for single core cables.
iv) Fault current & duration
v) Full load current of the circuit
vi) Steady state voltage drop with maximum load current
vii) Transient voltage dip on motor starting
viii) Consideration shall also be given to limit the cable to the nearest standard sizes instead of using too many types.
ix) The standard cable sizes, ampacities, de-rating factors, etc. shall be as given in IS or relevant standard.
x) Route length.

b) The fault current & interrupting time shall be as under: -

i) For 11kV - 40kA - 0.2 sec for outgoing motor feeders and transformer feeders and 40kA - 1sec for tie and incomer feeders.

ii) For 3.3kV - 40kA - 0.2 sec for outgoing motor feeders and transformer feeders and 40kA - 1 sec for incomers & tie feeders.

iii) For 415V - 50kA - 0.25 sec for motor feeders and 50kA -1sec for incomer & tie feeders.

For sizing of 11 kV incoming cable to FGD Switchgear from Station Transformer, contractor shall consider the secondary side full load current of the 63/31.5/31.5MVA Station Transformer as current carrying capacity of the cable.

5.26.02 For MCCB/MPCB protected feeders, minimum cross section criteria shall not apply. Also Outgoing feeders where only IDMTL protection is provided, 1sec shall be considered for cable sizing.

5.26.03 For ACB / MCCB / MPCB protected circuits the conductor size shall depend upon full load current subject to voltage drop limited to 3% during running of all feeders and 15% during starting of motors having rigid coupling. For motors having fluid coupling the starting voltage drop can be considered as 20%. In addition, transformer regulation shall also be considered for loads fed from 415V PMCC.

5.26.04 For all HV & LV power and 220V DC cable 10% design margin in load current shall be considered.

5.26.05 The voltage drop from main lighting distribution board to any fixture shall not exceed 3%. For welding receptacles 3% running drop shall only be considered.

5.34.08 At least one 5/15A, 230V AC universal socket outlet with switch shall be provided in each office, cabins, etc. 20A, 230V AC industrial receptacle with switch shall be provided strategically in all industrial area.

5.35.00 **Welding Sockets**

Suitable number of 63A, 3ph., 4 wire, 5 pin, 415V AC industrial receptacles shall be provided for entire plant for welding purposes, particularly near all major equipment and at an average distance of 50 M.

63A welding sockets shall be fed from 415V FGD PMCC.

5.36.00 **Degree of Protection for Enclosures of Electrical Equipment**

5.36.01 Degree of protection for various enclosures as per IS: 13947 shall be as follows:-

Description of Equipment	Degree of Protection
LV Switchgear/MCC/DBs/Fuse Boards	
Compartments and bus bar chambers up to 1600A	IP52
Compartments and bus bar chambers above 1600A	IP42
Switchgear located outdoor	IP55
Motors	
Indoor motors	IP55
Outdoor motors	IP55 with external FRP canopy
Actuator	IPW-67
Push button stations and any other kiosk/box/panel/ enclosure	
Indoor	IP42 for Control & Relay panels located in air-conditioned areas
Outdoor	IP55
In dusty areas, e.g. conveyor galleries, transfer points, bunker floor, lignite feeder, ESP area, Mill area etc	IP65
Junction boxes for cables/wires	IP55

6.00.00 LAYOUT CRITERIA

6.01.00 **Criteria of Oil Pit for Station FGD Transformer and FGD Auxiliary Transformer**

6.01.01 **Oil Pit under Transformer and its Cooler Bank (Station FGD Transformer):**

Gravel filled open oil pit shall be provided under each transformer and its cooler bank. The pit shall be such that it can take oil/water surge of 1/3 of the volume of the transformer oil when filled with gravel of size 38mm. Level of pit shall be such that there shall not be accumulation of oil/water in the pit. Each pit shall be

11.00.00 TROPICAL PROTECTION

11.01.00 All electrical equipment, accessories and wiring shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

11.02.00 Fine mesh screen of corrosion resistant material shall be furnished on all ventilating openings to prevent entry of insects.

12.00.00 TESTS

12.01.00 **Type Test**

All equipment / cables shall be of proven design and type tested as per relevant standards. Type test certificates / specific type tests shall be furnished / conducted, if asked for with reference to any specific equipment in the respective sub-section of the specification. In case of submission of type test if the contractor is not able to submit report of the type test(s) conducted or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests without cost implication in the presence of the purchaser and submit the reports for approval.

12.02.00 **Routine Tests**

All routine and acceptance tests shall be conducted as per relevant standards in the presence of the purchaser or his representative.

13.00.00 SPECIFIC REQUIREMENT - SERVICES & INSTALLATION

13.01.00 **Methods and Workmanship**

13.01.01 All equipment shall be installed in a first class, neat workmanlike manner by mechanics/electricians skilled in the trade involved.

13.01.02 The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.

13.01.03 All details on installation shall be electrically and mechanically correct.

13.01.04 The installation shall be carried out in such a manner as to preserve access to other equipment installed.

13.02.00 **Protection of Work**

13.02.01 For protection of this work, the Contractor shall provide fencing and lighting arrangement, connect space heaters and provide heating arrangement as necessary or as directed by the Owner/Consultant.

14.00.00 DRAWINGS, DATA, INFORMATION AND MANUALS

16.00.00 SAFETY

16.01.00 All equipment shall be complete with approved safety devices and with provision for safe access of personnel to and around the equipment for operation and maintenance. The design of plant & machinery shall include not only those usually furnished components but also the additional covers, stairways, ladders, steel structural platforms for operators control panels, handrails, partitions etc. which are necessary for safe operation of the plant.

16.02.00 The Contractor must take sufficient care in moving his construction plants and equipment from one place to another so that those may not cause any damage to the Property of the Purchaser/other Contractors particularly to the overhead and underground cables and other service lines.

16.03.00 When the work is carried out at night or in the obscure day light, adequate for flood lighting in the working area shall be made by Contractor at his own cost and got approved by the Purchaser.

16.04.00 The safety posters/regulation for prevention of accidents shall be displayed by the Contractor at appropriate places. Notices and warning signs shall be displayed for all sources of dangers.

16.05.00 All electrical drives and equipment must be equipped with safety devices. The safety provisions shall conform to the recognized standards, safety codes and statutory regulations.

16.06.00 All safety measures as required to be adopted as per the statutory regulations and the safety rules of the plant shall be strictly followed by the Contractor during the execution of the Contract.

16.07.00 Danger boards shall be provided in line with the statutory requirements.

16.08.00 Rubber mats shall be provided to meet the safety and other statutory requirements.

16.09.00 Adequate number of first aid boxes as defined in the State Factory Rules shall be provided and maintained at all work sites.

17.00.00 SPARES PHILOSOPHY

17.01.00 LV switch board, PMCCs, MCCs, PDBs and MLDBs shall be provided with 20% spare feeders or one no. of each type and rating whichever is higher shall be provided at the time of handing over the plant (irrespective of the spares finalized during detailed engineering).

17.02.00 DCDBs shall be provided with 20% of spare feeders shall be provided at the time of handing over the plant (irrespective of the spares finalized during detailed engineering).

17.03.00 20% spare terminals shall be provided in each module of PCC, PMCC, MCC and each ACB panel.

17.04.00 2 Nos. of interposing (24V) plug in type relays fully wired up to the terminal blocks shall be provided in all the incomer/bus coupler feeders of PCC/PMCC/MCC.

17.05.00 For HV and MV switchgears. In each switchgear sections

a) 1 no highest rated motor feeder
b) 1 no lowest rated motor feeder
c) 1 no highest rated transformer feeder

18.00.00 CONSTRUCTION POWER

18.01.00 The Contractor shall be provided with construction power at 415V, 630A, 2 feeders for the purpose of the erection construction under the Contract in the project "Site" free of charge. Maximum of 0.75 MVA shall be given free of Cost for FGD Package as Construction power. The Contractor shall make his own arrangement for further distribution. Contractor shall arrange necessary DBs, capacitor banks along with APFCR, armoured cables etc. for the distribution to various loads.

18.02.00 Contractor shall supply and install electrical equipment as per regulations of the local electrical inspectorate / statutory body for electrical installation. Contractor shall be responsible for getting all the necessary clearances from electrical inspector.

18.03.00 On award of contract, the Contractor shall furnish the electrical scheme for construction power supply for PURCHASER's review/ approval. The Contractor shall indicate 6 monthly maximum demand requirements with in the allotted maximum demand.

18.04.00 Operation and maintenance of all construction power supply equipment is in the scope of Contractor.

18.05.00 Capacitor banks shall be installed at each LT distribution board and at the load points for P.F. improvement to 0.95.

18.06.00 Distribution of 415V supply shall be done using underground cables. All cables being used for construction power shall be armoured only. For the areas like roads, nearer to buildings and areas where there are frequent vehicle movement the cable shall be routed in hume pipes or GI conduits. Buried cable shall be suitably identified by the route markers.

18.07.00 Detailing of LT (3 phase, 4 wire) switchgear, protection of transformers etc. are included in the scope of Contractor. Power distribution to loads shall be carried out by suitably rated cables buried under ground by the contractor. All CTs, PTs, necessary meters etc. for protection and metering are included in the scope.

Numerical relays & networking

These relays shall be connected to the Switchgear SCADA System, through Ethernet switches. Each numerical relay shall be connected to the Ethernet switch provided in the Switchgear through Cat5e Ethernet /FO cable. Ethernet Switches shall be connected through Fibre Optic cable to form a ring network. The alarm / status of each of protection function and trip operation shall be communicated to Switchgear SCADA / DDCMIS. The numerical relays shall have built in feature / hardware interface to provide such inputs to Switchgear SCADA / DDCMIS for analog / digital values. The required .ICD / .CID files of the Numerical relays under the scope of this package for the integration with the SCADA shall be provided by the Numerical relay vendor along with necessary engineering support. At least one no. of each type of Numerical Relay shall be made available during the Factory Acceptance Test (FAT) of the Switchgear SCADA system along with the necessary engineering support from the Numerical Relay vendor.

ETHERNET SWITCH

1. Ethernet switches shall be 'substation hardened', and shall comply with IEC61850 for communications and environment requirements. The Ethernet switches shall be of managed type with two (2) No of Fibre Optic cable ports and Sixteen / Eight Copper ports to achieve the LAN configuration indicated in the drawings. The Ethernet switches shall have features to support the dual redundant rings as shown in the architecture drawings. These switches shall be mounted inside the switchgear Panels and shall be suitable for accepting dual redundant power supplies. The FO ports shall be Single-mode 1000Mbps ports. Copper ports shall be 10/100Mbps ports.
2. Necessary software for configuration and real-time network monitoring shall be provided along with the Ethernet switches. Network monitoring feature shall be integrated with the SCADA software to provide complete network status on the HMI.

LAN CABLE & CONNECTOR

1.Cat5e Ethernet cable shall be used for connecting the numerical relays to Ethernet switches. In case FO ports are proposed on the numerical relays, Ethernet switches shall also have suitable FO ports as per the quantity mentioned above. Further, additional FO patch cords of maximum length (quantity – 10% of total quantity of IEDs) shall be supplied to facilitate maintenance.
FURTHER THE CONNECTION BETWEEN NUMERICAL RELAYS TO ETHERNET SWITCHES THROUGH cat5E/ OFC IS IN BIDDER'S SCOPE.
Ethernet switches shall have provision to receive dual redundant power supplies

DC FUSE DB & AC FUSE DB TECHNICAL SPECIFICATION:

Each DC MCCB Box shall comprise of the following :

(a.) 1 no. 63 A DP MCCB as incomer

(b.) 100 A fully insulated (PVC sleeved,UL224) busbars.

(c.) 8 nos. 16A outgoing DP MCCB feeders.

(d.) 1 no. auxiliary contactor for supply monitoring.

(e.) 1 no. Blue LED indicating lamp.

Each AC MCCB Box shall comprise of the following :

(a.) 1 no. 63A TPN MCCB as incomer.

(b.) 100 A, 3-phase, 4-wire, fully insulated (PVC sleeved,UL224) busbars.

(c.) 9 nos. 16 A DP MCCB and 3 nos. 16 A TPN MCCB units as outgoing feeders.
(d.) 3 nos. LED indicating lamps (R, Y, B) for incoming supply monitoring.

The handle of incoming MCCB shall be mounted on the door of the panel, with padlocking facility in both 'ON' and 'OFF' positions. All the outgoing feeders shall be accessible only after opening the panel door.

Cable entry facilities shall be provided at bottom with removable gland plates of suitable thickness. However, top cable entry may be allowed in case of layout constraints. All incoming and outgoing cables shall be terminated on suitable terminal blocks.

6. SCOPE OF SUPPLY

PRICE FORMAT

SL.NO	MATERIAL CODE	MATERIAL DESCRIPTION	QTY	UOM	BOM	UNIT PRICE (RS)	TOTAL PRICE (RS)
10	ELFGDTUTCPJ12101	415V FGD SERVICE PMCC UNIT 1 # 1DF	1	EA	ANNEXURE-01		
20	ELFGDTUTCPJ12102	415V FGD SERVICE PMCC UNIT 2 # 2DF	1	EA	ANNEXURE-02		
30	ELFGDTUTCPJ12103	415V EMERGENCY MCC # 0DG	1	EA	ANNEXURE-03		
40	ELFGDTUTCPJ12104	415V FGD HVAC MCC # 0TA	1	EA	ANNEXURE-04		
50	ELFGDTUTCPJ12105	415V WWTP MCC # 0SA	1	EA	ANNEXURE-05		
60	ELFGDTUTCPJ12106	415V WS,HVAC,Compressed AIR MCC-0SB	1	EA	ANNEXURE-06		
70	ELFGDTUTCPJ12107	415V COMMON MCC # 0SC	1	EA	ANNEXURE-07		
80	ELFGDTUTCPJ12108	220V MAIN DCDB # 0FA	1	EA	ANNEXURE-08		
90	ELFGDTUTCPJ12109	415V FGD LHP/GHP PMCC-0DE	1	EA	ANNEXURE-09		
100	ELFGDTUTCPJ12110	415V MLDB FOR LHP&GHP WITH 2X100KVA TRAF	1	EA	ANNEXURE-10		
110	ELFGDTUTCPJ12111	415V WDB FOR LHP &GHP WITH 2X100KVA TRAF	1	EA	ANNEXURE-11		
120	ELFGDTUTCPJ12112	DC FUSE DB	4	EA			
130	ELFGDTUTCPJ12113	AC FUSE DB	2	EA			
140	ELFGDTUTCPJ12114	Mandatory spares for LT switchgear ANX-D	1	LOT	ANNEXURE-14		
150	ELFGDTUTCPJ12115	COMMISSIONING SPARES-ANNEXURE-E	1	LOT	ANNEXURE-15		
160	ELFGDTUTCPJ12116	TOOLS & TACKLES -ANNEXURE-F	1	LOT	ANNEXURE-16		
170	ELFGDTUTCPJ12117	COMMISSIONING CHARGE FOR NR - ANNEXURE G	1	LOT	ANNEXURE-17		
180	ELFGDTUTCPJ12118	SITE MODIFICATION CHARGES Annexure-H	1	LOT	ANNEXURE-18		
190	ELFGDTUTCPJ12119	SITE MOD MATL@1% Total Exworks (SL 1-13)	1	LOT			
TOTAL BASIC COST							

NOTES:

1. SUMMATION OF ALL UNIT RATES OF MODULES SHALL BE EQUIVALENT TO TOTAL BOARD COST QUOTED, VARIANCE OF +/- 5% IS ACCEPTABLE. BEYOND 5% OFFER WILL NOT BE CONSIDER AS VALID OFFER. IN UNIT ADDITION-DELETION PRICES, PRICES QUOTED FOR COMPONENTS SHALL BE AS PER LIST PRICE OF CONCERNED MANUFACTURES. IF ANY ABNORMAL PRICES ON HIGHER SIDE OBSERVED OFFER MAY BE REJECTED.

2. ALL LT PCC/ MCC/ DBs SHALL BE SUPPLIED ALONGWITH THE INTEGRAL BASE FRAMES, CABLE GLANDS & LUGS AND TOOLS & TACKLES AS MENTIONED IN DIFFERENT SECTIONS. ALL FIXING NUTS & BOLTS TOGETHER WITH FOUNDATION BOLTS SHALL ALSO BE SUPPLIED.

3. ITEM WISE PRICES WITH DESCRIPTION AND RATING OF EACH ITEM COMPLYING TO LIST FURNISHED IN THE SCHEDULE OF UNIT PRICES SHALL BE FURNISHED IN SCHEDULE OF UNIT PRICE.PRICES SHALL BE FURNISHED IN SCHEDULE OF UNIT PRICE.

4. FOR DETAILED BOARD WISE BOM, REFER ANNEXURE-B.

5. FOR DETAILED MODULE WISE BOM, REFER ANNEXURE-C.

6.ADDITION/DELETION OF QUANTITIES SHALL BE APPLICABLE AT THE QUOTED PRICE.THE UNIT RATE OF SUPPLY OF ALL EQUIPMENTS & SERVICES QUOTED BY THE BIDDER SHALL BE FIRM FOR A VARIATION OF QUANTITIES , WHICH MAY BE TO THE EXTENT OF ±30% OF THE TOTAL CONTRACT VALUE DERIVED ON THE BASIS OF ORDERED QUANTITY. SUM OF INDIVIDUAL MODULE SHALL EQUAL TO BOARD PRICE.
a. COMPLETE DIMENSIONS OF ALL THE BOARDS INCLUDING NO OF PCC, MCC. GA DRAWING SHALL BE DULY SUBMITTED FOR ALL BOARDS.
b. DIMENSIONS OF EACH TYPE OF PANEL.
c. MODULE SIZE OF EACH TYPE OF FEEDER.
d. MINIMUM CLEARANCES REQUIRED ON ALL SIDES FOR EACH TYPE OF PANEL.
e. NO. of VERTICAL (including PCC, MCC etc.) of EACH PANLES TO BE GIVEN, ELSE YOUR OFFER WILL BE REJECTED..
7. DOUBLE COMPRESSION, NICKLE PLATED BRASS CABLE GLANDS & HEAVY DUTY LUGS OF NTPC APPROVED MAKE FOR EXTERNAL POWER, CONTROL & EARTHING CONNECTIONS AT SUPPLIED EQUIPMENT END AND FOUNDATION BOLT ARE IN THE SCOPE OF BIDDER. BIDDER TO QUOTE ALL EQUIPMENT WITH CABLE GLANDS, LUGS AND FOUNDATION BOLTS.

7. BOARDWISE BOM –ANNEXURE-B1 TO B11

ANNEXURE-01

1DF LOAD DATA		
FEEDER TYPE	**FDR RATING**	**TOTAL-QTY**
DAE (O/G)	2000A	2
DAE (O/G)	630A	1
DAE (O/G)	800A	2
DAET BC	4000A	1
DAET IC	4000A	2
DK2	15KW	4
DK2	3.7KW	10
DK2	7.5KW	6
DK21	18.5KW	4
DK21	75KW	2
E1 (O/G)	32A	7
E1 (O/G)	63A	2
E3 (O/G)	100A	16
E3 (O/G)	400A	4
E3 (O/G)	32A	119
E3 (O/G)	400A	2
E3 (O/G)	63A	5
G1	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
ACB O/G PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-02

2DF LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
DAE (O/G)	2000A	2
DAE (O/G)	630A	1
DAE (O/G)	800A	2
DAET BC	4000A	1
DAET IC	4000A	2
DK2	15KW	4
DK2	3.7KW	10
DK2	7.5KW	6
DK21	18.5KW	4
DK21	75KW	2
E1 (O/G)	32A	7
E1 (O/G)	63A	2
E3 (O/G)	100A	16
E3 (O/G)	400A	4
E3 (O/G)	32A	119
E3 (O/G)	400A	2
E3 (O/G)	63A	5
G1	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
ACB O/G PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-03

0DG LOAD DATA

FEEDER TYPE	FEEDER RATING	TOTAL-QTY
DAE BC	800A	1
DAE IC	800A	2
DK2	11KW	4
DK2	22KW	10
DK2	3KW	10
DK2	5.5KW	12
DK2	7.5KW	2
DK21	30KW	6
DK21	45KW	12
DK2E	5.5KW	10
E3 (O/G)	100A	6
E3 (O/G)	200A	2
E3 (O/G)	32A	7
E3 (O/G)	400A	6
G2	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-04

0TA LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
DAE BC	630A	1
DAE IC	630A	2
DK2	0.37KW	2
DK2	0.55KW	2
DK2	0.75KW	12
DK2	1.1KW	13
DK2	1.5KW	15
DK2	2.2KW	18
DK2	2.2KW'	8
DK2	7.5KW	4
E3 (O/G)	200A	4
E3 (O/G)	32A	6
EA1	32A	2
EA3	32A	6
G1	100VA	2
J1	2KVA	2
SH	2KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-05

0SA LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
DAE BC	400A	1
DAE IC	400A	2
DK2	0.37KW	13
DK2	0.55KW	8
DK2	0.75KW	2
DK2	1.1KW	4
DK2	1.5KW	13
DK2	15KW	4
DK2	2.2KW	4
DK2	3.7KW	6
E1(O/G)	32A	12
E3 (O/G)	100A	4
E3(O/G)	32A	9
E3(O/G)	63A	2
G1	100VA	2
J1	2KVA	2
SH	3KVA	2
ACB I/C PANEL	As required	AS REQ equired
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-06

0SB LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
DAE BC	630A	1
DAE IC	630A	2
DK2	0.37KW	5
DK2	1.1KW	1
DK2	1.5KW	5
DK2	11KW	5
DK2	2.2KW	6
DK2	3.7KW	4
DK21	30KW	4
DM-PM	90KW	4
E1 (O/G)	32A	9
E3 (O/G)	200A	4
E3 (O/G)	32A	29
G1	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-07

0SC LOAD DATA

FEEDER TYPE	FEEDER RATING	TOTAL-QTY
DAE BC	2000A	1
DAE IC	2000A	2
DK2	0.5KW	4
DK2	0.75KW	4
DK2	1.1KW	6
DK2	1.5KW	4
DK2	11KW	14
DK2	15KW	7
DK2	18.5KW	11
DK2	2.2KW	4
DK2	22KW	6
DK2	2KW	6
DK2	3.7KW	7
DK2	3KW	6
DK2	5.5KW	20
DK2	7.5KW	6
DK21	37KW	6
DK21	55KW	4
DK21	75KW	6
DM/PM	132KW	4
E3 (O/G)	100A	10
E3 (O/G)	32A	121
E3 (O/G)	63A	7
G1	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-08

0FA LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
CH	400A	2
DB	400A	2
DC	400A	3
VM	NA	2
X	32A	50
X	400A	4
X	63A	8
MCC (SFFT)	As required	As required

ANNEXURE-09

0DE LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
DAE OG	630A	3
DAET BC	2500A	1
DAET IC	2500A	2
DK2	0.37KW	12
DK2	0.55KW	6
DK2	11KW	4
DK2	2.2KW	6
DK2	22KW	4
DK2	3.7KW	4
DK2	7.5KW	4
DK2	9.3KW	4
DK21	75KW	4
DN1	2.2KW	6
E3	100A	6
E3	200A	8
E3	32A	28
E3	400A	8
E3	63A	18
G1	100VA	2
J1	2KVA	2
SH	5KVA	2
ACB I/C PANEL	As required	As required
ACB B/C PANEL	As required	As required
MCC (DFDO)	As required	As required
DUMMY PANELS	As required	As required
Ethernet Switch		1

ANNEXURE-10

MLDB LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
E3+TRAFO IC	100KVA / (400A MCCB PRIMARY + 400A MCCB SECONDARY)	2
E3	63A	7
E3	32A	6
E3	100A	2
VM	50VA	1
SH	2KVA	1
EM3 I/C	As required	As required
EM3 B/C	As required	As required
MCC (SFFT)	As required	As required

ANNEXURE-11

MLDB LOAD DATA		
FEEDER TYPE	**FEEDER RATING**	**TOTAL-QTY**
E3+TRAFO IC	100KVA / (400A MCCB PRIMARY + 400A MCCB SECONDARY)	2
E3	63A	12
VM	50VA	1
SH	2KVA	1
EM3 I/C	As required	As required
EM3 B/C	As required	As required
MCC (SFFT)	As required	As required

8. MODULEWISE BOM-ANNEXURE-C

MODULE WISE BOM **ANNEXURE-C REV 2**

SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.	Comments
1	DAET (I/C)	PMCC INCOMER OF 1600A, 2000A, 2500A, 3000A, 3200A, 4000A SHALL COMPRISE OF:		
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	1	
		MCB 6A, 4P 415V AC	1	
		MCB 16A DP, 220V DC	1	
		MCB 6A DP, 220V DC	5	
		Indicating Lamp	13	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		CURRENT TRANSFORMER (PROTECTION)10VA, CL-PS	3	
		METERING CT 10VA,CLASS 0.5 ACCURACY	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3	
		KW TRANDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AMMETER	1	
		VOLTMETER	1	
		AMMETER SELECTOR SWITCH	1	
		VOLTMETER SELECTOR SWITCH	1	
		LOCKOUT RELAY HAND RESET TYPE	1	
		FUSE FAILURE RELAY	1	
		NEUTRAL LINK 32A	1	
		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	
		POWER TERMINAL	As required	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTRH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL

		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		Auxilliary breaker contact multiplication relay	1	
2	**DAE (I/C)**	**MCC INCOMER OF 630A, 800A, 1000A, 1250A, 1600A, 2000A SHALL COMPRISE OF:**		
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	1	
		MCB 6A, 4P 415V AC	1	
		MCB 16A DP, 220V DC	1	
		MCB 6A DP, 220V DC	5	
		Indicating Lamp	13	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		METERING CT 10VA,CLASS 0.5 ACCURACY	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3	
		KW TRANDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AMMETER	1	
		VOLTMETER	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		AMMETER SELECTOR SWITCH	1	
		LOCKOUT RELAY HAND RESET TYPE	1	
		FUSE FAILURE RELAY	1	
		NEUTRAL LINK 32A	1	
		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	
		POWER TERMINAL	As required	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL

		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •RESTRICTED EARTRH FAULT PROTECTION(64R) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		Auxilliary breaker contact multiplication relay	1	
3	DAET/DAE (B/C)	**PMCC/MCC BUSCOUPLER OF 630A, 800A, 1000A, 1250A, 1600A,2000A, 2500A, 3000A, 3200A,4000A SHALL COMPRISE OF:**		
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL
		MCB 16A DP, 220V DC	3	
		MCB 6A DP, 220V DC	6	
		AUXILIARY CONTACTOR 2NO+2NC 220VDC	1	
		BREAKER CONTACT MULTIPLICATION RELAY	1	
		Indicating Lamp	13	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		METERING CT 10VA,CLASS 0.5 ACCURACY	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3	
		KW TRANDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AMMETER	1	
		VOLTMETER	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		AMMETER SELECTOR SWITCH	1	
		LOCKOUT RELAY HAND RESET TYPE	1	
		FUSE FAILURE RELAY	1	
		NEUTRAL LINK 32A	1	
		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	
		POWER TERMINAL	As required	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	

		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTRH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		DC SOURCE SLECTION SWITCH	2	
4	**DAEG(-I/C)**	**EMERGENCY MCC INCOMER OF 800A, 1000A, 1250A, 1600A, 2000A, 2500A SHALL COMPRISE OF:**		
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, WITH 6 NO+ 6 NC AUXILARY CONTACTS (FOR CUSTOMER USE) AND 4NO+4NC POSITION CONTACTS POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2	
		MCB 6A, 4P 415V AC	1	
		MCB 16A DP, 220V DC	1	
		MCB 6A DP, 220V DC	5	
		Indicating Lamp	13	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-PS	3	
		METERING CT 10VA,CLASS 0.5 ACCURACY	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3	
		KW TRANDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AMMETER	1	
		VOLTMETER	1	
		Ammeter Selector Switch	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		LOCKOUT RELAY HAND RESET TYPE	1	
		FUSE FAILURE RELAY	1	
		NEUTRAL LINK 32A	1	
		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	

		POWER TERMINAL	As required	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESTRICTED EARTRH FAULT PROTECTION(64R) • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%) • DIFFERENTIAL PROTECTION (HIGH IMPEDANCE) • REVERSE POWER PROTECTION • DG NEUTRAL DISPLACEMENT • DG MONITORING	1	Numerical Relay shall be supplied by BHEL
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •UNDER VOLTAGE PROTECTION(27) •BACKUP (STANDBY) EARTH FAULT PROTECTION (64S) •ANTI PUMPING (94) •CHECK SYNCHRONIZING 25 THROUGH RELAY MOUNTED IN BUS COUPLER		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		Auxilliary breaker contact multiplication relay	1	
5	**DAE/DAE-TIE (O/G)**	**OUTGOING BREAKER FEEDER OF 630A, 800A, 1000A, 1250A, 1600A, 2500A SHALL COMPRISE OF:**		
		ACB 4P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC,4NO + 4NC CONTACTS OF POSITION/ CELL SWITCH. SPRING CHARGE LIMIT SWITCH WITH minimum 2NO + 2NC contacts.	1	ACB shall be supplied by BHEL
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2	
		MCB 16A DP, 220V DC	1	
		MCB 6A DP, 220V DC	5	
		Indicating Lamp	10	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		METERING CT 10VA,CLASS 0.5 ACCURACY	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	3	
		KW TRANDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter Selector Switch	1	
		LOCKOUT RELAY HAND RESET TYPE	1	
		FUSE FAILURE RELAY	1	
		NEUTRAL LINK 32A	1	

		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	
		POWER TERMINAL	As required	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION • RESIDUAL EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • SYNCHRONIZING FEATURE • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	1	Numerical Relay shall be supplied by BHEL
		•INSTANTANEOUS OVER CURRENT PROTECTION (50) •IDMT OVER CURRENT PROTECTION (51) • INSTANTANEOUS EARTH PROTECTION (50N) • IDMT EARTH FAULT PROTECTION (51N) • CIRCUIT BREAKER FAILURE PROTECTION (50BF) •ANTI PUMPING (94)		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		Auxilliary breaker contact multiplication relay	1	
6	**DM /PM**	**BREAKER CONTROLLED MOTOR ABOVE 90KW SHALL COMPRISE OF:**		
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, 4NO + 4NC AUXILIARY CONTACTS (FOR CUSTOMER USE), POSITION LIMIT SWITCH FOR TEST & SERVICE POSITION SPRING CHARGE LIMIT SWITCH, OPERATION COUNTER, DOOR INTERLOCK WITH PAD LOCKING FACILITY	1	ACB shall be supplied by BHEL
		MPCB 6A, TP WITH 1NO AUX. CONTACT, WITHOUT ROH	2	
		MCB 6A, 4P 415V AC	1	
		MCB 16A DP, 220V DC	1	
		MCB 6A DP, 220V DC	5	
		Indicating Lamp	10	
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3	
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3	
		CURRENT TRANSDUCER (DC),4-20mA, DUAL O/P,AUX.-220V DC	3	
		KW TRANSDUCER	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		ENERGY METER	1	
		NEUTRAL LINK 32A	1	
		CONTROL TERMINALS(FIXED)	As required	
		CT SHORTING TERMINAL-STUD TYPE	As required	
		POWER TERMINAL	As required	
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF BREAKER MOTOR FDR-12A, 240VAC	1	
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1	
		TNC SWITCH	1	
		LOCAL REMOTE SWITCH	1	
		LOCKOUT RELAY HAND RESET TYPE	1	

		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS: • SHORT CIRCUIT PROTECTION (51) • EARTH FAULT PROTECTION (51N) • OVER LOAD PROTERCTION UNDER VOLTAGE • EARTH FAULT PROTECTION • TRIP CIRCUIT SUPERVISION (95) • CIRCUIT BREAKER MONITORING • PT FUSE FAILURE • ENERGY METERING • CURRENT, VOLTAGE & FREQUENCY MEASURENMENT • LOCKED ROTOR PROTECTION CURRENT UNBALANCE PROTECTION • No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%) •NEGATIVE SEQUENCE PROTECTION •RESTART INHIBIT PROTECTION	1	Numerical Relay shall be supplied by BHEL
		• ANTI PUMPING • TRIP CIRCUIT SUPERVISION • NEGATIVE PHASE CURRENT(46) • THERMAL OVERLOAD (49) • PHASE OVER CURRENT (50/51) • EARTH FAULT (50N/51N) • LOCKED ROTOR (51LR) • NO OF STARTS PER HOUR (66) •BREAKER FAILURE (50BF) •UNDER VOLTAGE (27 FROM PT)		
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		Auxilliary breaker contact multiplication relay	1	
7	**G1**	**BUS PT MODULE FOR PCC / PMCC SHALL COMPRISE OF:**		
		6A, TP MPCB	1	
		MCB 6A, 4P 415V AC	1	
		1 PH POTENTIAL TRANSFORMER -415/ROOT3 /110/ROOT3, 50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		VOLTMETER SQ96, TAUT BAND, 240 DEGREE DIFF., ACC. CL.+-2%	1	
		VOLTMETER SELECTOR SWITCH	1	
		NUMERICAL RELAY FOR BUS PT MODULE WITH UNDER VOLTAGE PROTECTION (27)	1	Numerical Relay shall be supplied by BHEL
		FUSE FAILURE RELAY	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		AUXILIARY CONTACTOR	1	
		NEUTRAL LINK-32A	1	
		CONTROL TERMINALS(FIXED)	As required	
8	**G2**	**BUS PT MODULE FOR DG PCC SHALL COMPRISE OF:**		
		6A, TP MPCB	1	
		MCB 6A, 4P 415V AC	1	
		1 PH POTENTIAL TRANSFORMER -415/ROOT3 /110/ROOT3, 50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		VOLTMETER SQ96, TAUT BAND, 240 DEGREE DIFF., ACC. CL.+-2%	1	
		VOLTMETER SELECTOR SWITCH	1	
		NUMERICAL RELAY FOR BUS PT MODULE WITH UNDER VOLTAGE PROTECTION (27)	1	Numerical Relay shall be supplied by BHEL
		FUSE FAILURE RELAY	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		AUXILIARY CONTACTOR	1	
		NEUTRAL LINK-32A	1	
		CONTROL TERMINALS(FIXED)	As required	
9	**VM**	**BUS PT MODULE FOR MCC/ACDB SHALL COMPRISE OF:**		
		6A, TP MPCB	1	
		MCB 6A, 4P 415V AC	1	
		AUX. CONTACTOR 2NO+2NC CV. 415 V AC	2	

		VOLTMETER (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		RECTIFIER (AC TO DC),I/P-240V AC, O/P-220VDC	1	
		UNDER VOLTAGE PROTECTION (27)	1	
		FUSE FAILURE RELAY	1	
10 (A)	**CONTROL SUPPLY (CS)**	**EACH CONTROL SUPPLY OUTGOING SHALL COMPRISE OF:**		
		13A, TP MPCB	2	
		MCB 6A DP, 240V AC	2	
		MCB 16A DP, 240V AC	4	
		INDICATION LAMP	2	
		AUX. CONTACTOR , 2NO+2NC,CV. 110 V AC	4	
		NEUTRAL LINK-32A	6	
		CONTROL TERMINALS(FIXED)	As required	
		POWER TERMINALS	As required	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 2KVA	2	
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 110V AC	2	
10(B)	**TEST SUPPLY (J2)**	**EACH TEST SUPPLY OUTGOING SHALL COMPRISE OF:**		
		13A, TP MPCB	2	
		MCB 6A DP, 240V AC	2	
		MCB 16A DP, 240V AC	4	
		INDICATION LAMP	2	
		AUX. CONTACTOR , 2NO+2NC,CV. 110 V AC	4	
		NEUTRAL LINK-32A	6	
		CONTROL TERMINALS(FIXED)	As required	
		POWER TERMINALS	As required	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 2KVA	2	
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 110V AC	2	
10(C)	**SPACE HEATER SUPPLY**	**EACH SPACE HEATER SUPPLY OUTGOING SHALL COMPRISE OF:**		
		13A, TP MPCB	2	
		MCB 6A DP, 240V AC	2	
		MCB 16A DP, 240V AC	4	
		INDICATION LAMP	2	
		AUX. CONTACTOR , 2NO+2NC,CV. 240 V AC	4	
		NEUTRAL LINK-32A	6	
		CONTROL TERMINALS(FIXED)	As required	
		POWER TERMINALS	As required	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/240 V, 2KVA	2	
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 240V AC	2	
10(D)	**MOTOR WINDING HEATING TRANSFORMER SUPPLY**	**EACH MOTOR WINDING HEATING TRANSFORMER SUPPLY OUTGOING SHALL COMPRISE OF:**		
		13A, TP MPCB	2	
		MCB 6A DP, 240V AC	2	
		MCB 16A DP, 240V AC	4	
		INDICATION LAMP	2	
		AUX. CONTACTOR , 2NO+2NC,CV. 24 V AC	4	
		NEUTRAL LINK-32A	6	
		CONTROL TERMINALS(FIXED)	As required	
		POWER TERMINALS	As required	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/24V, 2KVA	2	
		4POLE,2POSI, SELECTOR SWITCH FOR CONTROL TRF.-25A, 24V AC	2	
11	**DB**	**220V DC INCOMER FROM BATTERY SHALL COMPRISE OF:**		
		DC AMMETER WITH SHUNT AND CENTER ZERO along with selector switch	1	
		DC FUSE BOX WITH FUSE FAILURE MONITORING RELAY	1	

		LOAD VOLTAGE INDICATION	1	
		BUS VOLTAGE INDICATION	1	
		OVERLOAD ALARM TO DDCMIS	1	
12	**DC**	**220V DC BUS COUPLER SHALL COMPRISE OF:**		
		DOUBLE POLE 250V MCCB WITH 2NO+2NC AUXILIARY CONTACTS	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		LOAD VOLTAGE INDICATION	1	
		BUS VOLTAGE INDICATION	1	
		OVERLOAD ALARM TO DDCMIS	1	
13	**CH**	**220V DC INCOMER OF DCDB FROM CHARGER SHALL COMPRISE OF:**		
		Double pole, 250 V MCCB	1	
		INDICATING LAMP	2	
		DC VOLTMETER	1	
		DC AMMETER WITH SHUNT along with selector switch	1	
		CURRENT TRANSDUCER	1	
		BUS VOLTAGE INDICATION	1	
		LOAD VOLTAGE INDICATION	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		MCB 6A DP, 220V DC	2	
		OVERLOAD ALARM TO DDCMIS	1	
14	**HD**	**220V DC ISOLATING SWITCH/CIRCUIT BREAK MODULE SHALL COMPRISE OF:**		
		DOUBLE POLE 250V MCCB WITH REQUIRED AUXILIARY CONTACTS	1	
		BUS VOLTAGE INDICATION	1	
		LOAD VOLTAGE INDICATION	1	
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
		DC AMMETER WITH SHUNT along with selector switch	1	
		MCB 6A DP, 220V DC	2	
		OVERLOAD ALARM TO DDCMIS	1	
15	**S**	**220V DCDB BUS MODULE FOR METERING & PROTECTION SHALL COMPRISE OF:**		
		UNDERVOLTAGE RELAY (INSTANNANEOUS WITH SETTING OF 95% OF 240VDC. THE RESETTING OF RELAY SHOULD NOT BE MORE THAN 1.05)	1	
		OVERVOLTAGE RELAY(INSTANEOUS WHICH SHALL OPERATE AT 110% OF 240V DC. THE RESETTINGRATION SHOULD NOT BE LESS THAN .95)	1	
		EARTHFAULT RELAY (CAEM21 OR EQV.)	1	
		INDICATING LAMP	2	
		MCB 6A DP, 240V AC	1	
		MCB 6A DP, 220V DC	1	
		NEUTRAL LINK	1	
		DC VOLTAGE METER (0-300V)	1	
		VOLTMETER SELECTOR SWITCH	1	
		AUXILIARY CONTACTOR,2NO+2NC,CV 220AC	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	2	
		FUSE FAILURE PROTECTION		
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1	
16	**X**	**220V DC OUTGOING FEEDER SHALL COMPRISE OF:**		
		DOUBLE POLE 250V MCCB	1	
		DC AMMETER WITH SHUNT along with selector switch	1	
		OVERLOAD ALARM TO DDCMIS	1	
		MCB 6A DP, 220V DC	1	
		INDICATING LAMP	1	
		HRC FUSES	2	
17	**CC**	**ISOLATOR INCOMER WITH CONTACTOR UPTO 630A SHALL COMPRISE OF**		
		MCB 6A, 4P 415V AC	1	
		MCB 6A DP, 240V AC	1	

		Motorized MCCB TP	1	
		Auxiliary Switch for MCCB	1	
		INDICATING LAMP	3	
		SERVICE POSITION LIMIT SWITCH	2	
		TRIPLE POLE POWER CONTACTOR WITH COIL SUITABLE FOR 415V AC WITH 2NO+2NC AUX	2	
		AUXILIARY CONTACTOR 2NO+2NC ,CV 415V AC	2	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		AUX CONTACTOR,2N0+2NC, CV 110 V AC	2	
		ADD ON AUX CONTACTOR BLOCK 2NO+2NC	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		VOLTMETER (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1	
		AMMETER SELECTOR SWITCH	1	
		VOLTMETER SELECTOR SWITCH	1	
		4-20mA Dual o/p, Aux sup 240V AC, 1A, Current Transducer	1	
		TERMINAL BLOCKS	30	
18(A)	**EM3 (I/C)**	**INCOMER MCCB (NON MOTORIZED) FOR ACDB/MLDB/PDB FOR RATING from 100A UPTO 630A**		
		MCB 6A, 4P 415V AC	1	
		MCB 6A DP, 240V AC	1	
		MCCB TP	1	
		AMMETER	1	
		AMMETER SELECTOR SWITCH	1	
		VOLTMETER	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		Electronic Energy Meter Suitable for communication with RS485	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		AUX. SWITCH FOR MCCB-2C/O	2	
		ALARM SWITCH FOR MCCB-1C/O	1	
		SHUNT TRIP COIL 220VAC	1	
		EXTENDED ROTORY HANDLE	1	
		INDICATION LAMP	3	
		NEUTRAL LINK 32A	1	
		NEUTRAL LINK AS PER MCCB RATING	1	
		CONTROL TERMINALS	AS REQUIRED	
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED	
18(B)	**EM3 (I/C)**	**INCOMER MCCB (NON MOTORIZED) FOR ACDB/MLDB/PDB FOR RATING FOR RATING below 100A**		
		MCB 6A, 4P 415V AC	1	
		MCB 6A DP, 240V AC	1	
		MCCB TP	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		AMMETER SELECTOR SWITCH	1	
		VOLTMETER (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE,0-500V DIRECT	1	
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1	
		ELECTRONIC ENERGY METER SUITABLE FOR COMMUNICATION WITH MODBUS RS485	1	
		Multi-Function Energy Meter compliant with IEC 61850	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3	
		1-PH POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/RT(3)/110/RT(3),50 VA CL-1 INSL CL-E	3	Potential Transformer shall be supplied by BHEL
		AUX. SWITCH FOR MCCB-2C/O	2	
		ALARM SWITCH FOR MCCB-1C/O	1	
		SHUNT TRIP COIL 220VAC	1	

		EXTENDED ROTORY HANDLE	1	
		INDICATION LAMP	3	
		NEUTRAL LINK 32A	1	
		NEUTRAL LINK AS PER MCCB RATING	1	
		CONTROL TERMINALS	AS REQUIRED	
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED	
19	**EM3 (B/C)**	**BUSCOUPLER MCCB (NON-MOTORIZED) FOR FOR ACDB/MLDB/PDB FOR RATING UPTO 630A**		
		MCB 6A, 4P 415V AC	1	
		MCB 6A DP, 240V AC	1	
		Motorized MCCB TP	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		AMMETER SELECTOR SWITCH	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-0.5	3	
		Current TRANSDUCER	1	
		AUX. SWITCH FOR MCCB-2C/O	2	
		ALARM SWITCH FOR MCCB-1C/O	1	
		SHUNT TRIP COIL 220VAC	1	
		EXTENDED ROTORY HANDLE	1	
		INDICATION LAMP	3	
		NEUTRAL LINK 32A	1	
		NEUTRAL LINK AS PER MCCB RATING	1	
		CONTROL TERMINALS	AS REQUIRED	
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED	
20	**E/E3**	**TPN AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A**		
		TP MCCB	1	
		OVER CURRENT PROTECTION	1	
		SHORT CIRCUIT PROTECTION	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter selector Switch	1	
		EXTENDED ROTORY HANDLE	1	
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED	
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1	
21	**E2**	**DP AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A**		
		DP MCCB	1	
		OVER CURRENT PROTECTION	1	
		SHORT CIRCUIT PROTECTION	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter selector Switch	1	
		EXTENDED ROTORY HANDLE	1	
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1	
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED	
22	**E1**	**SP AC OUTGOING MCCB (NON MOTORIZED) OPERATED FEEDER FOR RATING UPTO 630A**		
		SP MCCB	1	
		OVER CURRENT PROTECTION	1	
		SHORT CIRCUIT PROTECTION	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter Selector Switch	1	
		EXTENDED ROTORY HANDLE	1	
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1	
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED	
23	**DK2/PK2/ AK2**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW (AU/BU/CU CONTROLLED FROM ATRS/DDCMIS/PLC SHALL COMPRISE OF:**		
		MPCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1	
		AUX. CONTACTOR,2N0+2NC, CV. 110 V AC	2	

		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		OVERLOAD RELAY,BUILT IN SINGLE PHASE PREVENTER FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	1	
		MOUNTING KIT FOR O/L RELAY	1	
		RESET CORD ACTUATOR	1	
		Indication lamp	4	
		NEUTRAL LINK-32A	1	
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED	
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
24	**EA1**	**1-PHASE MCCB (NON MOTORIZED) CONTACTOR CONTROLLED FEEDER SHALL COMPRISE OF:**		
		MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		MCB 6A DP, 240V AC	1	
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1	
		AUX. CONTACTOR,2N0+2NC, CV. 110 V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		Indication lamp	4	
		NEUTRAL LINK-32A	1	
		CONTROL TERMINALS (DRAWOUT)	AS REQUIRED	
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter selector switch	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
25	**EA3**	**3-PHASE MCCB (NON MOTORIZED) CONTACTOR CONTROLLED FEEDER SHALL**		
		MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		MCB 6A DP, 240V AC	1	
		3P POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1	
		AUX. CONTACTOR,2N0+2NC, CV. 110 V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		Indication lamp	3	
		NEUTRAL LINK-32A	1	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter Selector Switch	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
26(A)	**DK21/PK21/ AK21**	**UNIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM DDCMIS/PLC/ATRS SHALL COMPRISE OF:**		
		MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		MCB 6A DP, 240V AC	1	
		POWER CONTACTOR(AC) WITH 1NO AUX CONTACT COIL VOLTAGE 110V AC	1	
		AUX. CONTACTOR,2NO+2NC CV. 110 V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		OVERLOAD RELAY 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE WITH BUILT-IN SINGLE PHASE PREVENTER	1	
		RESET CORD ACTUATOR	1	

		Indication lamp	3	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter Selector Switch	1	
		NEUTRAL LINK	1	
		CONTROL TERMINALS (DRAWOUT)	50	
		CT SHORTING TERMINAL-STUD TYPE	18	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
		INTERPOSING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-11OV AC (for 30KW and above)	1	
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1	
27	**DKE2****	**UNIDIRECTIONAL MOTOR FEEDER (ESSENTIAL) BELOW 18.5KW CONTROLLED FROM DDCMIS/PLC/ ATRS SHALL COMPRISE OF:**		
		MPCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		Mounting Kit	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CONTROL FUSE	4	
		Contorl Fuse base	4	
		NEUTRAL LINK	2	
		AUXILIARY CONTACTOR	2	
		CT FOR METERING	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1	
		Ammeter Selector Switch	1	
		INTERPOSING RELAY RE302 OR EQVT	2	
		MOTOR RESTART TIMER	1	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
28(A)	**DKE21****	**UNIDIRECTIONAL MOTOR FEEDER (ESSENTIAL) 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM ATRS/DDCMIS/PLC SHALL COMPRISE OF:**		
		3P MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CONTROL FUSE	8	
		Contorl Fuse base	8	
		NEUTRAL LINK	2	
		AUXILIARY CONTACTOR	2	
		CT FOR METERING	1	
		AMMETER SELECTOR SWITCH	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		INTERPOSING RELAY RE302 OR EQVT	2	
		MOTOR RESTART TIMER	1	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	

	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-11OV AC (for 30KW and above)	1	
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1	
29	**K3**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW CONTROLLED FROM LPBS SHALL COMPRISE OF:**		
		3P MPCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		Mounting Kit	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		AUXILIARY CONTACTOR	1	
		INTERPOSING RELAY RE302 OR EQVT	2	
		CONTROL FUSE	1	
		Control fuse base	1	
		NEUTRAL LINK	1	
		NO. OF TERMINALS	25	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
30(A)	**K31**	**UNIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW CONTROLLED FROM LPBS SHALL COMPRISE OF:**		
		3P MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	
		THERMAL O/L RELAY OF SUITABLE RANGE SINGLE PHASE PREVENTER	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		AUXILIARY CONTACTOR	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		AMMETER SELECTOR SWITCH	1	
		INTERPOSING RELAY RE302 OR EQVT	2	
		CT FOR METERING	1	
		CONTROL FUSE	1	
		Control Fuse base	1	
		NEUTRAL LINK	1	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-11OV AC (for 30KW and above)	1	
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1	
33	**DW**	**220V DC SOLENOID VALVE FEEDER SHALL COMPRISE OF:**		
		DOUBLE POLE 250V DC ISOLATING MCCB	1	
		220V DC POWER CONTACTOR	1	
		AUXILIARY CONTACTOR	1	
		NEUTRAL LINK	1	
		DIODE WITH PEAK INVERSE VOLTAGE OF 440V	1	
		COUPLING RELAY	1	
		Control fuse	2	
		Control fuse base	2	
		INDICATING LAMP	2	
		OVERLOAD ALARM TO DDCMIS	1	
		SHUNT WITH AMMETER along with Selector Switch	1	
34(A)	DN1	**BIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW**		
		(TP)MPCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	2	

		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		MOUNTING Kit	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CONTROL FUSE	4	
		Control fuse base	4	
		NEUTRAL LINK	1	
		AUXILIARY CONTACTOR	2	
		NO. OF TERMINALS (240V AC/24V DC)	60	
		INTREPOSING RELAY	3	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
34(B)	DN21	**BIDIRECTIONAL MOTOR FEEDER 18.5KW & ABOVE UPTO 90KW**		
		(TP)MCCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	2	
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		MOUNTING Kit	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CONTROL FUSE	4	
		Control fuse base	4	
		NEUTRAL LINK	1	
		AUXILIARY CONTACTOR	2	
		NO. OF TERMINALS (240V AC/24V DC)	60	
		INTREPOSING RELAY	3	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2,SCALE-250, CL ±2% OF FULL SCALE	1	
		AMMETER SELECTOR SWITCH	1	
		CURRENT TRANSDUCER (AC),4-20mA, DUAL O/P,AUX.-11OV AC	1	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-11OV AC (for 30KW and above)	1	
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1	
35	K1	**UNIDIRECTIONAL MOTOR FEEDER BELOW 18.5KW CONTROLLED FROM MCC SHALL COMPRISE OF:**		
		(TP)MPCB	1	
		AUX. CONTACT FOR MPCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	
		THERMAL O/L RELAY OF SUITABLE RANGE WITH SINGLE PHASE PREVENTER	1	
		MOUNTING Kit	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CONTROL FUSE	1	
		CONTROL FUSE BASE	1	
		NEUTRAL LINK	1	
		NO. OF TERMINALS	30	
		SHORT CIRCUIT PROTECTION		
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
36(A)	K11	**UNIDIRECTIONAL MOTOR FEEDER RATED FROM 18.5KW to 90KW CONTROLLED FROM MCC SHALL COMPRISE OF:**		
		(TP)MCCB	1	
		AUX. CONTACT FOR MCCB (1NO+1NC)	1	
		TRIPLE POLE POWER CONTACTOR	1	

		THERMAL O/L RELAY OF SUITABLE RANGE with SINGLE PHASE PREVENTER	1	
		THERMAL O/L RELAY RESET PUSH BUTTON	1	
		INDICATING LAMP	3	
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1	
		AMMETER CTSEC 1A (AC),96 X 96 mm2, SCALE-250, CL ±2% OF FULL SCALE	1	
		AMMETER SELECTOR SWITCH	1	
		CONTROL FUSE	1	
		CONTROL FUSE base	1	
		NEUTRAL LINK	1	
		NO. OF TERMINALS	50	
		Single Phase switch for motor Space Heater	1	
		SHORT CIRCUIT PROTECTION	1	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V, 50VA	1	
		PUSH BUTTON- SPRING RETURN WITH 1NO+1NC AUX, CONTACT	1	
		LOCKABLE FLUSH MOUNTING SWITCH	1	
	Note: (for 30KW and above)	Current Transducer (AC),4-20mA, DUAL O/P,AUX.-11OV AC (for 30KW and above)	1	
	Note: (for 30KW and above)	MCB FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1	
	Note: (for 50KW and above)	Earth Fault protection (for 50KW and above)	1	

9. MANDATORY SPARE FOR LT SWITCHGEAR - ANNEXURE-D

	Annexure D		
	Mandatory Spares		
SLNO	**Description**	**UNIT**	**QTY.**
7	**PMCC (1DF - 4000A, 2DF - 4000A, 0DE -2500A)**		
7.1	Sliding Main power contact (Fixed and moving) Complete assembly (of each make, type and rating)	sets	2 sets of each type make and rating for 4000A PMCCs, 2 sets of each type make and rating for 2500A PMCC
7.2	Auxiliary contact assembly of breaker		
a.	Test position (of each type)	sets	3 sets of each type make and rating for 4000A PMCCs, 3 sets of each type make and rating for 2500A PMCC
b.	Service position (of each type)	sets	3 sets of each type make and rating for 4000A PMCCs, 3 sets of each type make and rating for 2500A PMCC
7.3	Closing and tripping coil (of each type)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC
7.4	Spring charging motor (of each type)	nos.	2 nos of each type make and rating for 4000A PMCCs, 2 nos of each type make and rating for 2500A PMCC
7.5	Arc chute for CBs (of each type)	nos.	5 nos of each type make and rating for 4000A PMCCs, 5 nos of each type make and rating for 2500A PMCC
7.6	Arching contacts (for fixed) (of each rating)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC
7.7	Arching contacts (for moving) (of each rating)	nos.	3 nos of each type make and rating for 4000A PMCCs, 3 nos of each type make and rating for 2500A PMCC
7.8	Main bus bar supporting insulators (of each type)	nos.	10 nos of each type make and rating for 4000A PMCCs, 2 nos of each type make and rating for 2500A PMCC
7.9	Dropper bus bar supporting insulators (of each type)	nos.	5 nos of each type make and rating for 4000A PMCCs, 5 nosts of each type make and rating for 2500A PMCC
7.10	CTs	nos.	3 Nos of all possible ratings and ratios for 4000A PMCCs 3 Nos of all possible ratings to be repeated for 2500A PMCC

7.11	PTs	nos.	3 Nos of all possible ratings and ratios for 4000A PMCCs 3 Nos of all possible ratings to be repeated for 2500A PMCC
7.12	Meters		
a.	Voltmeter (of each type)	nos.	2 Nos of each types for 4000A PMCCs 2 Nos of all each type to be repeated for 2500A PMCC
b.	Ammeter (of each type per board)	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs
7.14	Auxiliary relays (of each type per board) and shall also include Earth Leakage, OV relay and UV relays if provided in board	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs
7.15	Interposing relays (of each type)	nos.	2 Nos of each types for 4000A PMCCs 2 Nos of all each type to be repeated for 2500A PMCC
7.16	Check synchronizing relay	nos.	1 No for 4000A PMCCs 1 No for 2500A PMCC
7.17	MCB (of each rating)	no.	1 No of all possible ratings for 4000A PMCCs 1 No of all possible ratings to be repeated for 2500A PMCC
7.18	Timers (of each type per board)	nos.	2 Nos of all possible types in a board and shall be repeated for each and every 3 PMCCs
7.19	Misc. items		
a.	Push button with contact element (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC
b.	Selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC
c.	Voltmeter selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC
d.	Ammeter selector switch (of each type)	nos.	5 Nos of each type for 4000A PMCCs 5 Nos of each type to be repeated for 2500A PMCC
e.	Local-remote selector switch (of each type)	nos.	3 Nos of each type for 4000A PMCCs 3 Nos of each type to be repeated for 2500A PMCC
f.	Indicating lamp of LED (LVGP type)	nos.	10 Nos of each type and colour for 4000A PMCCs 10 Nos of each type and colour to be repeated for 2500A PMCC

g.	Terminal blocks	nos	10 Nos of each type for 4000A PMCCs 10 Nos of each type to be repeated for 2500A PMCC
h.	Breaker Test / Service Limit switch	sets	5 sets of each type make and rating for 4000A PMCCs, 5 sets of each type make and rating for 2500A PMCC
i.	Power and control circuit fuses (of each type) & Neutral links	Nos.	10 Nos of each type and rating for 4000A PMCCs 10 Nos of each type and rating to be repeated for 2500A PMCC
j.	Control Transformer (of each rating)	no.	1 No of each rating for 4000A PMCCs 1 No of each rating to be repeated for 2500A PMCC
7.2	Electronic overload relays with single phase preventors (of each type)	no.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC
7.23	Phase sequence meter	nos.	2 Nos for 4000A PMCCs 2 Nos for 2500A PMCC
7.24	MPCB (of each type and rating)	nos.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC
7.25	MCCB (of each type and rating)	nos.	1 No of each type and rating for 4000A PMCCs 1 No of each type and rating to be repeated for 2500A PMCC
8	**MCC (0DG - 800A, 0TA, 0SB - 630A, 0SA - 400A, 0SC - 2000A**		
8.1	Bus bar support insulators (of each type)	nos.	10 nos of each type shall be repeated for 800A, 630A, 400A, 2000A. Totally 40 quantities
8.2	Current transformers (of each type & rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.3	Potential transformer 415/110V	Nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A

8.4	Male contact of ACB (main and aux.)	sets	1 set of each type and rating for 800A, 1 set of each type and rating shall be repeated for 630A, 1 set of each type and rating shall be repeated for 400A, 1 set of each type and rating shall be repeated for 2000A
8.5	Female contact of ACB (main and aux.)	sets	1 set of each type and rating for 800A, 1 set of each type and rating shall be repeated for 630A, 1 set of each type and rating shall be repeated for 400A, 1 set of each type and rating shall be repeated for 2000A
8.6	Limit switch of ACB	nos.	3 Nos of each type and rating for 800A, 3 Nos of each type and rating shall be repeated for 630A, 3 Nos of each type and rating shall be repeated for 400A, 3 Nos of each type and rating shall be repeated for 2000A
8.7	Spring charging motor of ACB	nos.	3 Nos of each type and rating for 800A, 3 Nos of each type and rating shall be repeated for 630A, 3 Nos of each type and rating shall be repeated for 400A, 3 Nos of each type and rating shall be repeated for 2000A
8.8	Closing coil of ACB	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A
8.9	Tripping coil of ACB	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A

8.1	Breaker control switch	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A
8.12	Electronic overload relays with single phase preventors (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.13	Auxiliary relays (of each type per board) and shall also include Earth Leakage, OV relay and UV relays if provided in board	nos.	2 Nos of each type and rating for 800A, 2 Nos of each type and rating shall be repeated for 630A, 2 Nos of each type and rating shall be repeated for 400A, 2 Nos of each type and rating shall be repeated for 2000A
8.14	Indicating Lamp assembly (LED LVGP type) (of each type & colour)	nos.	10 Nos of each type and colour for 800A, 10 Nos of each type and colour shall be repeated for 630A, 10 Nos of each type and colour shall be repeated for 400A, 10 Nos of each type and colour shall be repeated for 2000A
8.15	Phase sequence meter	nos.	2 nos for 800A, 630A, 400A, 2000A (totally 8)
8.16	MPCB (of each type and rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.17	MCCB (of each type and rating)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A

8.18	Single phase control transformer (415/110V) (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.19	Interposing relay (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.2	Push button with contact element (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
8.21	Meters (of each type)	nos.	1 No of each type and rating for 800A, 1 No of each type and rating shall be repeated for 630A, 1 No of each type and rating shall be repeated for 400A, 1 No of each type and rating shall be repeated for 2000A
9	**ACDB/PDB/LDB/SLDB/Auxiliary PDB/Distribution Panels (To be repeated for each type & rating) 0FA - 400A, (MLDB & WDB)**		
9.1	Bus bar support insulators (of each type)	nos.	3 Nos for all possible types and ratings for 0FA, 3 Nos for all possible types and ratings for the other DBs.
9.2	MCCB / SFU (of each rating)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs
9.3	MCB (of each rating)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs
9.4	Control switch - please include all possible types including ammeter selector switches, voltmeter selector switches, Local remote selector switches, etc (of each type)	nos.	2 Nos for all possible types and ratings in 0FA 2 Nos for all possible types and ratings for other DBs

10. COMMISSIONING SPARE-ANNEXURE-E

ANNEXURE-E

COMISSIONING SPARE

SL NO	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE(Rs)	TOTAL PRICE(Rs)
1	**Factory built assemblies (PCC/MCC/DB)**				
1.1	Busbar supports (Horizontal)	1 set of 3 ph	1		
1.2	Primary isolating contacts (Bus side) of each rating	1 set of 3 ph			
a)	100A		1		
b)	**250A**		1		
c)	400A		1		
1.3	Primary isolating contacts (Load side) of each rating	1 set of 3 ph			
a)	100A		1		
b)	**250A**		1		
c)	400A		1		
1.4	Secondary isolating contacts of each rating	1 set of 3 ph			
a)	100A		1		
b)	**250A**		1		
c)	400A		1		
1.5	Gaskets (each size)	Meter	10		
1.6	Fixed terminal (one way)	Nos	20		
1.7	Shrouds (for outgoing modules)				
	300mm	Nos	1		
	500mm	Nos	1		
	700mm	Nos	1		
	1000mm	Nos	1		
	2000mm	Nos	1		
1.8	Wire (for secondary wiring)				
	2.5mm2	Meter	100		
	1.5mm2	Meter	100		
1.9	Lugs (for secondary wiring)	Nos	100		
2	**Air circuit breaker (for each rating)**				
2.1	Shunt trip coil	Nos	5		
2.2	Spring charging motor (1 no for each rating)	Nos	1		
2.3	Closing coil	Nos	5		
2.4	Auxiliary switch	Nos	1		
3	**Isolating switch**				
3.1	Main contact kiot for each rating	1 set of 3 poles	1		
4	**Power Contactors**				
4.1	contactor coil of each rating	Nos	1		
4.2	contactor kit (main) for each rating	1 set of 3 poles	1		
5	**Auxiliary conatctors**				
5.1	Complete unit with 2NO+2NC contacts (1 no of each rating/ type)	Nos	1		
5.2	contactor coils				
a.	AC for each rating	set	1		
b.	DC for each rating	set	1		
6	**HRC fuse**				
6.1	Fuse base (each rating)	Nos	1		
6.2	Fuse link				
a.	Upto 40A (assorted ratings)	Nos	10		
b.	63A to 200A (assorted ratings)	Nos	10		
c.	250A to 400A (assorted ratings)	Nos	5		
7	**Push Buttons**				
7.1	Actuator contacts	Nos	5		
7.2	Element	Nos	5		
8	**Indicating Lamps**				

SL NO	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE(Rs)	TOTAL PRICE(Rs)
8.1	Complete unit	Nos	10		
8.2	Lens (assorted)	Nos	10		
9	**Others**				
9.1	Selector & control switch (each type)	Nos	1		
	AC Voltmeter (0-500V)	Nos	1		
	DC Voltmeter (0-300V)	Nos	1		

11. TOOLS & TACKLES-ANNEXURE-F

ANNEXURE-F

LIST OF TOOLS & TACKLES

S.No.	ITEM / COMPONENT	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	ACB RACKING HANDLE	Nos	20		
2	MODULE RACKING HANDLE	Nos	20		
3	FUSE PULLERS	Nos	15		
4	TROLLEY FOR ACB HANDLING	Nos	3		
5	TEST CABINET WITH COUPLING CABLES FOR TESTING THE BREAKER IN DRAWOUT POSITION	Nos	2		

12. COMMISSIONING CHARGE FOR NUMERICAL RELAY-ANNEXURE-G

ANNEXURE-G

COMMISSIONING CHARGES FOR NUMERICAL RELAYS AT SITE

SL.NO.	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	1 VISITS		
2	LUMP SUM ALL INCLUSIVE PER NUMERICAL RELAY COMMISSIONING CHARGES	60 NOS		

NOTES:

1) AMOUNT PAYABLE FOR SERVICE ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (PER NUMERICAL RELAY COMMISSIONING CHARGES AS PER SL. NO. 2 ABOVE X NO. OF RELAYS) (TO BE CERTIFIED BY BHEL SITE)

13. **SITE MODIFICATION CHARGES-ANNEXURE-H**

ANNEXURE-H

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)	1 VISITS		
2	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SKILLED TECHNICIAN	4 DAYS		
3	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	1 VISITS		
4	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SERVICE ENGINEER	4 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)

14. UNIT PRICE SCHEDULE FOR ADDITION/DELETION-ANNEXURE-I

ANNEXURE - I

SL.NO.	ITEM DESCRIPTION
1	**INCOMING FEEDER UNIT**
a)	ACB Incomer to PCC/PMCC from Trafo. - Module Type DAET (I/C)
	630A
	800A
	1000A
	1600A
	2000A
	2500A
	3200A
	3500A
	4000A
b)	ACB Incomer to MCC - Module Type DAE/ DAEN/ AE (I/C)
	630A
	800A
	1000A
	1600A
	2000A
	2500A
	3200A
	4000A
c)	MCCB (NON MOTORIZED) Incomer for MCC / ACDB – Module Type EM3 (I/C)
	100A – Fixed Type
	125A – Fixed Type
	200A – Fixed Type
	250A – Fixed Type
	400A – Fixed Type
	630A – Fixed Type
	100A – Drawout Type
	125A – Drawout Type
	200A – Drawout Type
	250A – Drawout Type
	400A – Drawout Type
	630A – Drawout Type
d)	MCCB (NON MOTORIZED) Incomer for MCC / ACDB – Module Type E3 (I/C)
	Upto 100A – Fixed Type
	Upto 100A – Drawout Type
e)	220V DCDB Incomer from charger - Module type CH (I/C)
	150A – CH Fixed Type
	200A – CH Fixed Type
	400A – CH Fixed Type
	630A – CH Fixed Type
	800A – CH Fixed Type

	1250A – CH Fixed Type
	150A – CH Drawout Type
	200A – CH Drawout Type
	400A – CH Drawout Type
	630A – CH Drawout Type
	800A – CH Drawout Type
	1250A – CH Drawout Type
f)	220V DCDB Incomer from battery - Module type DB (I/C)
	150A – DB Fixed Type
	200A – DB Fixed Type
	400A – DB Fixed Type
	630A – DB Fixed Type
	800A – DB Fixed Type
	1250A – DB Fixed Type
	150A – DB Drawout Type
	200A – DB Drawout Type
	400A – DB Drawout Type
	630A – DB Drawout Type
	800A – DB Drawout Type
	1250A – DB Drawout Type
g)	220V DC Fuse DB Incomer from DCDB - Module type H2
	32A
	50A
	63A
h)	AC MCCB DB Incomer– Module Type H3
	32A
	63A
	125A
i)	ACB Incomer to Emergency Board - Module Type DAEG/ DAEGN (I/C)
	1600A
2	**BUSCOUPLER UNIT**
a)	ACB Buscoupler to PCC/PMCC/MCC from Trafo. - Module Type DAET/ DAE (B/C)
	630A
	800A
	1000A
	1600A
	2000A
	2500A
	3200A
	4000A
b)	MCCB (MOTORIZED) Buscoupler for MCC / ACDB – Module Type EM3 (B/C)
	Upto 63A – Fixed Type
	125A – Fixed Type
	160A – Fixed Type
	200A – Fixed Type
	250A – Fixed Type
	400A – Fixed Type
	630A – Fixed Type

	Upto 63A – Drawout Type
	125A – Drawout Type
	160A – Drawout Type
	200A – Drawout Type
	250A – Drawout Type
	400A – Drawout Type
	630A – Drawout Type
c)	220V DCDB buscoupler - Module Type - DC
	150A – DC Fixed Type
	200A – DC Fixed Type
	400A – DC Fixed Type
	630A – DC Fixed Type
	800A – DC Fixed Type
	1250A – DC Fixed Type
	150A – DC Drawout Type
	200A – DC Drawout Type
	400A – DC Drawout Type
	630A – DC Drawout Type
	800A – DC Drawout Type
	1250A – DC Drawout Type
d)	220V DCDB TIE - Module Type - HD
	150A – HD Fixed Type
	200A – HD Fixed Type
	400A – HD Fixed Type
	630A – HD Fixed Type
	800A – HD Fixed Type
	1250A – HD Fixed Type
	150A – HD Drawout Type
	200A – HD Drawout Type
	400A – HD Drawout Type
	630A – HD Drawout Type
	800A – HD Drawout Type
	1250A – HD Drawout Type
e)	ACB BUSCOUPLER to Emergency Board - Module Type DAEG (B/C)
	1600A
3	**Outgoing ACB supply feeder - Module Type DAE/DAE-TIE (O/G)**
	630A
	800A
	1000A
	1600A
	2000A
	2500A
	3200A
4	**Outgoing ACB motor feeder - Module Type DM/PM (controlled from DDCMIS/PLC)**
	90.1- 200KW
5.1	**DOL Motor Starter - Unidirectional Drive(MPCB/MCCB CONTROLLED) - Drawout Type**
a)	Module Type K2 (Controlled from LPBS)(MPCB WITH CONTACTORS)
	Upto 5.5KW

	5.6 - 7.0KW
	7.1 - 13KW
	13.1 - 18.5KW
b)	Module Type K21 (Controlled from LPBS)(MCCB WITH CONTACTORS)
	18.5 - 24KW
	24.1 - 29.9KW
	30.0 - 37.0KW
	37.1 - 40KW
	40.1 - 50.0KW
	50.1 - 75KW
	75.1 - 90KW
	90.1 - 110KW
c)	Module Type K3 (Controlled from LCP)(MPCB WITH CONTACTORS)
	Upto 5.5KW
	5.6 - 7.0KW
	7.1 - 13KW
	13.1 - 18.5KW
d)	Module Type K31 (Controlled from LCP)(MCCB WITH CONTACTORS)
	18.5 - 24KW
	24.1 - 29.9KW
	30.0 - 37.0KW
	37.1 - 40KW
	40.1 - 50.0KW
	50.1 - 75KW
	75.1 - 90KW
	90.1 - 110KW
e)	Module Type DK2/PK2/AK2 (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)
	Upto 5.5KW
	5.6 - 7.0KW
	7.1 - 13KW
	13.1 - 18.5KW
f)	Module Type DK21/PK21/AK21 (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)
	18.5 - 24KW
	24.1 – 29.9KW
	30.0 - 37.0KW
	37.1 - 40KW
	40.1 - 50.0KW
	50.1 - 75KW
	75.1 - 90KW
	90.1 - 110KW

g)	Module Type DK2E/PK2E/AK2E (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)
	Upto 5.5KW
	5.6 - 7.0KW
	7.1 - 13KW
	13.1 - 18.5KW
h)	Module Type DK21E/PK21E/AK21E (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)
	18.5 - 24KW
	24.1 – 29.9KW
	30.0 - 37.0KW
	37.1 - 40KW
	40.1 - 49.9KW
	50 - 75KW
	75.1 - 90KW
	90.1 - 110KW
6.1	**RDOL Motor Starter – Bidirectional Drive(MPCB/MCCB CONTROLLED) Drawout Type**
a)	Module Type DN1/ PN1/ AN1 (Controlled from DDCMIS/PLC/ATRS)(MPCB WITH CONTACTORS)
	Upto 5.5KW
	5.6 - 7.0KW
	7.1 - 13KW
	13.1 - 18.5KW
a)	Module Type DN21/ PN21/ AN21 (Controlled from DDCMIS/PLC/ATRS)(MCCB WITH CONTACTORS)
	18.5 - 24KW
	24.1 – 29.9KW
	30.0 - 37.0KW
	37.1 - 40KW
	40.1 - 49.9KW
	50 - 75KW
	75.1 - 90KW
7	**Outgoing MCCB/ SFU (NON MOTORIZED) controlled feeders**
a)	Outgoing SFU controlled supply feeder - Module Type E3 (O/G)
	upto 15.9A - Fixed type
	16A - Fixed type
	25A - Fixed type
	32A - Fixed type
	63A - Fixed type
	100A - Fixed type
	125A - Fixed type
	160A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	600A - Fixed type
	upto 15.9A - Drawout type
	16A - Drawout type
	25A - Drawout type
	32A - Drawout type

	63A - Drawout type
	100A - Drawout type
	125A - Drawout type
	160A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	600A - Drawout type
b)	Outgoing MCCB controlled supply feeder - Module Type E3 (O/G)
	16A - Fixed type
	32A - Fixed type
	63A - Fixed type
	125A - Fixed type
	160A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	600A - Fixed type
	16A - Drawout type
	32A - Drawout type
	63A - Drawout type
	125A - Drawout type
	160A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	600A - Drawout type
c)	Double pole SFU controlled 1-ph feeder - E1 (O/G)
	10A - Fixed type
	16A - Fixed type
	25A - Fixed type
	32A - Fixed type
	63A - Fixed type
	10A - Drawout type
	16A - Drawout type
	25A - Drawout type
	32A - Drawout type
	63A - Drawout type
d)	Double pole MCCB controlled 1-ph feeder - E1 (O/G)
	16A - Fixed type
	32A - Fixed type
	63A - Fixed type
	125A - Fixed type
	16A - Drawout type
	32A - Drawout type
	63A - Drawout type
	125A - Drawout type
e)	1-Ph SFU controlled outgoing contactor feeder (EA1)
	10A - Fixed type
	16A - Fixed type
	25A - Fixed type
	32A - Fixed type
	63A - Fixed type
	10A - Drawout type
	16A - Drawout type

	25A - Drawout type
	32A - Drawout type
	63A - Drawout type
f)	1-Ph MCCB controlled outgoing contactor feeder (EA1)
	16A - Fixed type
	32A - Fixed type
	63A - Fixed type
	16A - Drawout type
	32A - Drawout type
	63A - Drawout type
g)	3-Ph SFU controlled outgoing contactor feeder (EA3)
	10A - Fixed type
	16A - Fixed type
	25A - Fixed type
	32A - Fixed type
	63A - Fixed type
	125A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	600A - Fixed type
	10A - Drawout type
	16A - Drawout type
	25A - Drawout type
	32A - Drawout type
	63A - Drawout type
	125A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	600A - Drawout type
h)	3-Ph MCCB controlled outgoing contactor feeder (EA3)
	16A - Fixed type
	32A - Fixed type
	63A - Fixed type
	125A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	600A - Fixed type
	16A - Drawout type
	32A - Drawout type
	63A - Drawout type
	125A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	600A - Drawout type
i)	3-Ph SFU controlled Contactor Changeover Between Two In Coming Supplies Module Type CC
	16A - Fixed type
	32A - Fixed type

	63A - Fixed type
	125A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	600A - Fixed type
	16A - Drawout type
	32A - Drawout type
	63A - Drawout type
	125A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	600A - Drawout type
8	**1-Ph MCB controlled outgoing feeder (H1) from AC MCCB DB**
	10A
	16A
9	**Outgoing MCCB feeders**
a)	220V DC Outgoing MCCB feeder (X)
	2A - Fixed type
	4A - Fixed type
	6A - Fixed type
	10A - Fixed type
	16A - Fixed type
	25A - Fixed type
	32A - Fixed type
	50A - Fixed type
	63A - Fixed type
	100A - Fixed type
	125A - Fixed type
	200A - Fixed type
	250A - Fixed type
	400A - Fixed type
	500A - Fixed type
	630A - Fixed type
	2A - Drawout type
	4A - Drawout type
	6A - Drawout type
	10A - Drawout type
	16A - Drawout type
	25A - Drawout type
	32A - Drawout type
	50A - Drawout type
	63A - Drawout type
	100A - Drawout type
	125A - Drawout type
	200A - Drawout type
	250A - Drawout type
	400A - Drawout type
	500A - Drawout type
	630A - Drawout type
10	**Common Auxiliary Module**
a)	PT module
i	Bus PT module for PCC/PMCC-G1 Type
ii	Bus PT module for Emergency MCC-G2 Type
iii	Bus PT DCDB-S Type

iv	Bus PT module for MCC/ACDB-VM Type
b)	Space heater and Power Socket - TT
c.1)	110V AC control supply module – Type CS (consisting of 415/110V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
c.2)	240 V AC control supply module – type CS (consisting of 415/240V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
d.1)	110V AC control supply module – Type CS-A (consisting of 415/110V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
d.2)	240 V AC control supply module – type CS-A (consisting of 415/240V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
e)	240V AC motor space heater module
f)	220V DC supply module
	(for receiving 220V DC supply)
g)	24 V winding heating module
h)	Alarm module
i)	Test supply module
J.1)	240 V AC Panel Space hetaing supply module – type SH (consisting of 415/240V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
J.2)	240 V AC Panel Space hetaing supply module – type SH-A (consisting of 415/240V control Trafo.)
	1KVA
	2KVA
	2.5KVA
	3KVA
	5KVA
	7.5KVA
	10KVA
11	**Empty Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar**

a)	MCC Panel (Double Front Drawout Type)
	250 / 250A
	400 / 400A
	630 / 630A
	800 / 630A
	1000 / 630A
	1600 / 630A
	2000 / 630A
	2500 / 630A
	3000 / 630A
	4000 / 630A
b)	MCC Panel (Double Front Fixed Type)
	250 / 250A
	400 / 400A
	630 / 630A
	800 / 630A
	1000 / 630A
	1600 / 630A
	2000 / 630A
	2500 / 630A
	3000 / 630A
	4000 / 630A
c)	220V DCDB Panel (Double Front Fixed type)
	UPTO 630A (with 630A VBB)
	1000A (with 630A VBB)
	1600A (with 630A VBB)
d)	220V DCDB Panel (Double Front Drawout type)
	UPTO 630A (with 630A VBB)
	1000A (with 630A VBB)
	1600A (with 630A VBB)
12	**Empty Panel With Horizontal & Vertical Busbar, Support & Auxiliary Busbar**
a)	PCC Panel (Single Front Drawout Type)
	1600 / 1600A
	2000 / 2000A
	2500 / 2500A
	3000 / 3000A
	4000 / 4000A
b)	MCC Panel (Single Front Drawout Type)
	250 / 250A
	400 / 400A
	630 / 630A
	800 / 630A
	1000 / 630A
	1600 / 630A
	2000 / 630A
	2500 / 630A
	3000 / 630A
	4000 / 630A
c)	MCC Panel (Single Front Fixed Type)
	250 / 250A
	400 / 400A
	630 / 630A
	800 / 630A
	1000 / 630A
	1600 / 630A
	2000 / 630A
	2500 / 630A
	3000 / 630A
	4000 / 630A

d)	220V DCDB Panel (Single Front Fixed Type)
	UPTO 630A (with 630A VBB)
	1000A (with 630A VBB)
	1600A (with 630A VBB)
e)	220V DCDB Panel (Single Front Fixed Type)
	UPTO 630A (with 630A VBB)
	1000A (with 630A VBB)
	1600A (with 630A VBB)
13	**ACB Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar**
	630 / 630A
	800 / 630A
	800 / 800A
	1000 / 630A
	1000 / 800A
	1000 / 1000A
	1600 / 630A
	1600 / 800A
	1600 / 1000A
	1600 / 1600A
	2000 / 630A
	2000 / 800A
	2000 / 1000A
	2000 / 1600A
	2000 / 2000A
	2500 / 630A
	2500 / 800A
	2500 / 1000A
	2500 / 1600A
	2500 / 2000A
	2500 / 2500A
	3000 / 630A
	3000 / 800A
	3000 / 1000A
	3000 / 1600A
	3000 / 2000A
	3000 / 2500A
	3000 / 3000A
	4000 / 630A
	4000 / 800A
	4000 / 1000A
	4000 / 1600A
	4000 / 2000A
	4000 / 2500A
	4000 / 3000A
	4000 / 4000A
14	**Dummy Panel**
	UPTO 630A
	800A
	1000A
	1600A

	2000A
	2500A
	3000A
	4000A
15	**Unit Prices For Circuit Components**
a)	Air Circuit Breaker without releases
	630A MDO
	800A MDO
	1000A MDO
	630A ACB, 3P, EDO, AC
	800A ACB, 3P, EDO, AC
	1000A ACB, 3P, EDO, AC
	1250A ACB, 3P, EDO, AC
	1600A ACB, 3P, EDO, AC
	2000A ACB, 3P, EDO, AC
	2500A ACB, 3P, EDO, AC
	3200A ACB, 3P, EDO, AC
	4000A ACB, 3P, EDO, AC
	630A ACB, 4P, EDO, AC
	800A ACB, 4P, EDO, AC
	1000A ACB, 4P, EDO, AC
	1250A ACB, 4P, EDO, AC
	1600A ACB, 4P, EDO, AC
	2000A ACB, 4P, EDO, AC
	2500A ACB, 4P, EDO, AC
	3200A ACB, 4P, EDO, AC
	4000A ACB, 4P, EDO, AC
	1250A ACB, 4P, MDO, DC
b)	MCCB, 2NO+2NC AUX, FSC
	16A
	25A
	32A
	63A
	80A
	115A
	150A
	185A
	265A
	315A
	400A
	630A
c)	MCCB, 2NO+2NC AUX, ASC
	16A
	25A
	32A
	63A
	80A
	115A
	150A
	185A
	265A
	315A
	400A
	630A
d)	MPCB 2NO+2NC
	16A
	25A
	32A
	63A

	80A
	115A
	150A
	185A
	265A
	315A
	400A
	630A
e)	MCCB with LSIG release
	200A
	250A
	300A
	350A
	400A
	630A
	MCCB - Motorized with LSIG release
	200A
	250A
	300A
	350A
	400A
	630A
f)	POWER FUSE LINK FOR SFU (AC) - TPN
	Upto 16A
	25A
	32A
	63A
	125A
	250A
	400A
	630A
g)	POWER FUSE LINK FOR SFU (DC) - DP
	Upto 16A
	25A
	40A
	50A
	60A
	80A
	100A
	200A
	300A
	400A
	630A
h)	SFU WITHOUT POWER FUSE LINK (AC) - TPN
	Upto 16A
	25A
	32A
	63A
	125A
	250A
	400A
	630A
i)	SFU WITHOUT POWER FUSE LINK (DC) - DP
	Upto 16A
	25A
	40A
	50A
	60A
	80A

	100A
	200A
	300A
	400A
	630A
j)	HRC Fuse Links (Offset tag Type)
	Upto 10A
	16A
	25A
	32A
	50A
	63A
k)	HRC Fuse DIN Type (Blade Contact)
	Upto 10A
	16A
	20A
	32A
	36A
	50A
	63A
	80A
	100A
	125A
	160A
	200A
	250A
	315A
	400A
	Control Fuse Link
l)	Power contactor (AC)
	16A
	25A
	32A
	63A
	80A
	115A
	150A
	185A
	265A
	315A
	400A
m)	Power contactor (DC)
	16A
	25A
	32A
	63A
	80A
	115A
	150A
	185A
	265A
	400A
n)	Fuse Base
	UPTO 20A
	32A
	50/63A
	100A
	250A
	400A

	630A
o)	Auxiliary contactor AC/DC
i)	AC Aux. contactor
	2NO + 2NC
	3NO + 3NC
	4NO + 4NC
	6NO + 6NC
ii)	DC Aux. contactor
	2NO + 2NC
	3NO + 3NC
	4NO + 4NC
	6NO + 6NC
p)	Protection Relay
	VAGM 23
	CTU 12
	CTU 32
	VTT 11
	VAG 11
	VAA 11
	VAJHM 13
	VAJHM 23
	CDGM-12
	CAG 12
	CAG 34
	CCUM 21
	CDG 11
	CDG 31
	CDG 61
	VDG 14
	CDV 62
	CAG 14
	VAX 31
	CAG 37
	CAEM-21
	VAG-21
	VAJC-11
	CTMM-501
	MOTPRO
	VAA21
	VTT12
	VTIG
	VTU21
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, REF PROTECTION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION, 50, 50N, 51, 51N, 27, 98, 86, 25, 95, 30A, 30B, 64R
	SEF NUMERICAL RELAY
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B

	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & WITH CHECK SYNCHRONIZATION, FUSE FAILURE, ENERGY METERING, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 25, 95, 30A, 30B, DG PROTECTION (Like Neutral Under-voltage-27N, Power Direction / Reverse Power (Islanding)-32, Negative Phase Sequence Over-current (Phase unbalance, reverse phase sequence) -46, , Negative Sequence Voltage -47, Ground Over-voltage trip or ground over-current trip-51G, Instantaneous Over-voltage trip (ferro-resonance)-59, Over-voltage trip-59T, Neutral over-voltage-59N, Over/Under Frequency trip-81O/ 81U etc.)
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION, LOGIC, METERING FUNCTION & FUSE FAILURE, OVER LOAD PROTECTION 50, 50N,51, 51N, 27, 98, 86, 95, 30A, 30B
	NUMERICAL RELAY FOR PROTECTION, T/C SUPERVISION-95, LOGIC, METERING FUNCTION & FUSE FAILURE-98, OVER LOAD PROTECTION, LOCKED ROTOR PROTECTION-14, RESTART INHIBIT PROTECTION-49, NEGATIVE SEQUENCE PROTECTION-46, 50, 50N, 51, 51N, 27, 86, 30A, 30B
	Communicable type Numerical relay for O/C, E/F, TC Supervision on IEC-61850 protocol
	Communicable type Numerical relay for O/C, E/F, Check Synchronization, TC Supervision on IEC-61850 protocol
	Communicable type Numerical relay for Voltage control O/C, 3Phase O/C, Reverse power, Differential, Neutral Displacement, E/F, U/V, O/V protection, Check Synchronization, TC Supervision on IEC-61850 protocol
	Communicable type Numerical relay for Under voltage, Over voltage etc. on IEC-61850 protocol
	Communicable type Numerical relay for E/F protection for DCDB on IEC-61850 protocol
	Communicable type Numerical relay for composite motor protection including TC Supervision on IEC-61850 protocol
	Communicable type Numerical relay for Neutral Displacement on IEC-61850 protocol
	Communicable type Numerical relay for O/C, E/F, TC Supervision on Modbus protocol
	Communicable type Numerical relay for O/C, E/F, Check Synchronization, TC Supervision on Modbus protocol
	Communicable type Numerical relay for Voltage control O/C, 3Phase O/C, Reverse power, Differential, Neutral Displacement, E/F, U/V, O/V protection, Check Synchronization, TC Supervision on Modbus protocol
	Communicable type Numerical relay for Under voltage, Over voltage etc. on Modbus protocol
	Communicable type Numerical relay for E/F protection for DCDB on Modbus protocol
	Communicable type Numerical relay for composite motor protection including TC Supervision on Modbus protocol
	Communicable type Numerical relay for Neutral Displacement on Modbus protocol
	Numerical Check synchronising Relay
	Check synchronising Relay Type-SKE11 or better
	Guard Relay
	NUMERICAL RELAY Over current and Earth fault
	BATTERY EARTH FAULT RELAY, 1-7mA, NOMINAL VOLTAGE-220V DC, 1DV, 2NO S/R, FLUSH
	OVERLOAD RELAY, NOMINAL VOLTAGE-220V DC, O/V VLTAGE SETTING-110%, 1/4NV, 1NO+1NC S/R
	UNDER VOLTAGE RELAY, NOMINAL VOLTAGE-220V DC, U/V SETTING-80%, AUX..-240V AC, 1/2NH, 1NO+2NC S/R
	JAMING RELAY - CAG17
q)	Bimetal Thermal O/L Relays

i)	Thermal O/L relay with SPP - OLR
	Upto 5.5KW
	5.6 to 11KW
	11.1 to 22KW
	22.1 to 45KW
	45.1 to 75KW
	75 to 110KW
ii)	**Heavy Duty** Thermal O/L relay with SPP - OLR
	Upto 5.5KW
	5.6 to 11KW
	11.1 to 22KW
	22.1 to 45KW
	45.1 to 75KW
	75 to 110KW
r)	Timer (DC)
	ON DELAY TIMER, 0.5-5SEC., 220V DC, 2NO+2NC
	ON DELAY TIMER, 1.0-10SEC. 220V DC, 2NO+2NC
	240VAC MTR RESTART CONTROL TIMER (.2-60SECS)
	240VAC ON DELAY TIMER(1-10SECNS)WITH 1NO
	220VDC ON DELAY TIMER(.5-5SECS) WITH 1NO
	220VDC 0N DELAY TIMER(0.5-5SECS)WITH 3NO
	220VDC ON DELAY TIMER(1-10SECS) WITH 3NO
s)	Meter
	AC ammeter (Digital)
	AC ammeter (Analog) linear scale
	AC ammeter (Analog) compressed scale
	DC ammeter (Digital)
	DC ammeter (Analog)
	AC voltmeter (Digital)
	DC voltmeter (Analog)
	Wattmeter (3 Phase)
	Wattmeter (1 Phase)
	TVM meter
	DIGITAL ENERGY METER
	Frequency meter
	Synchroscope
	Differential Voltmeter
	Differential Frequency meter
	Multifunction digital Energy meter with RS485 Port (0.2 Acc. Class)
	Multifunction digital Energy meter with RS485 Port (0.5 Acc. Class)
	Multifunction digital Energy meter with RS485 Port (1.0 Acc. Class)
t)	Single Phase Preventor Relay
u)	MCB
	6A, 4P 415V AC
	6A DP, 240V AC
	10A DP, 240V AC
	16A DP, 240V AC
	32A DP, 240V AC
	6A DP, 110V AC
	10A DP, 110V AC
	16A DP, 110V AC
	32A DP, 110V AC
	16A DP, 220V DC
	6A DP, 220V DC
	6A DP, 240V AC
	10A SP, 240V AC

	16A SP, 240V AC
	32A SP, 240V AC
	6A SP, 110V AC
	10A SP, 110V AC
	16A SP, 110V AC
	32A SP, 110V AC
	16A SP, 220V DC
	6A SP, 220V DC
v)	SWITCH & PUSH BUTTON
	BREAKER CONTROL SWITCH, 16A,220V DC, 2CLOSE+2TRIP
	DC ISOLATING SWITCH 16A,220V DC, DP, BASE MTG.
	16A,240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG
	25A,240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG
	16A,240V AC SELECTOR SWITCH 2WAY, 2POLE, FLUSH MTG
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG,
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG.
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG.LOCKABLE TYPE
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG., LOCKABLE TYPE
	AMMETER SELECTOR SWITCH
	VOLTMETER SELECTOR SWITCH
	TOGGLE SWITCH 5A, 240V AC
	AC SWITCH SPST-5A,240V AC
	10A, 220V DC SWITCH
	Door Limit switch
	Ammeter selector switch
	Voltmeter selector switch
	Synchronisation selector switch
	Trip selector switch
	Push Button
	2NO + 2NC Shrouded
	1NO + 1NC Shrouded
	2NO + 2NC Mushroom head stayput
	2NO + 2NC Lockable type
w)	Indicating Lamp Assembly (LED Type)
	240V AC-GREEN
	240V AC-RED
	240V AC- AMBER
	110V AC-GREEN
	110V AC-RED
	110V AC- AMBER
	220V DC-WHITE
	220V DC-RED
	220V DC-GREEN
	220V DC-BLUE
	220V DC- AMBER
	63.5V AC-RED
	63.5V AC-YELLOW
	63.5V AC-BLUE

x)	CT
i)	Metering CT
	Upto 75/1A
	100/1A
	125/1A
	150/1A
	200/1A
	250/1A
	300/1A
	400/1A
	500/1A
	630/1A
	800/1A
	1000/1A
	1250/1A
	1600/1A
	2000/1A
	2500/1A
	3000/1A
	4000/1A
ii)	Protection CT (5P20)
	Upto 75/1A
	100/1A
	125/1A
	150/1A
	200/1A
	250/1A
	300/1A
	400/1A
	500/1A
	630/1A
	800/1A
	1000/1A
	1250/1A
	1600/1A
	2000/1A
	2500/1A
	3000/1A
	4000/1A
	630/5A
	800/5A
	1000/5A
	1250/5A
	1600/5A
	2000/5A
	2500/5A
	3000/5A
	4000/5A
iii)	PS Class CT
	1600/1A
	2500/1A
	3000/1A
	4000/1A
	1600/5A
	2500/5A
	3000/5A
	4000/5A
y)	Voltage Transformer
i)	415/√3 : 110/√3V, 1ph, 50VA

ii)	415/√3 : 110/√3V, 1ph, 100VA
iii)	415/√3 : 240/√3V, 1ph, 50VA
iv)	415/√3 : 240/√3V, 1ph, 100VA
z)	Toggle switch (16A)
aa)	Secondary Isolating Contact Block
ab)	Control Terminal (Fixed)
ac)	Thermostat
ad)	CONTROL TRANSFORMER
	415/240V,CL-E, 50VA
	415/240V,CL-E, 100VA
	415/240V,CL-E, 150VA
	415/240V,CL-E, 200VA
	415/240V,CL-E, 500VA
	415/240V,CL-E, 1 KVA
	415/240V,CL-E, 2KVA
	415/240V,CL-E, 2.5KVA
	415/240V,CL-E, 3KVA
	415/240V,CL-E, 5KVA
	415/240V,CL-E, 10KVA
	415/110V,CL-E, 50VA
	415/110V,CL-E, 100VA
	415/110V,CL-E, 150VA
	415/110V,CL-E, 200VA
	415/110V,CL-E, 500VA
	415/110V,CL-E, 1 KVA
	415/110V,CL-E, 2KVA
	415/110V,CL-E, 2.5KVA
	415/110V,CL-E, 3KVA
	415/110V,CL-E, 5KVA
	415/110V,CL-E, 10KVA
ac)	4-20mA Dual o/p, Aux sup 220V DC, 1A, Current Transducer
	4-20mA Dual o/p, Aux sup 240V AC, 1A, Current Transducer
	4-20mA Dual o/p, Aux sup 110V AC, 1A, Current Transducer
	4-20mA Dual o/p, Aux sup 220V DC, VoltageTransducer, PTR 415/110V
	4-20mA Dual o/p, Aux sup 240V AC, VoltageTransducer, PTR 415/110V
	4-20mA Dual o/p, Aux sup 110V AC, VoltageTransducer, PTR 415/110V
	4-20mA Dual o/p, Aux sup 220V DC, FrequencyTransducer, PTR 415/110V
	4-20mA Dual o/p, Aux sup 220V DC, Input 0-75mV DC, Current Transducer-DC
	4-20mA Dual o/p, Aux sup 240V AC, Input Voltage 0-220V DC, Voltage Transducer-DC
ad)	4-20mA Dual Output kW transducer
ae)	4-20mA Dual Output kVA transducer
af)	4-20mA Dual Output PF transducer
ag)	4-20mA Dual Output Frequency transducer
ah)	Interposing relay RE 302 or Eqvt with freewheeling diode & LED
ai)	Laptop PC alongwith software & hardware
aj)	3 PIN SOCKET - 5A, 110V AC, 3PIN
ak)	THERMOSTATE, DIAL TYPE
am)	SPACE HEATER
an)	CFL WITH HOLDER
ao)	NEUTRAL LINK
	20A FOR CONTROL CKT. & POWER CKT. UPTO 25A MCCB RATING
	32A FOR 50A MCCB RATING
	63A FOR 100A & 125A MCCB RATING
	125A FOR 250A MCCB RATING
	250A FOR 400A & 500A MCCB RATING
ap)	CASTLE KEY INTERLOCK FOR MCCB - 3LOCK+2KEY
aq)	MECHANICAL INTERLOCK FOR POWER CONTACTOR

	16A
	25A
	32A
	63A
	80A
	115A
	150A
	185A
	265A
	315A
	400A
ar)	AUX. CONTACTOR
	2NO+2NC, CV-220V DC
	4NO, CV-220V DC
	2NO+2NC, CV-240V AC
	3NO+1NC, CV-240V AC
	2NO+2NC, CV-110V AC
	3NO+1NC, CV-110V AC
	1NO + 1NC 240V AC
	1NO + 1NC 110V AC
	1NO + 1NC 220V DC
	1NO 240V AC
	1NO 110V AC
	1NO 220V DC
as)	ISOLATING TRANSFORMER-15kVA
	ISOLATING TRANSFORMER-20kVA
	ISOLATING TRANSFORMER-25kVA
	ISOLATING TRANSFORMER-30kVA
16	**Foundation Frame**
a)	MCC panel
	upto 1600A (SF)
	2500A (SF)
	3000A (SF)
	4000A (SF)
	upto 1600A (DF)
	2500A (DF)
	3000A (DF)
	4000A (DF)
b)	220V DCDB panel
	SF
	DF
c)	PCC / PMCC panel
	upto 1600A
	2500A
	3000A
	4000A
17	**Connection from PMCC/MCC panel to PMCC/MCC panel**
	250A
	400A
	630A
	800A
	1000A
	1600A
	2500A
	3000A

	4000A
18	**Cable Glands & Lugs:**
a)	**Single Compression Cable Glands for cable sizes:**
	2C X 2.5 Sq. mm.
	3C X 2.5 Sq. mm.
	5C X 2.5 Sq. mm.
	7C X 2.5 Sq. mm.
	12C X 2.5 Sq. mm.
	16C X 2.5 Sq. mm.
	2C X 10 Sq. mm.
	2C X 16 Sq. mm.
	2C X 25 Sq. mm.
	2C X 35 Sq. mm.
	2C X 50 Sq. mm.
	2C X 70 Sq. mm.
	2C X 95 Sq. mm.
	3C X 2.5 Sq. mm.
	3C X 10 Sq. mm.
	3C X 16 Sq. mm.
	3C X 25 Sq. mm.
	3C X 35 Sq. mm.
	3C X 50 Sq. mm.
	3C X 70 Sq. mm.
	3C X 95 Sq. mm.
	3C X 150 Sq. mm.
	3C X 185 Sq. mm.
	3C X 240 Sq. mm.
	3.5C X 25 Sq. mm.
	3.5C X 50 Sq. mm.
	3.5C X 70 Sq. mm.
	3.5C X 300 Sq. mm.
	3.5C X 240 Sq. mm.
	3.5C X 185 Sq. mm.
	3.5C X 95 Sq. mm.
	4C X 16 Sq. mm.
	4C X 35 Sq. mm.
	1C X 400 Sq. mm.
	1C X 630 Sq. mm.
b)	**Double Compression Cable Glands for cable sizes:**
	2C X 2.5 Sq. mm.
	3C X 2.5 Sq. mm.
	5C X 2.5 Sq. mm.
	7C X 2.5 Sq. mm.
	12C X 2.5 Sq. mm.
	16C X 2.5 Sq. mm.
	2C X 10 Sq. mm.
	2C X 16 Sq. mm.
	2C X 25 Sq. mm.
	2C X 35 Sq. mm.
	2C X 50 Sq. mm.
	2C X 70 Sq. mm.
	2C X 95 Sq. mm.
	3C X 2.5 Sq. mm.
	3C X 10 Sq. mm.
	3C X 16 Sq. mm.
	3C X 25 Sq. mm.

	3C X 35 Sq. mm.
	3C X 50 Sq. mm.
	3C X 70 Sq. mm.
	3C X 95 Sq. mm.
	3C X 150 Sq. mm.
	3C X 185 Sq. mm.
	3C X 240 Sq. mm.
	3.5C X 25 Sq. mm.
	3.5C X 50 Sq. mm.
	3.5C X 70 Sq. mm.
	3.5C X 300 Sq. mm.
	3.5C X 240 Sq. mm.
	3.5C X 185 Sq. mm.
	3.5C X 95 Sq. mm.
	4C X 16 Sq. mm.
	4C X 35 Sq. mm.
	1C X 400 Sq. mm.
	1C X 630 Sq. mm.
c)	**Cable Lugs for sizes:**
	2.5 Sq. mm.
	10 Sq. mm.
	16 Sq. mm.
	25 Sq. mm.
	35 Sq. mm.
	50 Sq. mm.
	70 Sq. mm.
	95 Sq. mm.
	120 Sq. mm.
	150 Sq. mm.
	185 Sq. mm.
	240 Sq. mm.
	300 Sq. mm.
	400 Sq. mm.
	630 Sq. mm.
19	**Daily 8 hour rate deployed at site:**
	Engineer : (per day)
20	**Module Name plate**
21	**Wires for Secondary wiring:**
a)	1.5 Sq. mm. per meter
b)	2.5 Sq. mm. per meter
c)	4.0 Sq. mm. per meter
22	**Control Terminal for Secondary wiring suitable for cable size:**
a)	0.5 Sq. mm.
b)	1.5 Sq. mm.
c)	2.5 Sq. mm.
23	**Unit price for following tests:**
a)	Local Push Button Station - Degree of protection test
b)	Local motor Starter - Degree of protection test
24	**Electrical Junction Boxes (for termination of 0.5 sqmm screened control cables)**
a)	48 ways
b)	64 ways
c)	72 ways
a)	96 ways
25	**ISMC channels**

a)	ISMC 75 channel per meter
a)	ISMC 100 channel per meter
26	**ANY OTHER ITEM WHICH MAY BE REQUIRED FOR ADDITION / DELETION DURING DETAILED ENGINEERING**
27	**SBMCC**
	WALL BLOWER FEEDER-0.56 KW
	WALL BLOWER FEEDER-0.09 KW
	LR BLOWER FEEDER-0.56 KW
	LR BLOWER FEEDER-0.736 KW
	AH BLOWER FEEDER-0.18 KW
	ISOLATION BLOWER VALVE-4 KW
28	**ETHERNET SWITCH**
	8 PORT
	16 PORT
	24 PORT

15. DRAWINGS/DOCUMENTS REQUIRED FROM VENDOR

SL. NO	DRAWING/ DOCUMENT	NO. OF PRINTS (HARD-COPIES) TO BE SUBMITTED TO BHEL-SBD	NO. OF CD-ROM'S TO BHEL-SBDD
1	All drawings/ documents to BHEL	1	0
2	All R0 drawings submitted to Customer	6	0
3	All drawings/ documents approved by customer in "Approval/ Information" category	10	5
4	All "AS-BUILT" drawings/ documents	10	5
5	Erection Manual	6	5
6	Type test reports	6	5
7	O&M manual	6	5

ALL FINAL DRAWINGS SHALL BE SUBMITTED IN BOTH PDF AND AUTOCAD (.DWG 2015 OR LOWER VERSION) FORMAT

16. LIST OF CODES & STANDARDS

Notes:

1 Equipment, accessories, components, material and tests shall confirm, to the specifications of latest revision of applicable standards.

2 Equipment, accessories, components, material and tests shall confirm, in general, to the Specifications of

[√] S [ ] BS [ ] IEC

Unless marked otherwise in the list below. Applicable standards are to be ticked [ ]

LV SWITCHGEAR

1	Switchgear General Requirements	[√] IS : 4237	[ ] BS : 162	[ ] IEC :
2	Factory built assemblies of LV Switchgear control gear	[√] IS : 8623	[ ] BS:5486	[ ] IEC : 439
3	Selection , installation and maintenance of switchgear and control gear	[√] IS : 10118	[ ] :	[ ] IEC :
4	Busbar main connections and accessories	[√] IS: 5578	[ ] BS : 159	[ ] IEC :
5	Rail mounting in switchgear and control gear installation	[√] IS :11039	[ ] BS :	[ ] IEC : 715
6	Marking and identification of conductor and apparatus terminal	[√] IS:11053	[ ] BS :	[ ] IEC :
7	Marking of insulated conductors	[√] IS: 5578	[ ] BS :	[ ] IEC : 391
8	Item designation	[√] IS :8270	[ ] BS :	[ ] IEC :
9	Climate proofing of electrical equipment	[√] IS: 3202	[ ] BS : CP 1014	[ ] IEC :
10	Degree of protection (enclosure)	[√] IS:13947	[ ] BS :	[ ] IEC : 144
11	Wrought aluminium & Al. alloys	[√] IS:5082	[ ] BS: 2898	[ ] IEC : 114
12	Copper of bus bars	[√] IS :	[ ] BS :	[ ] IEC : 28
13	LV circuit breakers	[√] IS :2516 Pt. I& II	[ ] BS: 4752 [ ] BS:3871 SEC 1	[ ] IEC : 157 -1
14	Starters	[√] IS : 8544	[ ]BS: 4941	[ ] IEC : 292-1
15	Identification of terminals of contractors and associated overload	[√] IS :10705	[ ]BS:	[ ] IEC : 158-1C
16	Air break switch	[√] IS :4064	[ ]BS: 5419	[ ] IEC : 408
17	Contactors	[√] IS:2959	[ ]BS: 775	[ ] IEC : 158-1
18	HRC cartridge fuses	[√] IS:13703	[ ]BS: 88	[ ] IEC : 269-1

19	Indicating instruments	[√] IS:1248	[ ]BS: 89	[ ] IEC : 51
20	Dimensions for panel mounted indicating instruments	[√] IS:2419	[ ]BS:	[ ] IEC :
21	AC electricity meters	[√] IS:722	[ ]BS: 5685	[ ] IEC : 521
22	Relays	[√] IS:3231	[ ]BS:142	[ ] IEC : 255
23	Static protective relays	[√] IS :8686	[ ]BS:	[ ] IEC :
24	Current transformers	[√] IS :2705	[ ]BS: 3938	[ ] IEC : 185
25	Voltage transformers	[√] IS: 3941	[ ]BS: 3941	[ ] IEC :
26	LV Control Transformers	[√] IS: 12021	[ ]BS :	[ ] IEC :
27	Miniature circuit breakers	[√] IS: 8828	[ ] BS : 3871	[ ] IEC :
28	Control switches & push button	[√] IS: 13947	[ ] BS:	[ ] IEC :
29	Thermostatic Bimetals	[√] IS: 8588	[ ] BS:	[ ] IEC :
30	Phosphating of iron & steel	[√] IS: 6005	[ ] BS: 3189	[ ] IEC :
31	"Colours for ready mixed paints and enamels"	[√] IS: 5	[ ] BS:	[ ] IEC :
32	Environmental tests	[√] IS: 2106	[ ] BS:	[ ] IEC :
33	Maintenance & field testing of relays	[√] IS:9124	[ ] BS:	[ ] IEC :
34	Specification for PVC insulated cables for working voltage upto & including 1100volts	[√] IS: 694	[ ] BS:	[ ] IEC :

LPB & Local Starters:-

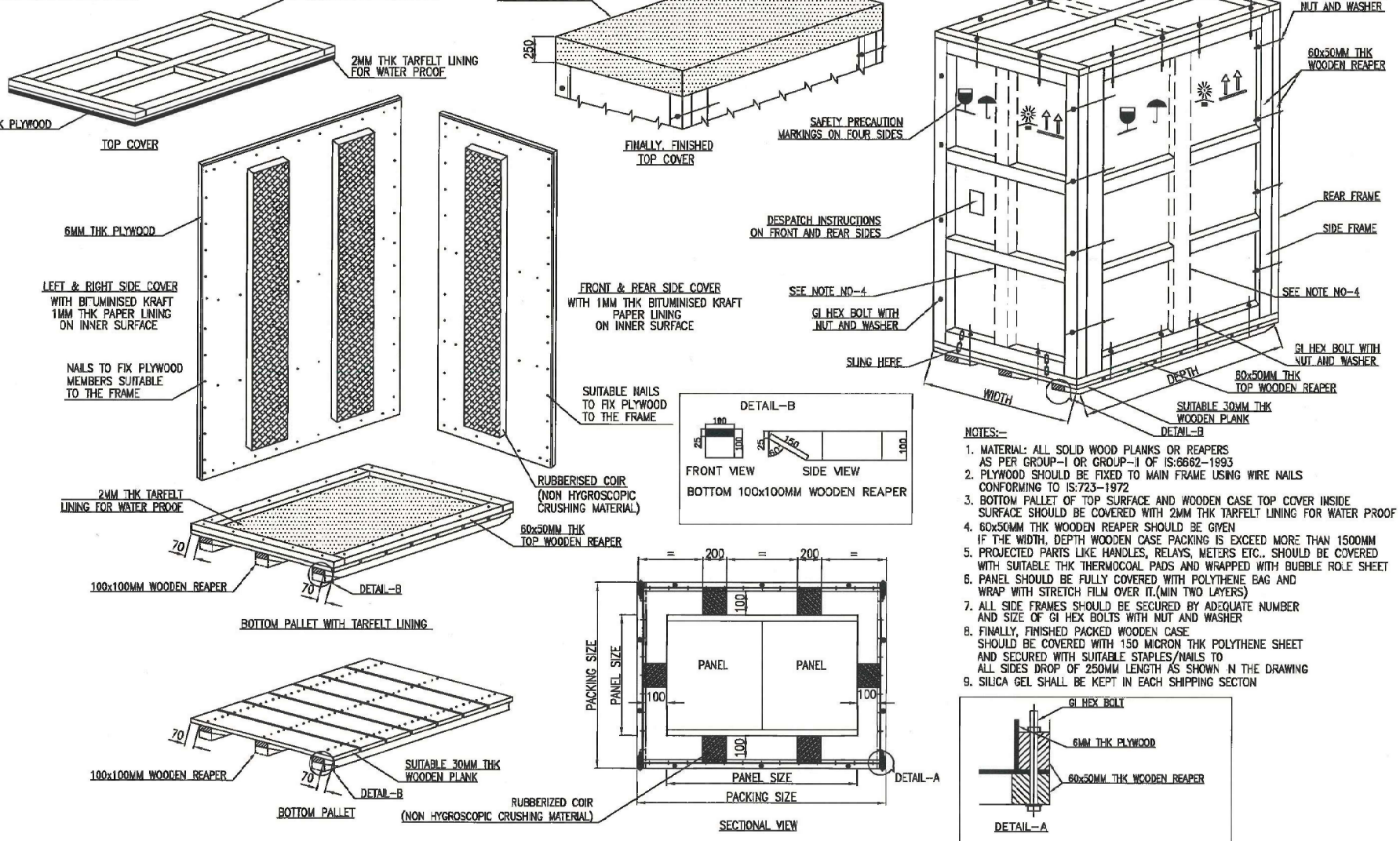
1	Factory built assemblies of LV Switchgear and control gear	[√] IS: 8623 PART -II	[ ] BS :5486	[ ] IEC : 439
2	Degree of protection	[√] IS: 13947	[ ] BS :5420	[ ] IEC : 144
3	Push button	[√] IS: 13947	[ ] BS :	[ ] IEC : 337
4	Climatic proofing of electrical equipment	[√] IS: 3202	[ ] BS :CP1014	[ ] IEC :
5	AC motors starters for voltage not exceeding 1000 V	[√] IS: 8544	[ ] BS : 4941	[ ] IEC : 292
6	Code of practice for phosphating iron & steel	[√] IS: 6005	[ ] BS :3189	[ ] IEC :
7	Colour for ready mixed paints & enamels	[√] IS: 5	[ ]:	[ ] IEC :

17. GENERAL PACKING SPECIFICATION

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

NOT TO SCALE
ASK DOUBT IF ANY



NOTES:-

1. MATERIAL: ALL SOLID WOOD PLANKS OR REAPERS AS PER GROUP-I OR GROUP-II OF IS:6662-1993
2. PLYWOOD SHOULD BE FIXED TO MAIN FRAME USING WIRE NAILS CONFORMING TO IS:723-1972
3. BOTTOM PALLET OF TOP SURFACE AND WOODEN CASE TOP COVER INSIDE SURFACE SHOULD BE COVERED WITH 2MM THK TARFELT LINING FOR WATER PROOF
4. 60x50MM THK WOODEN REAPER SHOULD BE GIVEN IF THE WIDTH, DEPTH WOODEN CASE PACKING IS EXCEED MORE THAN 1500MM
5. PROJECTED PARTS LIKE HANDLES, RELAYS, METERS ETC.. SHOULD BE COVERED WITH SUITABLE THK THERMOCOAL PADS AND WRAPPED WITH BUBBLE ROLE SHEET
6. PANEL SHOULD BE FULLY COVERED WITH POLYTHENE BAG AND WRAP WITH STRETCH FILM OVER IT.(MIN TWO LAYERS)
7. ALL SIDE FRAMES SHOULD BE SECURED BY ADEQUATE NUMBER AND SIZE OF GI HEX BOLTS WITH NUT AND WASHER
8. FINALLY, FINISHED PACKED WOODEN CASE SHOULD BE COVERED WITH 150 MICRON THK POLYTHENE SHEET AND SECURED WITH SUITABLE STAPLES/NAILS TO ALL SIDES DROP OF 250MM LENGTH AS SHOWN N THE DRAWING
9. SILICA GEL SHALL BE KEPT IN EACH SHIPPING SECTON

DRG. NO. EP-3-PP-001-001

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01	24.05.18	REVISED FOR WOODEN REAPER		

	NAME	SIGN.	DATE
DESIGNED	JAGADISH		02.10.17
DRAWN			
CHECKED	BMH		02.10.17
APPROVED	SKG		02.10.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : WOODEN CASE PACKING FOR CONTROL PANEL

NO. OF SHEETS 01
SHEET. NO. 01

SCALE | JOB NO. | DRG. NO. EP-3-PP-001-001 | REV. 01

FORM 66-301 A

18. GENERAL PAINTING SPECIFICATION

GENERAL PAINTING SPECIFICATION

OF

LT SWITCHGEAR

Document No: EP- 4 - CP- SD - 001

BHARAT HEAVY ELECTRICALS LIMITED

CONTROL PANEL BUSINESS GROUP

ELECTROPORCELAINS DIVISION,

BENGALURU-560012

Date of issue: 13.04.2018

1. General Specification:

All 415V switchgears, MCC's, AC & DC distribution boards etc. shall be painted by powder coating process.

2. Pre-Treatment or Surface Preparation:

Minimum 7 tank process or better shall be used for pre-treatment or surface preparation of sheet steel used for enclosures. The sequence of pre-treatment process shall include but not be limited to the following steps:

TANK-1: DEGREASING

Sheet Metal Surface shall be cleaned of grease, oils, soils, lubricants, oxide films, Heat Treatment / welding Scales etc. by using ALKALINE DEGREASER at Room Temperature for a Duration of 30-40 Minutes

TANK-2: WATER RINSE-I

Sheet Metal Surface shall be rinsed with water

TANK-3: DERUSTING

Sheet Metal Surface shall be cleaned of Rust by using Mixed HYDROCHLORIC ACID at Room Temperature for a Duration of 20 Minutes.

TANK-4: WATER RINSE-II

Sheet Metal Surface shall be rinsed with water

TANK-5: SURFACE ACTIVATION

Sheet Metal Surface shall be activated for Zn & Mn phosphate Coating by using ACTIVATION CHEMICALS ACID at Room Temperature for a Duration of 20 Minutes.

TANK-6: PHOSPHATING

Sheet Metal Surface shall be smoothly & uniformly coated with Zn Phosphate by using ZINC PHOSPHATE SOLUTION at Room Temperature for a Duration of 5 - 20 Minutes

TANK-7: WATER RINSE-III

Sheet Metal Surface shall be rinsed with water

TANK-8: PASSIVATION

For Sealing Pores of Sheet Metal Surface for obtaining Maximum Corrosion Resistance over Phosphate Coating by DECXYLITE SOLUTION at Room Temperature for a Duration of 15 - 20 Minutes

3. Powder Coating:

The following steps shall be followed to complete the powder coating process -

- **OVEN DRYING**
  Sheet Metal Parts shall be dried by HOT AIR at 150 Deg C Process, Duration-10-20 Minutes.

- **POWDER COATING**
  Within 24 Hours of Oven Drying, Sheet Metal parts shall be coated with Powder of shade desired by client through Spraying in Spray Booths, and then Epoxy-Powder Coated/Sprayed Sheet Metal parts are BAKED in an electrically fired oven at 140-150 Deg C for 10-15 Minutes.

4. Paint Thickness:

To be followed as per Customer Specifications or Project-wise Technical Specification documents.

5. Paint Shade:

To be followed as per Customer Specifications or Project-wise Technical Specification documents.

6. Testing and Verification of Painting Process:

To be followed as per Customer Approved or Project-wise approved Quality Plan.

Routine tests:

a. Test for Paint shade with reference to shade card
b. Paint thickness measurement
c. Adhesion test

Special Tests:

If any special tests are specified, the same shall be carried out as per approved Quality Plan

19. MANUFACTURING QUALITY PLAN FOR LV SWITCHGEAR

BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION
BANGALORE -560012
QUALITY (CPBG)

STANDARD QUALITY ASSURANCE PLAN FOR PMCC, MCC, FLOOR MOUNTED DB

SQAP NO: EPD_QP_CP_2021-22_0001; REV: 00; Dt: 06-April-2021

Supplier shall raise the inspection call along with Internal Test Report, Manufacture Test Certificates/Type Test Reports (wherever applicable) for BHEL/BHEL TPIA /Customer Inspection.

Note:

1. The SQAP (**EPD_QP_CP_2021-22_0001; REV: 00**) shall be read in conjunction with BHEL Specification mentioned in Purchase Order and shall deem to include any additional tests as per the specification/Standard.

2. Material supplied shall be in line with BHEL Purchase Order, Technical Specification, Data Sheet, BOM, Approved Drawings, applicable Standard References, or any other document/references.

3. In case of any contradiction between this SQAP, BHEL Specifications the following precedence shall be followed:
   1st: BHEL Purchase Order Specification;
   2nd: This STANDARD QUALITY ASSURANCE PLAN & Applicable standard;

4. **Packing** shall be as per BHEL purchase order packing specification/ or as per Manufacturer standard or approved Drgs from BHEL Engineering.

5. All **packing** cases should be **marked** with BHEL Purchase Order no, Item description and **CQIR NO** (by which material has been cleared for dispatch).

6. The SQAP shall be treated as reference and the manufacturer shall submit a detailed QAP (as applicable for the PO items) in line with this SQAP in their format after award of PO.

Documentation Part:

1. **Supplier shall raise the inspection call in the CQIR with inspection agency as BHEL SBD URL: www.cqir.bhel.in. and shall upload documents mention under Note 2 in CQIR Portal.**

2. Supplier to furnish the Test Certificates, Internal Tests Report and Type Test Reports (wherever applicable) as per this SQAP along with inspection call.

3. The items will be **inspected at BHEL approved manufacturer work.**

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
					M	C/N				D*	M	B	C	
1	2	3	4	5			7	8	9					11
A	**RAW MATERIAL**													
1	Angle, Channels & CRCA / HR / MS / SS / GI / ALU-ZINC Sheets	1) Dimension	Major	Meas.	1 Sample of each type & size	-	IS-513 , IS-1079 , IS-2062, IS-277, ASTM 240, 480	As per BHEL / CUSTOMER spec.	QC Record	✓	P	V		
		2) Surface Finish & check for Waviness/flatness	Major	Visual		-		As per Standard	QC Record		P	V		
		3)Tensile / Bending Test	Major	Mech. Test	As per IS	-			MTC / COC	✓	V	V		
2	Bus Bar – Copper / Aluminum / GI	1) Dimension	Major	Meas.	1 Sample of each type & size	-	IS-5082, IS-1897, IS-1897, App. Data Sheet	IS-5082, IS-1897, IS-1897, App. Data Sheet	QC Record	✓	P	V		
		2) Surface Finish	Major	Visual		-		As per Standard	QC Record		P	V		
		3) Bending Test	Major	Mech Test	As per IS	-			MTC / COC		P	V		
		4) Conductivity	Major	Elec.	As per IS	-		As per IS		✓	P	V		
3	Synthetic rubber / Neoprene / PU Foam / XLPE / EPDM Gasket	1) Material Type	Major	Visual	1 Sample of each type & size	-	IS-11149 , Approved Data Sheet	IS-11149 , Approved Data Sheet	Supplier TC / COC / QC Record		V			
		2) Dimension / Profile & Visual Inspection	Major	Meas.		-					P			
3	Synthetic rubber / Neoprene / PU Foam / XLPE / EPDM Gasket	3) Shore Hardness	Critical	Test	1 Sample per lot	-	CUSTOMER Spec. & IS-11149, L&T drg.	CUSTOMER Spec. & IS-11149, L&T drg.	Supplier TC / COC / QC Record		V	V	V	
		4) Elongation	Major	Test	1 Sample of each type & size	-	IS-11149 , Approved Data Sheet	IS-11149 , Approved Data Sheet			V	V	V	
		5) Compression	Critical	Test		-					V	V	V	
		6) Ozone Resistance	Major	Test		-					V	V	V	For Neoprene
4	Paint / Powder	1) Shade	Major	Visual	100%	-			MTC / QC Record	✓	P	V		

*** Records, identified with "TICK"(✓) shall be included in documentation.**
M- MANUFACTURER; B- BHEL / BHEL TPIA; C-CUSTOMER; MTC- MANUFACTURER TEST CERTIFICATES; COC- CERTIFICATE OF CONFORMANCE
P-PERFORM; V-VERIFY; W-WITNESS

SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		2) Make, Type , Finish & Shelf Life	Major	Visual	100%	-	Mfg. Std / Factory Standard	Mfg. Std / Factory Standard			P	V		
B	**BOUGHT OUT ITEMS**													
1	Air Circuit Breaker	1) Make, Type, Model & Rating	Major	Visual	100%	-	IS-13947 / Approved Data Sheet/ Drg.	IS-13947 / Approved Data Sheet/ Drg.	MTC / COC / QC Record	✓	P	V		
		2) Dimension & Mounting Arrangement	Major	Meas.	10% of each type	-					V			
		3) Routine Test	Critical	Test	10% of each type & rating	100 %					V	V	V	
2	CT / PT	1) Dimension & Mounting Arrangement	Major	Meas.	10% of each type & rating	10% of each type	CUSTOMER Approved Drg. & Data Sheet	CUSTOMER Approved Drg. & Data Sheet	QC Record		P			
		2) Type & Rating	Major	Visual							P	V	V	
		3) IR, HV, Ratio & Polarity	Critical	Test			IS 2705 / IS 3156, IS 16227: 2016	IS 2705 / IS 3156, IS 16227: 2016	Supplier TC		P	V		
		4) Routine Test as per IS 2705 & IS 3156	Critical	Elec.	100%	100 %				✓	V	V	V	
3	AC / DC Power & Aux. Contactor	1) Make, Type, Model & Rating	Major	Visual	10% of each type & rating	-	IS-13947 / Approved Data Sheet/ IEC 60947	IS-13947 / Approved Data Sheet/ IEC 60947	QC Record		P			
		2) Operation Check	Major	Test							P			
4	Switches	1) Make, Type, Model & Rating	Major	Visual	10% of each type & rating	-	CUSTOMER Approved Drg. / IS 3854	CUSTOMER Approved Drg. / IS 3854	QC Record		P			
		2) Operation Check	Major	Test		-					P			
5	HRC Fuse	1) Make, Type, Model & Rating	Major	Visual		-	CUSTOMER Approved	CUSTOMER Approved	MTC		P			

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SIGNATURES:

DOC. Title: STANDARD QUALITY ASSURANCE PLAN FOR PMCC, MCC, FLOOR MOUNTED DB
QP NO.: EPD_QP_CP_2021-22_0001 REV. NO.: 00; Dt: 06-April-2021

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		2) Operation Check	Major	Test	10% of each type & rating	-	Drg. / IS 9926 / IS 13703	Drg. / IS 9926 / IS 13703			P			
6	Protection Relays Overload, Coupling , Electromagnetic & Static	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-3231, IS-8686 / Approved Data Sheet	IS-3231, IS-8686 / Approved Data Sheet	MTC / QC Record	✓	P	V		
		2) Routine Test	Major	Test		10%					V	V		
		3) Operational Check	Major	Test		10%					P			
7	Numerical Relay	1) Make, type, Model & Rating	Major	Test	100&	100 %	IEC 60255 & IEC 61850	IEC 60255 & IEC 61850	MTC / COC	✓	V	V	W	
		2) Numerical relay FAT Test	Critical	Elect.	100%	10%	CUSTOMER Approved FAT Procedure	CUSTOMER Approved FAT Procedure	CUSTOMER CHP / MTC	✓	V	V	W	
8	Timer	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-722, IS-13779, IEC-60688 / Approved Data Sheet	IS-722, IS-13779, IEC-60688 / Approved Data Sheet	MTC / QC Record		P	V		
		2) Operational Check	Major	Test		10%					P			
		3) Routine Test	Major	Test		10%					V			
9	Transducers	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS 12784/ Approved Data Sheet	IS 12784/ Approved Data Sheet	MTC / QC Record		P	V		
		2) Operational Check	Major	Test		10%					P			
		3) Routine Test	Major	Test		10%					V	V	V	
10	KWH Meters	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-722 , IS-13779 / Approved Data Sheet	IS-722 , IS-13779 / Approved Data Sheet	MTC / QC Record	✓	P	V		
		2) Operational Check	Major	Test		10%					P			
		3) Routine Test	Major	Test		10%					V	V	V	
11	Indicating Instruments (Analog)	1) Make, type, Color, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-1248 / IS-7436	IS-1248 / IS-7436	QC Record		P	V		

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SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		2) Operational Check	Major	Test		10%	Approved Data Sheet	Approved Data Sheet			P			
		3) Routine Test	Major	Test		10%			MTC		V	V	V	
12	Push Button	1) Make, type, Color, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-13947 / Approved Data Sheet	IS-13947 / Approved Data Sheet	QC Record		P			
		2) Operational Check	Major	Test		10%					P			
13	Indication Lamp	1) Make, type, Color, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-13947 / Approved Data Sheet	IS-13947 / Approved Data Sheet	QC Record		P			
		2) Operational Check	Major	Test		10%					P			
14	MCB	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-8828 / Approved Data Sheet	IS-8828 / Approved Data Sheet	QC Record		P			
		2) Operational Check	Major	Test		10%					P			
15	MCCB	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	As per IS-13947 Part 1 & 2 / IEC 60947 Part 1 & 2/ Approved Data Sheet	As per IS-13947 Part 1 & 2 / IEC 60947 Part 1 & 2/ Approved Data Sheet	QC Record		P			
		2) Operational Check	Major	Test		10%					P			
16	SFU	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS/IEC 60947-1: 2007) & (IS/IEC 60947-3 : 2012/ Approved Data Sheet	IS/IEC 60947-1:2007) & (IS/IEC 60947-3 : 2012/ Approved Data Sheet	QC Record		P			
		2) Operational Check	Major	Test		10%					P			
17	ELCB	1) Make, type, Model & Rating	Major	Visual		10%			QC Record		P			

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SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		2) Operational Check	Major	Test	10% of each type & rating	10%	IS-8828 / Approved Data Sheet	IS-8828 / Approved Data Sheet			P			
18	Control Transformer	1) Make, type & Rating	Major	Visual	100%	100 %	IS-12021 / Approved Data Sheet	IS-12021 / Approved Data Sheet	MTC / QC Record	✓	P	V	V	
		2) Voltage Ratio	Major	Elec.							P	V	V	
		3) Routine Test	Major	Elec.							V	V	V	
19	Wires	1) Make, type & Rating	Major	Visual	10% of each type & rating	-	IS-694	IS-694	QC Record / MTC		P			
20	Terminal , Lugs, Thermostat, Space Heater, Socket, Hooter, CFL, LED	1) Make, type & Rating	Major	Visual	10% of each type & rating	-	Mfg. Standard / FS	Mfg. Standard / FS	QC Record		P			
		2) Functional Test	Major	Elec.		-	Mfg. Standard / FS		QC Record		P			
21	Busbar Support Insulator	1) Make, Type, Rating & Finish	Major	Visual	10% of each type & rating	-	As per Drg.	As per Drg.	QC Record		P	V	V	
		2) Dimension	Major	Meas.		-	Mfg. Standard	Mfg. Standard	QC Record		P	V	V	
		3) HV-IR Test	Major	Elec.		-	As per IS-8623 / IEC-61439	As per IS-8623 / IEC-61439	MTC / QC Record		P	V	V	
		4) Comparative Tracking Index & Flexural Strength Test	Major	Elec.			As per approved Data Sheet / ASTMD 790 & BS 5901	As per approved Data Sheet / ASTMD 790 & BS 5901	MTC / COC ./ QC Record		V	V	V	
22	Insulating Barriers & Shrouds	1) Make, Type, Rating & Finish	Major	Visual	10% of each type & rating	-	As per approved Drg.	As per approved Drg.	QC Record		P			
		2) Flame Resistance Test	Major	Elec.			As per approved Data Sheet/ UL 94	As per approved Data Sheet/ UL 94	MTC / COC ./ QC Record		V			

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SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		3) HV Test	Major	Elec.			ASTM D 149	ASTM D 149			V			As per ASTM D149
23	ACB handling Trolley	1) Dimensional & Functional Check	Major	Test	10% of each type & rating	-	Approved. Drg by BHEL	Approved. Drg by BHEL	QC Record		P	V	V	COC to be submitted
24	Tools & Tackles	1. Make, model 2. Quantity	Minor	Visual	10% of each type & rating	-	Approved Drg by CUSTOMER	Approved Drg by CUSTOMER	QC Record		P	V	V	COC to be submitted
25	FASTNERS	Hardware type and coating thickness used at both the panel assembly and busbar assembly.	Major	Document Verification	100%	100 %	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet	Manufacturer TC		V	V	-	MTC shall be reviewed by the Inspector during final inspection
26	VFD	1) Make, type, Model & Rating	Major	Visual	10% of each type & rating	10%	IS-13947 (Part 4/Set 1)/ IEC-60947-4-1 (1990)/ Approved Data Sheet	IS-13947 (Part 4/Set 1)/ IEC-60947-4-1 (1990)/ Approved Data Sheet	QC Record		P	V		
		2) Operational Check	Major	Test		10%					P			
		3) Routine Test	Major	Test		10%			MTC	✓	V	V	V	
C	**IN - PROCESS**													
1	FABRICATION	1) Shearing, Punching, Notching & Bending	Major	Meas.	Mfg. Practice	-	Mfg. Standard / Approved Drawing	Mfg. Standard / Approved Drawing	QC Record		P			
		2) Dimension Check	Major	Meas.	100%	-	Approved Drawing	Approved Drawing	QC Record		P			
		3) Cut Outs	Major	Meas.	100%	-	Approved Drawing	Approved Drawing	QC Record		P			
		4) Welding & De-burring Check	Major	Meas.	Mfg. Practice	-	Mfg. Standard / Approved Drawing	Mfg. Standard / Approved Drawing	QC Record		P			

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SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
2	PRETREATMENT & PROTETIVE COATING (PAINT / POWDER)	1) Pre-wiping & Degreasing	Major	Chemical	Mfg. Practice	-	Mfg. Standard	Mfg. Standard	QC Record		P	V	V	
		2) Surface Preparation by Nano technology	Critical	Chemical	Mfg. Practice	-	Mfg. Standard	Mfg. Standard	QC Record		P	V	V	
		3) Paint / Powder Shade	Major	Visual	10% of each type & rating	10%	Approved Specification	Approved Specification	QC Record		P	V	V	
		4) Paint / Powder Thickness & Adhesion	Critical	Meas.	Mfg. Practice	-	Approved Specification	Approved Specification	QC Record		P	V	V	As per IS 101
		5) Salt Spray Test	Major	Visual	01 Sample per year	-	Mfg. Standard	Mfg. Standard	QC Record		P	V	V	As per IS 101
3	PANEL INTERNAL ASSEMBLY	1) Profile , Alignment & Overall Dimension Check	Major	Process.	100%	-	Mfg. Standard / Approved Data Sheet & Drawing	Mfg. Standard / Approved Data Sheet & Drawing	QC Report	✓	P			
		2) Overall Assembly with Hinge, Lock, Door, Knob, Gasket Arrangement	Major	Process.	100%	-			QC Report	✓	P			
		3) Busbar Size, Arrangement, Support, & Joints	Major	Process.	100%	-			QC Report	✓	P			
		4)) Busbar Insulator, Bolts, Tightening, Clearance	Major	Process.	100%	-			QC Report	✓	P			
		5) Form 4B Type 5 design in cable alley	Major	Process.	100%	-			QC Report	✓	P			
		6) All component mounting arrangement	Major	Process.	100%	-			QC Report	✓	P			

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P-PERFORM; V-VERIFY; W-WITNESS

SIGNATURES:

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		7) Earthing Check & Arrangement with Busbar	Major	Process.	100%	-			QC Report	✓	P			
		8) Colour Coding of Busbar	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		9) Clearance of Busbar	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		10) Tin/Silver plating/bimetallic strip/washer between Cu & Al joints	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		11) Termination for power & control circuit	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		12) Lug Size, crimping Quality	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		13) Spring loaded power & control contacts alignment	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		14) Resistance check on power contacts	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			In line with Temp. rise Test Report
		15) Incoming & outgoing power & control contacts assembly	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		16) Alignment of panel & module/CB - Alignment of contacts with each other.	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			
		17) Check of mounting of VFD, input filter & output filter.	Major	Process.	100%	-	Mfg. Standard	Mfg. Standard	QC Report	✓	P			

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SIGNATURES:

DOC. Title: STANDARD QUALITY ASSURANCE PLAN FOR PMCC, MCC, FLOOR MOUNTED DB
QP NO.: EPD_QP_CP_2021-22_0001 REV. NO.: 00; Dt: 06-April-2021

SR NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
4	CONTROL & POWER WIRING	1) Wire & Lug size, Type, Color, Make	Major	Visual	100%	-	As per approved Drawing	As per approved Drawing	QC Report	✓	P			
		2) Ferruling, Crimping, Tightening, Clamping Check	Major	Visual	100%	-	As per approved Drawing	As per approved Drawing	QC Report	✓	P			
		3) Continuity & Earthing Check	Critical	Elec.	100%	-	As per approved Drawing	As per approved Drawing	QC Report	✓	P			
		4) Functional Check	Critical	Elec.	100%	-	As per approved Drawing / Scheme	As per approved Drawing / Scheme	QC Report	✓	P			
		5) Shrouding of accessible live parts & Tool Falling	Major	Visual	100%	-	Mfg. Standard / FS	Mfg. Standard / FS	QC Report	✓	P			
		6) Terminal Arrangement	Major	Elec.	100%	-	As per approved Drawing	As per approved Drawing	QC Report	✓	P			
		7) Breaker Assembly & Operation Test	Major	Elec.	100%	-	As per approved Drawing	As per approved Drawing	QC Report	✓	P			
D	**FINAL INSPECTION & TESTING**													
1	Visual & Dimension Check	1) Visual check (aesthetics of overall panel and components mounting)	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		2) Verification of overall dimensions	Major	Meas.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		including sheet steel thickness.												
		3) Verticality of panels and alignment between two transport sections	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
2	Panel & feeder Identification	1) Name Plates & verification of caution labels on panels, live parts	Major	Visual	100%	100 %	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
3	Paint Check	1) Paint Shade, Thickness & Adhesion Test	Major	Meas.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
4	Alignment & profile	1) Door & Gasket Arrangement with Alignment	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		2) CT /PT fixing & mounting arrangement. (Firm fixing & rigid support)	Major	Visual	100%	10%	Approved Drawing / Mfg. drawing approved by BHEL	Approved Drawing / Mfg. drawing approved by BHEL	QC Report / TC		P	W	W	CT should be mounted on a mounting plate for firm fixing & rigidity
		3) Busduct interface, phase sequence, flange dimensions & clearances.	Major	Visual	100%	100 %	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
5	Busbar Material, Size, Type, Sequence, Sleeves, Clearance	1) Busbar arrangement, center to center support distance between supports	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		2) Busbar colour coding.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		3) Overlapping of busbar joints.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	

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SIGNATURES:

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		4) Verification of tightness of busbar joints by torque wrench.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		5) Check shrouding of accessible live parts & tool falling shroud in cable alley with caution/ live/danger sticker at all shrouds.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
6	BOM Verification	1) Make, Size, Type, Rating & Model.	Major	Visual	100%	10%	App.Drg. / BOM / Make List	App. Drg. / BOM / Make List	QC Report / TC		P	W	W	10% of each type of module / lot
7	Continuity & Earthing	1) Continuity & Earthing Test	Critical	Elec.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
8	IR Test	1) Before & After HV	Critical	Elec.	100%	100 %	As per IS-8623 / IEC-61439	As per IS-8623 / IEC-61439	QC Report / TC		P	W	W	
9	HV test on Power & Control circuit.	1) HV Test	Critical	Elec.	100%	100 %	As per IS-8623 / IEC-61439	As per IS-8623 / IEC-	QC Report / TC		P	W	W	
10	Functional Check	1) Functional & Operational Check of feeders	Critical	Elec.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		2) Check control wiring / terminal arrang. & feruling.	Major	Elec.	100%	10%	Approved Drawing	Approved Drawing			P	W	W	10% of each type of module / lot
		3) Check for Breaker anti pumping & trip free feature.	Major	Elec.	100%	100 %	Approved Drawing	Approved Drawing			P	W	W	
		4) Inter changeability	Major	Elec.	100%	10%	Approved Drawing	Approved Drawing			P	W	W	10% of each

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
		check for drawout type feeders.												type of module / lot
11	Interlocking Check & Breaker Check	1) Breaker Interlock Operation Check (Elec. Or Mech.)	Major	Elec.	100%	100 %	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
		2) Breaker Operation at Service, Test & Isolation position					Approved Drawing IEC 60947 / IEC 61439	Approved Drawing / IEC 60947 / IEC 61439						
		3) Mech operation test for ACB as per IS and operation check.			100%				QC Report / TC		P	W	W	
		4) Earthing of ACB cradle.												
12	I/C & O/G power & control contacts assembly & alignment of panel & module	1) Alignment of contacts with each other.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
13	Verification of IP Class: IP 54 & IP 42 (Refer GN)	Degree of protection check, check profile & fixing of gaskets	Major	Visual	100%	10%	As per IS-2147 , IEC-60529, Approved Drawing	As per IS-2147 , IEC-60529, Approved Drawing	QC Report / TC		P	W	W	Paper insertion for IP 5X & 1 mm wire Insertion method for IP 4X. Type, Dim. & profile of the gaskets should be same as type tested panel gaskets

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
14	Terminal & Lugs	1) Verification of Outgoing Terminals with Cable Lugs for each type of feeder	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	10% of each type of module / lot
15	General Notes	Verification of General Notes	Major	Visual	100%	100 %	Approved Drawing / BOM	Approved Drawing / BOM	QC Report / TC		P	W	W	
16	Alignment Check	Check for proper alignment of SFU, MCCB, MPCB extended rotary operated handle on random sampling for different ratings.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
17	Gland Plate	Check for thickness of gland plates and matl. as per drg / specification.	Major	Meas.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
18	Breaker Doors	Verification for sagging of breaker feeder doors (front and rear).	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
19	Locking Arrangement	Verification of Locking mechanism of feeder doors, defeat interlock of breaker, MCCB / SFU / MPCB on sample basis and check for pad locking arrangement	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
20	Labeling of components and Tags	Verification of Legible name plates for all components and tags as per drg.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
21	Cable Support	Verification of Cable supports for power and control cabling in cable alleys.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
22	Tightness & Dressing	Tightness & dressing (sleeves, bunching, firm fixing) of control and power wiring.	Major	Visual	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
23	Earthing Arrangement	Verification of earth bus dimensions, earthing of draw out modules, cable alley & D/O feeder doors numerical, electromechanical relays, electronics relays / devices etc.	Major	Meas.	100%	10%	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	
24	External Earthing	Provision of external earthing for customer earth connection as per drg / specification.	Major	Visual	100%	100 %	Approved Drawing	Approved Drawing	QC Report / TC		P	W	W	

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1	2	3	4	5	M	C/N	7	8	9	D*	M	B	C	11
25	Document Verification of Type Test Reports	Verification of approved Type Test Reports of SC, TR & IP	Major	Document Verification	100%	100 %	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet / Approved Drawing	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet / Approved Drawing	Type Test Report from Third Party		V	V	V	Approved Type test reports shall be reviewed by the Inspector during final inspection
26	Document Verification	Verification of approved Test Sequence-1 & Combined Test Sequence report for each rating of ACB	Major	Document Verification	100%	100 %	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet / Approved Drawing	As per BHEL / CUSTOMER contractual requirement / Approved Data Sheet / Approved Drawing	Type Test Report from Third Party		V	V	V	Approved Type test reports shall be reviewed by the Inspector during final inspection
27	Cable Lugs & Cable Glands	Verification of approved make, model	Major	Dimensional, Visual	100%	10%	Approved Drawing	Approved Drawing	TC		V	V	V	Test Report to be reviewed during inspection.
E	**PACKING**													
1	PACKING	Packing of Panel for Completeness, Sturdiness & Loose Items	Major	Visual	100%	-	BHEL Approved Packing Standard	BHEL Approved Packing Standard	Packing Report		P			PANEL CLEARANCE BY CUSTOMER/BHEL

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SIGNATURES:

20. MAKE OF COMPONENT

COMPONET	MAKE
BOI'S	WITH VDE/CE/UL/CSA MARKED OR BIS APPROVED WITH VALID CML NO.
ETHERNET SWITCH	KEMA CERTIFIED MODEL

NTPL FGD_Electrical Sub-vendor List

Class I items:

Sl. No	Item Description	Cat 1	Cat 2
1.	63MVA, 220/11KV FGD Transformer	• ABB • BHEL • GE T&D • SIEMENS • TELK • TOSHIBA, INDIA	• BIAODING, CHINA • CGL • DANISH PRIVATE LIMITED • EMCO LIMITED • ESENNAR TRANSFORMERS (P) LTD. • HYUNDAI, S.KOREA • ILJIN TRANSFORMERS • KANOHAR ELECTRICALS LTD. • KIRLOSKAR ELECTRIC CO.LTD. • KRYFS POWER COMPONENTS LTD. • MARSONS LIMITED • SCHNEIDER ELECTRIC INFRASTRUCTURE LIMITED • SEPCO, CHINA • SHANDONG , CHINA • SOUTHERN POWER EQUIPMENT COMPANY PVT. LTD. • T&R (INDIA) LTD. • TESLA TRANSFORMERS LTD., • UNIVERSAL POWER TRANSFORMERS PVT. LTD., • VOLTAMP TRANSFORMERS LTD. • XIAN, CHINA • TBEA, INDIA
2.	Auxiliary Transformers (Oil Filled)	• Andrew Yule • BHEL • CGL • GE • GE Prolec • KIRLOSKAR • SCHNEIDER • TOSHIBA • VOLTAMP	• DANISH PRIVATE LIMITED • ESENNAR • HYOSUNG • KANOHAR ELECTRICALS LTD. • KRYFS Power Components Ltd • Raychem RPG • Shree Abirami Electricals • Telawne • Tesla Transformers Ltd., • TRANSFORMERS (P) LTD • Voltech
3.	415 V Switchgear (PCC/PMCC/ MCC)	• ABB • BHEL • C&S ELECTRIC • GE POWER • GE-T&D • L&T • SCHNEIDER • SIEMENS	• Alstom • Areva T&D • CONTROL & SCHEMATICS • Crompton Greaves Limited • NITYA ELECTRO CONTROLS • Toshiba • VENUS • VOLTECH MANUFACTURING LIMITED

4.	ACB	• ABB • ALSTOM • BHEL • C&S ELECTRIC • CGL • GE-POWER • GE-T&D • L&T • SCHNEIDER • SIEMENS	
5.	Auxiliary Relays	• ABB • ALSTOM • C & S Electric • GE • JYOTHI LTD • L&T • SCHNEIDER • SIEMENS	• BCH • GEC • JVS • VOLTECH
6.	Battery Charger (FC/FCBC)	• AMARARAJA • CALDYNE • CHHABI • CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED • DUBAS • HBL - NIFE • HBL POWER SYSTEMS LTD • MASS-TECH CONTROLS PVT.LTD • EMERSON NETWORK POWER • Vertiv Energy Private Limited	• AMCO • ENERPAC • MASS-TECH • EXIDE • HOPPECKE, GERMANY • MMAX • ENGINEERS • ELTECH • SABNIFE • STATCON POWER SYSTEMS & SOLUTIONS
7.	Electrical Actuators	• ANTRIEB • AUMA (India) • LIMITORQUE • ROTORK CONTROLS LTD	
8.	Electro Mechanical Relays	• ABB • ALSTOM • C & S Electric • EASUN REYRALLE • GE • JYOTI RE-300 • L&T • SCHNEIDER • SIEMENS	• ALLEN BRADELY • GEC • JVS • OMRON • PARAMOUND
9.	H.T. Motors	• ABB • BHEL • CROMPTON GREAVES • KEC • MARATHON (ALSTOM) • SIEMENS • TMEIC	• BBL • ELJIN • HUNDAI • HYOSUNG • IJLIN • JEUMOUNT ELECTRIC • LHP

		• WEG INDIA LTD	• NANYANG EXPLOSION • SHANGAI ELECTRIC • TECO ELECTRIC & MACHINERY (P) Ltd. • JYOTHI
10.	H.T. Power Cables (XLPE)	• APAR INDUSTRIES LTD • CCI • CMI LTD • Finolex • GEMSCAB • GUPTA POWER • INFRASTRUCTURE LIMITED • KEC INTERNATIONAL LIMITED • KEI INDUSTRIES • POLYCAB • TORRENT CABLES • UNIVERSAL CABLES	• DYNAMIC CABLES • HAVELLS INDIA LTD • LS CABLE • PARAMOUNT COMMUNICATIONS LTD • RAVIN CABLES LIMITED • SERVAL • SRIRAM CABLES PVT. LTD • STERLITE • Sterlite Power Transmission Ltd • TIRUPATI PLASTOMATICS PVT. LTD.
11.	HT Busduct (Segregated Phase)	• BHEL • C&S • KGS Engg • POWERGEAR • REEP • STARDRIVE	• BUS BAR SYATEMS LIMITED • ELEMECH • ELPRO • ENPRO ENGG • GLOBE ELECTRICAL INDUSTRIES • POWER WAYS • VEE VEE CONTROLS
12.	HT Switchboard 11KV, 3.3KV	• ABB • BHEL • L&T • SCHNEIDER • SIEMENS	• CGL • SYSTEM CONTROL • VOLTECH
13.	L.T. Motors (AC & DC)	• ABB • ALSTOM • Bharat Bijilee Ltd., • Jyoti Limited • Kirloskar Electric Co. Ltd • Laxmi Hydraulics Pvt Ltd • Marathon Electric Motors India Limited • Siemens • WEG	• BHEL Electrical Machines Ltd • ELJIN MOTOR • GE POWER • Hem Industries • HYUNDAI • IJLIN • JEUMOUNT ELECTRIC • NANYANG EXPLOSION • Power House • SHANGAI ELECTRIC • TECO ELECTRIC & MACHINERY (P) Ltd. • TMEIC • CGPower & Industrial Solutions Limited • NGEF(Hubli) Ltd
14.	Lighting Transformer	• AMES IMPEX ELECTRICALS PVT.LTD. • BHEL	• MEGAWIN • MEHRU ELECT & MECH ENGINEERS(P) LTD,

		• ESENNAR TRANSFORMERS PVT LTD • INDCOIL TRANSFORMERS PVT LTD	• POWER PACK • SOUTHERN POWER EQUIPMENT CO PVT LTD (SPEC) • SUDHIR INTRA VIDYUT • SUDHIR TRANSFORMERS LIMITED
15.	LT Busduct (Non-Segregated Phase)	• ALSTOM • BHEL • CONTROL & SWITCHGEAR • POWERGEAR • STARDRIVE	• Balaji Electro controls • BUSBAR SYSTEMS LIMITED • Controls and schematics • ELEMECH • ELPRO • GLOBE ELECTRICALS • POWER WAYS • REEP • System Infotech • Tech up engineering • Tricolite Electrical Ind. Ltd • VEE VEE CONTROLS
16.	LT Control Cables	• APAR INDUSTRIES LTD. • CABLE CORPORATION OF INDIA LTD • CCI • CMI LIMITED, • CORD Cable • DELTON CABLES • Elkay Telelink • FINOLEX • GEMSCAB INDUSTRIES LTD, • GOVIND CABLE INDUSTRIES • GOYOLENE FIBRES (INDIA) PVT LTD., DAMAN • GUPTA POWER INFRASTRUCTURE LTD, • HAVELLS • HINDUSTAN VIDYUT PRODUCTS LTD. • ICL • INCAB • INDO ASIAN FUSE GEAR LIMITED, • KEC INTERNATIONAL LIMITED, • KEI INDUSTRIES • KRISHNA ELECTRICAL INDUSTRIES LTD, • LAPP INDIA (P) LTD • NICCO • PARAGON • PARAMOUNT • PLAZA CABLES • POLYCAB WIRES PVT LTD	• Advance cable • ALPHA COMMUNICATION LTD • BHANSALI CABLES & CONDUCTORS PVT LTD • BROOKS CABLES,MUMBAI • CHANDRESH CABLES LIMITED • DIAMOND POWER INFRASTURCTURE LTD • DYNAMIC CABLES • EPSILLON CABLES PVT. LTD, • FINECAB WIRES & CABLES PVT. LTD • GLOSTER cables • GoyleneFibre Pvt Ltd • MANOJ CABLES LTD. • MANSFIELD CABLE CO., • NANGALWALA IMPEX (P) LTD • NATARAJ PLAST INDUSTRIES LTD., NEW DELHI, • PAGODA CABLES PVT. LTD • PARAMOUNT COMMUNICATIONS LTD. • RALLISON ELECTRICALS PVT. LTD. (Old name-Roolex Electroproducts LTd) • RAVIN CABLES • RR Kabel • SBEE CABLES LTD., • Scott Innovation wires and cables • SERVAL • SHIVAPRIYA CABLES LTD., • SHYAM CABLE INDUSTRIES DELHI • SPECIAL CABLES PVT. LTD

		• Radiant • SRIRAM CABLES PVT. LTD • Suyog Cables • SUYOG ELECTRICALS LTD., BARODA, • TCL CABLES LTD • TECHMECH ENGINEERS , BANGALORE • THERMO CABLES LIMITED • TORRENT CABLES • TOSHNIWAL CABLES, JAIPUR • UNIVERSAL CABLES	• SPM POWER & TELECOM PVT LTD. • STEP Industries • SUJOG ELECTRICALS • SURAJ CABLES • TC COMMUNICATION PVT LTD. • TERACOM • TERACOM LIMITED • THERMO PADS • TIRUPATI PLASTOMATICS PVT. LTD. • TirupatiPlasomatics • TORRENT Power • VARSHA CABLES PVT LTD • VIKAS CABLE COMPANY • WINDSOR CABLES PVT. LTD.
17.	LT Power Cables (XLPE)	• APAR INDUSTRIES LTD. • CCI • CMI LIMITED, • CORDS CABLE INDUSTRIES LTD. • DELTON CABLES • ELKAY TELELINKS, NEW DELHI • FINOLEX • GEMSCAB INDUSTRIES LTD, • GLOSTER CABLES LTD • GOVIND CABLE INDUSTRIES • GOYOLENE FIBRES (INDIA) PVT LTD., DAMAN • GUPTA POWER INFRASTRUCTURE LTD, • HAVELL'S INDIA LTD., NEW DELHI • HINDUSTAN VIDYUT PRODUCTS LTD. • ICL • INCAB • INDO ASIAN FUSE GEAR LIMITED, • KEC INTERNATIONAL LIMITED, • KEI INDUSTRIES • KRISHNA ELECTRICAL INDUSTRIES LTD, • LAPP INDIA (P) LTD • NICCO CORPORATION LTD • PARAGON • Paramount cable • POLYCAB • Radiant • RAVIN • RAVIN CABLES LIMITED • Sbee Cables	• Advance cable • ALPHA COMMUNICATION LTD • AVOCAB • BHANSALI CABLES & CONDUCTORS PVT LTD • BROOKS CABLES,MUMBAI • CHANDRESH CABLES LIMITED • CRYSTAL CABLES, KOLKATA • DIAMOND POWER INFRASTURCTURE LTD • DYNAMIC CABLES • EPSILLON CABLES PVT. LTD, • FINECAB WIRES & CABLES PVT. LTD • MANOJ CABLES LTD. • MANSFIELD CABLE CO., • NANGALWALA IMPEX (P) LTD • NATARAJ PLAST INDUSTRIES LTD., NEW DELHI, • PAGODA CABLES PVT. LTD • PARAMOUNT COMMUNICATIONS LTD. • Plaza CABLES • Rallison • RALLISON ELECTRICALS PVT. LTD. (Old name-Roolex lectroproducts LTd) • RPG • RR KABEL • SBEE CABLES LTD., • Scott Innovation wires and cables • SERVAL • SHIVAPRIYA CABLES LTD., • SPECIAL CABLES PVT. LTD • SPM POWER & TELECOM PVT LTD. • Sri Ram Cables

		• SHYAM CABLE INDUSTRIES DELHI • TCL CABLES LTD • THERMO CABLES LIMITED • Thermocables • TORRENT CABLES • TOSHNIWAL CABLES, JAIPUR • UNIVERSAL CABLES	• STEP Industries • SURAJ CABLES • SUYOG ELECTRICALS LTD., BARODA, • TC COMMUNICATION PVT LTD. • TECHMECH ENGINEERS , BANGALORE • TERACOM LIMITED • THERMO CABLE • THERMO PAD • TIRUPATI PLASTOMATICS PVT. LTD. • TORRENT POWER LIMITED • VARSHA CABLES PVT LTD • VIKAS CABLE COMPANY • WINDSOR CABLES PVT. LTD.
18.	LT Trailing Cables		• RALLISON • SUJOG ELECTRICALS • THERMO PADS
19.	LT Transformer (Dry Type)	• ABB • BHEL • CG POWER (CGL) • GE PROLEC • KIRLOSKAR • SCHNEIDER • TOSIBA T&D SYSTEM (INDIA) • VOLTAMP TRANSFORMERS	• RAYCHEM RPG • SUDHIR INTRA VIDYUT • TELAWNE • VOLTECH • AMES IMPEX • KANOHAR ELECTRICALS
20.	MLDB/PDB/ACDB/ WDB/ELDB / DCDB / LCP / LPBS / DCLDB	• ABB • ADVANCE POWER CONTROLS LIMITED • ALSTOM, • AMBIT SWITCHGEAR PVT LTD • AUTOMATION NETWORKS & SERVICES • BALAJI ELECTRO CONTROLS PVT LTD. • BCH ELECTRIC LIMITED • BHEL • C&S ELECTRIC • CGL, • CONTROL & SCHEMATICS • CONTROL DEVICES • CONTROL ENGINEERING CO. • CONTROL INFOTECH P LTD, • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • CUBIC CONTROL SYSTEMS • DYNASPEDE INTEGRATED SYSTEMS PVT. LTD.	• ADLEC POWER • ANAND POWER LTD • ELINS SWITCHBOARDS PVT LTD. • ELKTRISCHEN POWER GEARS (P) LTD. • EMCONS • EXCEL POWER • HORSE POWER CONTROL • HYUNDAI, • INTRELEC • JANANI ELECTRICALS • LOAD CONTROL • POPULAR SWITCHGEAR • POWER CONTROL EQUIPMENTS • POWERICA LTD. • PRASHA TECHNOLOGIES • PRITHVI TECHNOLOGIES • SEN & SINGH ENGINEERS, KOLKATA • SHREE ABIRAMI ELECTRICAL ENGINEERS • SHRENIK & COMPANY • SPACE AGE • STAR DELTA ENGINEERING

		• ELECMECH SWITCHGEAR & INSTRUMENT • ENPRO INDUSTRIAL • GE • GEC • GEMCO CONTROLS LTD • GEPC • HAVELLS, • HENSEL ELECRIC INDIA PVT. LTD. • HINDUSTAN CONTROLS & EQUIPMEN PVT. LTD.,KOLKATA • HI-TECH SERVICES • INDO ASAIN • INDO KOPP • INDUSTRIAL CONTROLS & APPLIANCES PVT.LTD • INDUSTRIAL CONTROLS & DRIVES (I) PVT. LTD. • JAKSON ENGINEERS LTD • JASPER ENGINEERS PVT.LTD. • JOLLY ENGINEERING INSUSTRIES • KMG ATOZ SYSTEMS (P) LTD. • L&T, • LOTUS POWER GEAR PRIVATE LTD. • MDS, • MEDITRON, • MERLIN GERIN • MK ENGINEERS • NAPTUNE INDIA LTD. • NGEF, • NIE POWER & ENGINEERING (P) LTD. • NIKITECH ELECTRIC PVT LTD. • NITYA ELECTOCONTROLS • POPULAR SWITCHGEAR PVT LTD., MUMBAI, • POSITRONIC • POWER CONTROL • POWER & PROECTION • POWER PLUS (BANGALORE) PVT LTD. • POWERTECH SWITCHGEARS (I) PVT LTD • PYROTECH . • PYROTECH ELECTRONICS PVT. LTD. • S&S	• STERLING GENERATORS • SUPERNOVA ENGINEERS LTD • VOLTECH • ADVANCE ENGG. COMPAN • Sterling Generators Pvt. Ltd. • ELEXPRO ELECTRICALS PVT/ LTD. • AVAIODS TECHNOVATORS LTD

		• S.B. POWER SYSTEMS • SAMCON INDUSTRIAL CONTROLS PVT LTD • SCHNEIDER • SCHNEIDER ELECTRIC INDIA PVT.LTD. • SIEMENS • STANDARD • SWITCHING CIRCUITS, KOLKATA • SYSTEM INFOTECH • TAURUS • TECH-UP ENGINEERING PVT LTD. • TELEMECANIQUE • TRICOLITE ELECTRICAL INDUSTRIES, SAHIBABAD, • UNILEC ENGINEERS LIMITED • VEE VEE CONTROLS • VENSON ELECTRIC CO. LTD • VENUS CONTROLS & SWITCHGEAR PVT.LTD. • VERSATRP • VIDYUT CONTROL • VMAX POWER CONTROLS PVT LTD • VRL AUTOMATION ENGINEERING & PROJECTS LTD	
21.	Neutral Grounding Resistors (NGR)	• AMP CONTROL • EQUIPMENTS PVT LTD. • LACHHMAN ELECTRONICS • NATIONAL RESISTORS • NATIONAL SWITCHGEAR • RESITECH • RSI INDIA PVT LTD • SR NARKHEDE	
22.	Numerical Protection Relays	• ABB • ALSTOM • C & S • EASUN REYRALLE • GE (ALSTOM) • L&T • SCHNEIDER • SIEMENS	• GEC • JYOTI RE-300 • TM • SEL
23.	Plante Battery	• EXIDE • HOPPECKE, GERMANY	• AMARA RAJA • CUMMINS • HBL – NIFE • HBL POWER SYSTEMS LTD • PULSELITE
24.	UPS	• HITACHI HI-REL POWER	• Consul Neowatt Power Solutions

		• ELECTRONICS • Vertiv Energy (formerly EMERSON Network Power) • KELTRON POWER ELECTRONICS	• GUTOR
25.	Variable Frequency Drive (VFD)		
26.	VCB	• ABB • ALSTOM • BEL • BHEL • CGL • GE-T&D • L&T • SCHNEIDER • SIEMENS • BHEL	• C&S • Eaton Corporation

Class II items

Sl. No	Item Description	Cat1	Cat2
1.	AC/DC Control Contactors	• ABB • C&S • GE POWER • L&T • SCHNEIDER • SIEMENS	
2.	AC/DC Power Contactors	• ABB • C&S • GE POWER • L&T • SCHNEIDER • SIEMENS	• BCH
3.	Cable Glands	• 3D • BRACO ELECTRICALS (INDIA) PVT. LTD. • Commet • COSMOS • DOWELLS • Jainson • SUNIL & COMPANY	• HMI • SMI
4.	Cable Lugs	• 3D • Commet • COSMOS • DOWELLS • HEX • Jainson	• A.F.Noman& Co • Excel Enterprises Chennai • Fomra Electricals • Goodwill Hardware Stores • Industrial Equipment Suppliers

		• Sunil & Co.	• Kayser Electricals • M.J.Traders • Navakar Trading Co. Pvt. Ltd. • Rangoon Mill Stores • Rashmi Electric Co • S.M Trading Co. • Shanthi Electricals • Singhi Industrial Electrical • South India Astek Electricals &Controls switch Gear Co • South India Switch Gear Co. • Southern Industrial Products • Standard Electric Co.
5.	Cable Termination & Jointing Kits	• 3M ELECTRICALS • 3M Electro and Communication India P.Ltd • RAYCHEM – RPG	• ACCESSORIES PVT. LTD. • ALPHA POWER SYSTEM • Classic Enterprises • HARI CONSOLIDATED • HARI CONSOLIDATED PVT.LTD.,NEW DELHI • POWER CABLE CORPORATION • SATYA ELECTRO MECH PVT. LTD • SS ENGINEERING • TRANS ELECTRIC • VENELEC ELECTROMECH IND. PVT. LTD • YAMUNA CABLE ACCESSORIES PVT. LTD
6.	Cable Trays	• Amtech • AnadUdyog • AV Engg • GLOBE • Inar Profile • India Electric Syndicate • Indiana Cable Trays • Indiana Gratings • INDIANA GRATINGS PVT • INDUSTRIAL PERFORATION • JAMNA METAL • MJ Engg • PARMAR METAL PVT. LTD. • Patny • PATNY SYSTEMS • Rabi Engg • RATAN PROJECTS	• Ind mark Formtech • Premier Power • T.R.G

		• RatanEngg • Rukani • RUKMANI ELECTRICAL • Sterlite • Techno Engg • Unitech Fabricators & Engineers • VATCO • Mahavir	
7.	Control Transformers	• Automatic Electric • Gujrat plug in • Indcoils • KALPA • Kappa Electricals • Precise Electricals • SILCON • Pragati	• Newtek Electricals • POWER PACK
8.	Current Measuring Modules	• ABB • ALSTOM • EASUN REYRALLE • GEC • JYOTI RE-300 • L&T • SCHENEIDER • SIEMENS • TM	
9.	Energy Meters/Multi Function Meters	• AE • CONZERVE • L&T • MECO • RISHAB • Secure • SIEMENS • SCHNEIDER	• ABB • ELMEASURE • IMP
10.	High Mast	• BAJAJ ELECTRICALS LIMITED • CANARA LIGHTING INDUSTRIES, MANGALORE • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • HAVELL'S INDIA LTD., NEW DELHI • PHILIPS INDIA LIMITED • VINTUS SYSTEMS • WIPRO ENTERPRISES PVT. LTD.	• CHENNAI POLES • KUMARAN INDUSTRIES • METAL COATS • PONDICHERI POLES & FABRICATORS
11.	Intelligent Controllers	• ABB	• EASUN REYROLLE

		• ALSTOM • GE • L&T • Schneider Electric • SIEMENS	• GEC • JYOTI RE-300 • TM
12.	LED Lighting	• BAJAJ ELECTRICALS LIMITED • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • PHILIPS INDIA LIMITED • WIPRO ENTERPRISES PVT. LTD. • HAVELL'S INDIA LTD., NEW DELHI	• CANARA LIGHTING INDUSTRIES, MANGALORE • VINTUS SYSTEMS
13.	Lighting Fixtures (Flame Proof)	• BAJAJ ELECTRICALS LIMITED • BaliGA • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • FCG • GE HAVELL'S INDIA LTD., NEW DELHI • PHILIPS INDIA LIMITED • WIPRO ENTERPRISES PVT. LTD.	• HAVELL'S INDIA LTD., NEW DELHI • CANARA LIGHTING INDUSTRIES, MANGALORE • K-LITE • SURYA ROSHINI LIMITED • THORN • VINTUS SYSTEMS
14.	Lighting Fixtures (General)	• BAJAJ • CANARA LIGHTING INDUSTRIES, • CROMPTON • GE • PHILIPS • WIPRO	• AVAIDS TECHNOVATORS PVT. LTD • ENGG. CO. LTD. • HAVELL'S INDIA LTD., • HPL Electric & Power Ltd • K-LITE • MIKA ENGINEERS • Signify Innovations India Limited • SURYA ROSHINI LIMITED • TECHNO ELECTRIC and • THORN • VINTUS SYSTEMS
15.	MCCB/MPCB/MCB	• ABB • ALSTOM, • BCH Electric • C & S Electric • CGL, • GE-POWER • HAVELLS, • L&T, • LEGRAND • MDS,	• HYUNDAI, • NGEF

		• Schneider • SIEMENS • STANDARD	
16.	Meters (Analog/Digital)	• ABB • AE • CGL • Conzerv • ENERCON • GE POWER • IMP • INDUSTRIAL METERS • L&T • MECO • NIPPON • RISHAB • SCHNEIDER • Secure • SIEMENS • SILKAANS • STANDARD	• GEC • SIMCO
17.	Street Light Poles	• BAJAJ • BOMBAY TUBES & POLES • CHENNAI POLE • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • PHILIPS INDIA LIMITED • WIPRO	• CANARA LIGHTING INDUSTRIES • HAVELL'S INDIA LTD., • KUMARAN INDUSTRIES • METAL COATS • MIKA ENGINEERS • PONDICHERI POLES & FABRICATORS • VINTUS SYSTEMS
18.	Transducer	• ABB • AE • ALSTOM • ELESTER • MECO • PERFECT CONTROL • PYROTECH • RISHAB • SECURE • SIEMENS • SOUTHREN	• C&S • Elesta • Guardian • HEL • Jyothi • L&T • OEN • Omran • Paramount
19.	CT/PT	• A.E • ABB • BHEL • CGL • Gujrat plug in • IND COIL • KALPA • KAPPA • PRAGATI	• JYOTI LTD • Newtek Electricals • PRAYOG • WSI

		• PRECISE • SIEMENS • SILCON • TELK	

21. SINGLE LINE DIAGRAM FOR LT SWITCHGEAR

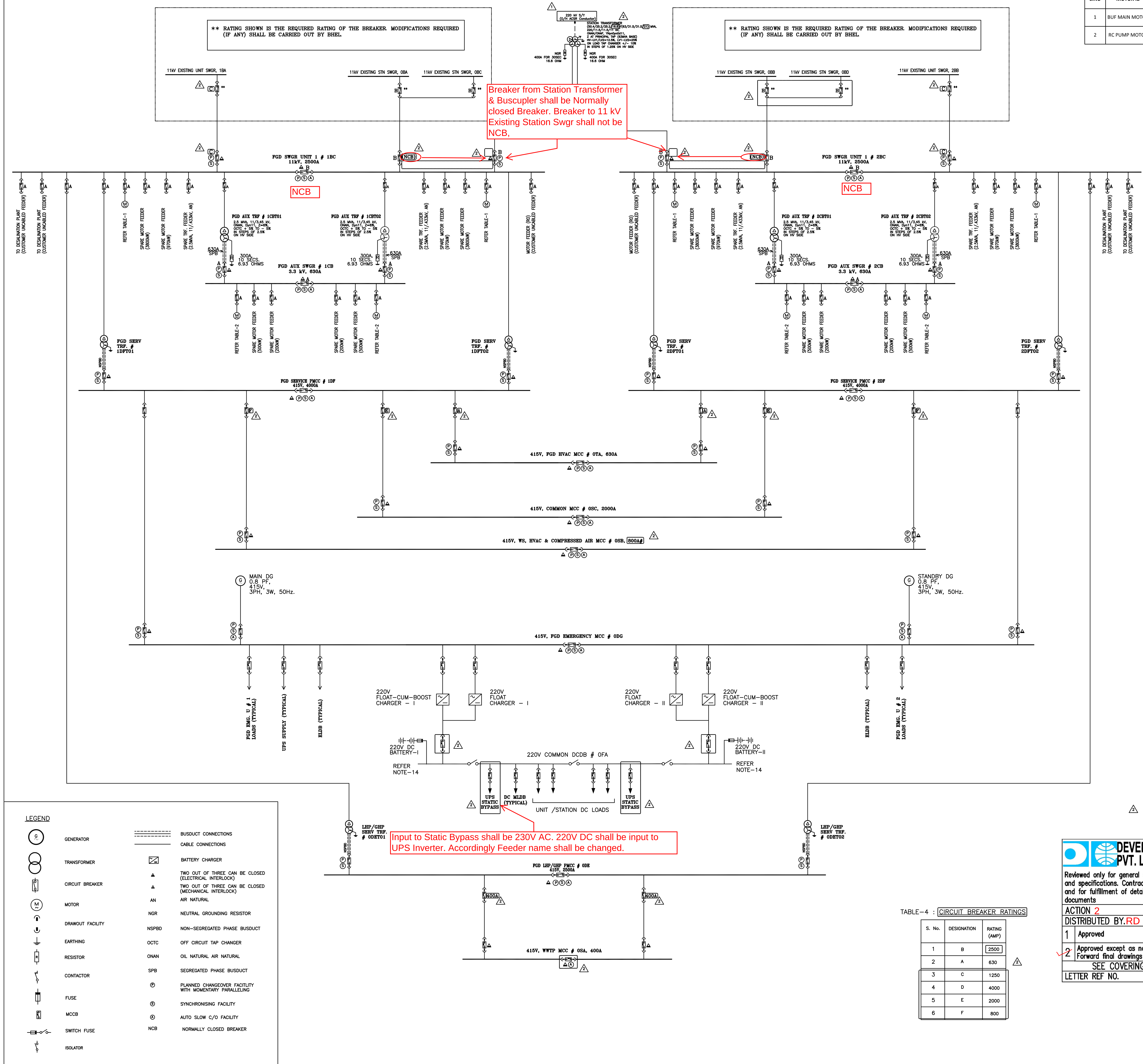

TABLE -1: 11KV MOTORS (ABOVE 750KW)

S.NO	MOTOR ID	NAME PLATE RATING (kW)	TOTAL NUMBERS FOR 2 UNITS & STATION	SWBD#1BC SEC-A	SWBD#1BC SEC-B	SWBD#2BC SEC-A	SWBD#2BC SEC-B	LOCATION OF MOTOR
1	BUF MAIN MOTOR	3800	4	1A	1B	2A	2B	NEAR ABSORBER
2	RC PUMP MOTOR	970	8	1A, 1B	1C, 1D	2A, 2B	2C, 2D	RC PUMP HOUSE

TABLE-2: 3.3KV MOTORS (ABOVE 160KW & UPTO 750KW)

S.NO	MOTOR ID	NAME PLATE RATING (kW)	TOTAL NUMBERS FOR 2 UNITS & STATION	SWBD#1CB SEC-A	SWBD#1CB SEC-B	SWBD#2CB SEC-A	SWBD#2CB SEC-B	LOCATION OF MOTOR
1	OXIDATION AIR BLOWER MOTOR	350	4	1A	1B	2A	2B	RC PUMP HOUSE
2	PRIMARY HYDROCLONE FEED TANK PUMP	200	2	A	-	B	-	GDW AREA
3	VACCUM PUMP	200	2	-	A	-	B	GDW AREA
4	WET BALL MILL MAIN DRIVE MOTOR	500	2	-	A	-	B	BALL MILL BUILDING

TABLE-3 : AUXILIARY & SERVICE TRANSFORMERS

S.NO	TRANSFORMER ID	SERVICE	RATING/ PARAMETERS	LOCATION OF TRANSFORMER
1	1CBT01, 1CBT02, 2CBT01, 2CBT02	FGD AUXILIARY TRANSFORMER	2.5 MVA, 11/3.45 kV, ONAN, Dyn11, Z=6%, OCTC, +/- 5% IN STEPS OF 2.5%	FGD CONTROL ROOM
2	1DFT01, 1DFT02, 2DFT01, 2DFT02	FGD SERVICE TRANSFORMER	2.5 MVA, 11/0.433 kV, AN, Dyn11, Z=12%, OCTC, +/- 5% IN STEPS OF 2.5%	FGD CONTROL ROOM
3	0DET01, 0DET02	LHP/GHP SERVICE TRANSFORMER	1.6 MVA, 11/0.433 kV, AN, Dyn11, Z=8%, OCTC, +/- 5% IN STEPS OF 2.5%	LHP/GHP CONTROL ROOM

TABLE-5 : SWITCHBOARDS

S.NO	SWITCHBOARD ID	SERVICE	RATING/ PARAMETERS	LOCATION OF SWITCHBOARD
1	1BC, 2BC	11kV FGD SWITCHGEAR	11kV, 2000A	FGD CONTROL ROOM
2	1CB, 2CB	3.3kV FGD AUX SWITCHGEAR	3.3kV, 630A	FGD CONTROL ROOM
3	1DF, 2DF	415V FGD SERVICE PMCC	415V, 4000A	FGD CONTROL ROOM
4	0DE	415V LHP/GHP PMCC	415V, 4000A	LHP/GHP CONTROL ROOM
5	0DG	415V FGD EMERGENCY MCC	415V	FGD CONTROL ROOM
6	0FA	220V COMMON DCDB	220V	FGD CONTROL ROOM
7	0SA	415V WWTP MCC	415V, 400A	WWTP BUILDING
8	0SB	415V WS, HVAC & COMPRESSED AIR MCC	415V, 1000A	COMPRESSOR BUILDING
9	0SC	415V COMMON MCC	415V, 3000A	FGD CONTROL ROOM
10	0TA	415V FGD HVAC MCC	415V, 630A	FGD CONTROL ROOM

Swgr rating need to be updated as shown in the SLD and as agreed in CRS.

TABLE-4 : CIRCUIT BREAKER RATINGS

S. No.	DESIGNATION	RATING (AMP)
1	B	2500
2	A	630
3	C	1250
4	D	4000
5	E	2000
6	F	800

NOTES

1. BUS DUCTS ARE OF FOLLOWING TYPE:
   MEDIUM VOLTAGE SYSTEM 3.3kV SEGREGATED PHASE BUSDUCT
   LOW VOLTAGE SYSTEM 415V NON-SEGREGATED PHASE BUSDUCT
2. MV SYSTEM IS 3PH., 3W, 50HZ; LV SYSTEM IS 3PH., 4W, 50HZ EXCEPT EMERGENCY BOARD WHICH IS 3PH. 3W, 50HZ.
3. MOTORS RATED ABOVE 750kW ARE CONNECTED TO 11kV SYSTEM WHILE MOTORS RATED ABOVE 160kW & UPTO 750kW ARE CONNECTED TO 3.3kV SYSTEM. MOTORS RATED 160kW AND BELOW ARE CONNECTED TO THE LV SYSTEM.
4. ONE MAIN DG SET & ONE STANDBY DG SET ARE PROVIDED TO CATER FOR EMERGENCY REQUIREMENT OF FGD PLANT.
5. CHANGEOVER FACILITY

(A) 11/ 3.3KV SYSTEM BUSES ARE PROVIDED WITH MANUAL LIVE C/O WITH CHECK SYNCHRONIZATION BETWEEN I/C & B/C. BUS-COUPLERS ARE PROVIDED WITH AUTO CLOSING FACILITY FOR SLOW C/O.

(B) ALL 415V SYSTEM BUS INCOMERS ARE PROVIDED WITH MANUAL DEAD BUS CLOSING AND MANUAL LIVE CHANGEOVER (BETWEEN I/C-A, I/C-B & B/C) FACILITY. BUS-COUPLERS ARE PROVIDED WITH AUTO-CLOSING FACILITY FOR LIVE C/O.

(C) DURING NORMAL OPERATION, EACH SECTION OF 415V FGD EMERGENCY MCC IS FED FROM FGD SERVICE PMCC OF RESPECTIVE UNIT WITH BUSCOULER BEING KEPT OPEN. IN THE EVENT OF FAILURE OF NORMAL POWER SUPPLY, MAIN AND STANDBY DG WILL AUTO START SIMULTANEOUSLY. UPON ATTAINING NORMAL VOLTAGE AND FREQUENCY, MAIN DG INCOMER WILL CLOSE AUTOMATICALLY TO RESTORE EMERGENCY POWER SUPPLY TO THE UNIT. IN THE EVENT OF FAILURE OF RESTORATION OF SUPPLY FROM MAIN DG, INCOMER OF STANDBY DG WILL BE CLOSED MANUALLY.

6. INTERLOCKING
   THE 11kV, 3.3 kV & 415V SWITCHBOARDS/MCCs ARE PROVIDED WITH POSITIVE ELECTRICAL INTERLOCKING TO ENSURE THAT DIFFERENT POWER SUPPLY SOURCES ARE NOT OPERATED IN PARALLEL FOR PROLONGED DURATION TO AVOID FAULT LEVEL EXCEEDING THE DESIGNATED SWITCHBOARD CAPABILITY, EXCEPT DURING MOMENTARY PARALLELING IN CASE OF ON-LOAD LIVE CHANGEOVER, WHERE PROVIDED.
7. ELECTRICAL EQUIPMENT RATINGS ARE INDICATED FOR AN AMBIENT TEMPERATURE OF 50 DEG C.
8. LT MOTORS RATED ABOVE 90kW SHALL BE ACB CONTROLLED. MOTORS RATED UP TO 90kW SHALL BE CONTACTOR CONTROLLED.
9. NUMBERS AND RATINGS OF LV SERVICE TRANSFORMERS & ASSOCIATED SWBDs/ MCCs ARE INDICATIVE AND MAY UNDERGO REVISIONS DURING DETAILED DESIGN, TO SUIT THE ELECTRICAL LOADS AND LAYOUT REQUIREMENTS WITHOUT AFFECTING THE OVERALL SYSTEM.
10. THE RATINGS OF MV CIRCUIT BREAKERS ARE DENOTED BY AN ALPHABET ON THE RIGHT HAND SIDE OF BREAKERS AND THE CORRESPONDING AMPERE RATINGS ARE INDICATED IN TABLE-4.
11. PERMISSIBLE VOLTAGE & FREQUENCY VARIATION AT 11kV, 3.3kV & 415V VOLTAGE LEVELS SHALL BE AS FOLLOWS:
    VOLTAGE : +/- 10%,
    FREQUENCY : +/- 5%
    COMBINED VOLTAGE & FREQUENCY VARIATION : 10% (ABSOLUTE SUM)
12. THE SELECTION OF LT OUTGOING FEEDERS (DRAW OUT TYPE) SHALL BE AS INDICATED HEREUNDER:
    (i) BELOW 630A : MCCB
    (ii) 630A & ABOVE : BREAKER
13. THE RATING OF EMERGENCY DG & CORRESPONDING EMERGENCY MCC SHALL BE INCLUDED AFTER FINALIZATION OF DG SIZING CALCULATION.
14. PERMISSIBLE VOLTAGE VARIATION AT 220V VOLTAGE LEVEL SHALL BE -15% TO +10%. THE RATING OF 220V DC BATTERY, FLOAT CHARGER & FLOAT-CUM-BOOST CHARGER SHALL BE INDICATED AFTER FINALIZATION OF DC SYSTEM ENGINEERING.
15. FOR BOARDS 1BC & 2BC, THERE ARE 3 NOS. INCOMER, 2 NOS. FROM EXISTING UNIT BOARD (1BA/ 2BB) AND EXISTING STATION BOARD (0BA & 0BC/ 0BB & 0BD) AND 1 NO. FROM NEW STATION TRANSFORMER. UNDER NORMAL CONDITIONS, IT IS ASSUMED THAT TWO INCOMERS (ONE ON EACH BUS SECTIONS) SHALL BE 'ON' AND BUS-COUPLER SHALL BE 'OFF'.
16. # - RATING OF 0SB BOARD. AS PER DESIGN MEMORANDUM, BUSBAR RATING (INCLUDING 20% MARGIN) IS 650A. HENCE, BOARD RATING IS SELECTED AS 800A.

Note-14 shall be corrected as per CRS Point.25. FGD Swgr shall have 2 incomers (One from Unit Board; One From Station Transformer) and a buscoupler.

DEVELOPMENT CONSULTANTS PVT. LIMITED.

Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION 2	DATE 19/05/2021
DISTRIBUTED BY. RD	
1 Approved	3 Returned wth Comments. Please Resubmit.
2 ✓ Approved except as noted. Forward final drawings	4 For information only
SEE COVERING LETTER	
LETTER REF NO.	DATE.

REV	DATE	ALTD	CHD	APPD	
02	04.05.2021	MEG	AbA/ SL	DR	1 REVISED AS PER CUSTOMER/ CONSULTANT'S COMMENTS & ERM DATED 09.04.2021.
01	12.03.2021	MEG	AbA/ SL	DR	1 REVISED AS PER CUSTOMER/ CONSULTANT'S COMMENTS DATED 05.01.2021.

DRG./REF. NO. (INTERNAL)

PRINT SCALE IN METRE

CUSTOMER:	एनएलसी तमिलनाडु पावर लिमिटेड NLC TAMILNADU POWER LIMITED
CONSULTANT:	M/s DEVELOPMENT CONSULTANTS PVT LTD
PACKAGE:	FLUE GAS DESULPHURIZATION SYSTEM (FGD) PACKAGE
PROJECT:	NLC TAMILNADU POWER LIMITED (NTPL) 2x500 MW COAL FIRED UNITS AT TUTICORIN

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE: C

	NAME	SIGN	DATE
DRN	MEG	-SD-	17.12.2020
DESN	MEG	-SD-	17.12.2020
CHD	AbA	-SD-	19.12.2020
APPD	SL/ DR	-SD-	19.12.2020

TITLE : ELECTRICAL SINGLE LINE DIAGRAM FOR FGD AUXILIARY POWER DISTRIBUTION

MPL | ELEC | C&I | MSE | MAX | DEPT. SIGN DATE | SCALE VARIES

DRAWING NO. PE-DG-483-565-E001

SHEET 1 OF 1 REV. 02

FORMAT SIZE A0

22. DESIGN DIRECTIVE

General Points to be considered during Engineering and Manufacturing of Project.

1. Each Single Front / Double Front vertical shall have not more than one supply feeder of 400A and above, or not more than one DOL feeder of 45KW and above. Additional feeders of these ratings may be placed in the next vertical. DOL feeders of 45KW rating and above shall be preferably placed at the centre position with respect to operating height middle of the vertical for easy module handing during maintenance.
2. Outgoing terminals of any AC/DC feeders above 400A capacity shall have provision / shall be suitably sized to accept 2 runs of 630 sq.mm cable connections per phase. The terminals shall also be suitably placed to achieve the specified Ph-Ph & Ph-E clearances after connection of field cables
3. Draw-out Modules with a height of 500mm and above shall have additional guides on both sides at the upper end in order to minimize / eliminate misalignment of the Power contacts & (Sliding In-line Contacts?) SIC.
4. Components shall be suitably positioned or fixed in the draw-out modules such that the weight distribution shall be balanced / uniform and not lead to imbalance while drawing in / out and handling the modules.
5. For Draw-out or Fixed type Modules inside the Panels, all connections of the power circuit wires/Cables shall be terminated using long barrel and heavy duty copper lugs only.
6. If any special cable(s) are used for the power wiring, suitable cable lugs (Rating & Duty) shall be selected based on cable manufacturer's recommendations or in coordination with the cable supplier.
7. In case of electrical components like Digital meters, transducers, etc. that may have special termination requirements, designer shall obtain the confirmation from supplier for special lug requirements (if any) and also add spare requirements.
8. In case any fixed / draw-out vertical contains any supply feeder above 400A respective cable compartment shall have aluminium cable gland plate, to eliminate eddy currents.
9. Aluminium gland plates shall be provided for all breaker-controlled incoming, outgoing and motor feeders, except Bus duct connected incomers and bus couplers.
10. Each shipping section (Single or Double or Three Vertical) bottom frame shall be single common piece and each side shall have straight single piece without any welding joints piece. However top lifting frame also shall be single common piece.
11. 4 wire supply load is not recommended for Emergency MCCs connected to DG Supply (like Emergency MCC, Boiler & Turbine Valve MCC, and ESP ID Fan Area MCC etc.). The above MCCs control supply shall be designed with CST arrangement for 415/110 or 415/230 V. However, if the MCC is designed with Neutral, then the neutral shall not be used.
12. Packed panels loaded onto trucks / trailers shall be covered with tarpaulin to avoid the water ingress and protection from environmental factors during transportation.
13. If the Breaker is in service position, it shall not be possible to open the breaker compartment front door. However, it shall be mandatorily ensured that the breaker compartment front door shall be opened only when breaker is in isolated position.
14. In case of fixed / draw out modules for PT & CST, the thickness of the bottom mounting plate shall be sufficiently selected to cater to the weight of CST & PT.
15. All the panel protective barrier sheets / vertical dropper shrouds shall be of fire retardant material, preferably Perforated CRCA sheets (transparent sheets not allowed) Module and Breaker compartment live bus bar protective shutters shall be of fire retardant material / FRP sheet (no metallic shutter allowed).

16. Module and Breaker compartment live bus bar protective shutters shall be of fire retardant material / FRP sheet (no metallic shutter allowed).
17. If any electrical components are mounted in the panel/module compartment door, the door shall be earthed

23. COMPONENTS DIRECTIVE

BHEL's Supply of components

The following components shall be supplied by BHEL to the vendor, and vendor shall not consider such components in their pricing

1) **LV Air Circuit Breakers (ACBs) shall be supplied by BHEL to the vendor**
2) **Numerical Relays for Incomers, Buscouplers and Bus PTs shall be supplied by BHEL to the vendor**
3) **Potential Transformers for Incomers, Buscouplers and Bus PT, shall be supplied by BHEL to the vendor**