



**FGD FOR NTPL TUTICORIN THERMAL
POWER PROJECT(2X500MW)**

**TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : SBD-TS-CPBG-FGD-TUT

DATE: 14.02.2022

REV 00

15. DRAWINGS/DOCUMENTS REQUIRED FROM VENDOR



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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



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



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



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LPB & Local Starters:-

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



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17. GENERAL PACKING SPECIFICATION



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DATE: 14.02.2022

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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



**GENERAL PAINTING SPECIFICATION
FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : EP-4-CP-SD-001

VOLUME -

SECTION -

REVISION
00

DATE: 13/04/2018

SHEET 1 OF 2

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



**GENERAL PAINTING SPECIFICATION
FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : EP-4-CP-SD-001

VOLUME -

SECTION -

REVISION
00

DATE: 13/04/2018

SHEET 2 OF 2

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



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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.

P. Ganesh



Manas Ghosh



**BHARAT HEAVY ELECTRICALS LIMITED,
SOLAR BUSINESS DIVISION, BANGALORE-560012**

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

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	-	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:



**BHARAT HEAVY ELECTRICALS LIMITED,
SOLAR BUSINESS DIVISION, BANGALORE-560012**

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) Make, Type, Finish & Shelf Life	Major	Visual	100%	-	Mfg. Std / Factory Standard	Mfg. Std / Factory Standard			P	V		
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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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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		

* Records, identified with "TICK"(✓) shall be included in documentation.

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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

		2) Operational Check	Major	Test		10%	Approved Data Sheet	Approved Data Sheet	MTC		P			
		3) Routine Test	Major	Test		10%					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:



**BHARAT HEAVY ELECTRICALS LIMITED,
SOLAR BUSINESS DIVISION, BANGALORE-560012**

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) 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 / ASTM D 790 & BS 5901	As per approved Data Sheet / ASTM D 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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		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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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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		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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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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		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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		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-61439	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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		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	Major	Elec.	100%	100 %	Approved Drawing IEC 60947 / IEC 61439	Approved Drawing / IEC 60947 / IEC 61439	QC Report / TC		P	W	W	
		3) Mech operation test for ACB as per IS and operation check.												
		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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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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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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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

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

* 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:



**FGD FOR NTPL TUTICORIN THERMAL
POWER PROJECT(2X500MW)**

**TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : SBD-TS-CPBG-FGD-TUT

DATE: 14.02.2022

REV 00

20. MAKE OF COMPONENT



**FGD FOR NTPL TUTICORIN THERMAL
POWER PROJECT(2X500MW)**

**TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : SBD-TS-CPBG-FGD-TUT

DATE: 14.02.2022

REV 00

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	<ul style="list-style-type: none"> • ABB • BHEL • GE T&D • SIEMENS • TELK • TOSHIBA, INDIA 	<ul style="list-style-type: none"> • BIAODING, CHINA • CGL • DANISH PRIVATE LIMITED • EMCO LIMITED • ESENNAR TRANSFORMERS (P) LTD. • HYUNDAI, S.KOREA • ILJIN TRANSFORMERS • KANO HAR 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)	<ul style="list-style-type: none"> • Andrew Yule • BHEL • CGL • GE • GE Prolec • KIRLOSKAR • SCHNEIDER • TOSHIBA • VOLTAMP 	<ul style="list-style-type: none"> • DANISH PRIVATE LIMITED • ESENNAR • HYOSUNG • KANO HAR 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)	<ul style="list-style-type: none"> • ABB • BHEL • C&S ELECTRIC • GE POWER • GE-T&D • L&T • SCHNEIDER • SIEMENS 	<ul style="list-style-type: none"> • Alstom • Areva T&D • CONTROL & SCHEMATICS • Crompton Greaves Limited • NITYA ELECTRO CONTROLS • Toshiba • VENUS • VOLTECH MANUFACTURING LIMITED



NTPL FGD_Electrical Sub-vendor List

4.	ACB	<ul style="list-style-type: none"> • ABB • ALSTOM • BHEL • C&S ELECTRIC • CGL • GE-POWER • GE-T&D • L&T • SCHNEIDER • SIEMENS 	
5.	Auxiliary Relays	<ul style="list-style-type: none"> • ABB • ALSTOM • C & S Electric • GE • JYOTHI LTD • L&T • SCHNEIDER • SIEMENS 	<ul style="list-style-type: none"> • BCH • GEC • JVS • VOLTECH
6.	Battery Charger (FC/FCBC)	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • AMCO • ENERPAC • MASS-TECH • EXIDE • HOPPECKE, GERMANY • MMAX • ENGINEERS • ELTECH • SABNIFE • STATCON POWER SYSTEMS & SOLUTIONS
7.	Electrical Actuators	<ul style="list-style-type: none"> • ANTRIEB • AUMA (India) • LIMITORQUE • ROTORK CONTROLS LTD 	
8.	Electro Mechanical Relays	<ul style="list-style-type: none"> • ABB • ALSTOM • C & S Electric • EASUN REYRALLE • GE • JYOTI RE-300 • L&T • SCHNEIDER • SIEMENS 	<ul style="list-style-type: none"> • ALLEN BRADLEY • GEC • JVS • OMRON • PARAMOUND
9.	H.T. Motors	<ul style="list-style-type: none"> • ABB • BHEL • CROMPTON GREAVES • KEC • MARATHON (ALSTOM) • SIEMENS • TMEIC 	<ul style="list-style-type: none"> • BBL • ELJIN • HUNDAI • HYOSUNG • IJLIN • JEUMOUNT ELECTRIC • LHP

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> WEG INDIA LTD 	<ul style="list-style-type: none"> NANYANG EXPLOSION SHANGAI ELECTRIC TECO ELECTRIC & MACHINERY (P) Ltd. JYOTHI
10.	H.T. Power Cables (XLPE)	<ul style="list-style-type: none"> APAR INDUSTRIES LTD CCI CMI LTD Finolex GEMSCAB GUPTA POWER INFRASTRUCTURE LIMITED KEC INTERNATIONAL LIMITED KEI INDUSTRIES POLYCAB TORRENT CABLES UNIVERSAL CABLES 	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> BHEL C&S KGS Engg POWERGEAR REEP STARDRIVE 	<ul style="list-style-type: none"> BUS BAR SYATEMS LIMITED ELEMECH ELPRO ENPRO ENGG GLOBE ELECTRICAL INDUSTRIES POWER WAYS VEE VEE CONTROLS
12.	HT Switchboard 11KV, 3.3KV	<ul style="list-style-type: none"> ABB BHEL L&T SCHNEIDER SIEMENS 	<ul style="list-style-type: none"> CGL SYSTEM CONTROL VOLTECH
13.	L.T. Motors (AC & DC)	<ul style="list-style-type: none"> ABB ALSTOM Bharat Bijilee Ltd., Jyoti Limited Kirloskar Electric Co. Ltd Laxmi Hydraulics Pvt Ltd Marathon Electric Motors India Limited Siemens WEG 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> AMES IMPEX ELECTRICALS PVT.LTD. BHEL 	<ul style="list-style-type: none"> MEGAWIN MEHRU ELECT & MECH ENGINEERS(P) LTD,

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NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • ESENNAR TRANSFORMERS PVT LTD • INDCOIL TRANSFORMERS PVT LTD 	<ul style="list-style-type: none"> • POWER PACK • SOUTHERN POWER EQUIPMENT CO PVT LTD (SPEC) • SUDHIR INTRA VIDYUT • SUDHIR TRANSFORMERS LIMITED
15.	LT Busduct (Non-Segregated Phase)	<ul style="list-style-type: none"> • ALSTOM • BHEL • CONTROL & SWITCHGEAR • POWERGEAR • STARDRIVE 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • APAR INDUSTRIES LTD. • CABLE CORPORATION OF INDIA LTD • CCI • CMI LIMITED, • CORD Cable • DELTON CABLES • Elkay Telelink • FINOLEX • GEMSCAB INDUSTRIES LTD, • GOVIND CABLE INDUSTRIES • GOYOLINE 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 	<ul style="list-style-type: none"> • Advance cable • ALPHA COMMUNICATION LTD • BHANSALI CABLES & CONDUCTORS PVT LTD • BROOKS CABLES,MUMBAI • CHANDRESH CABLES LIMITED • DIAMOND POWER INFRASTRUCTURE LTD • DYNAMIC CABLES • EPSILON 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

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Advance cable • ALPHA COMMUNICATION LTD • AVOCAB • BHANSALI CABLES & CONDUCTORS PVT LTD • BROOKS CABLES,MUMBAI • CHANDRESH CABLES LIMITED • CRYSTAL CABLES, KOLKATA • DIAMOND POWER INFRASTRUCTURE LTD • DYNAMIC CABLES • EPSILON 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



NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • SHYAM CABLE INDUSTRIES DELHI • TCL CABLES LTD • THERMO CABLES LIMITED • Thermocables • TORRENT CABLES • TOSHNIWAL CABLES, JAIPUR • UNIVERSAL CABLES 	<ul style="list-style-type: none"> • 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		<ul style="list-style-type: none"> • RALLISON • SUJOG ELECTRICALS • THERMO PADS
19.	LT Transformer (Dry Type)	<ul style="list-style-type: none"> • ABB • BHEL • CG POWER (CGL) • GE PROLEC • KIRLOSKAR • SCHNEIDER • TOSIBA T&D SYSTEM (INDIA) • VOLTAMP TRANSFORMERS 	<ul style="list-style-type: none"> • RAYCHEM RPG • SUDHIR INTRA VIDYUT • TELAWNE • VOLTECH • AMES IMPEX • KANO HAR ELECTRICALS
20.	MLDB/PDB/ACDB/ WDB/ELDB / DCDB / LCP / LPBS / DCLDB	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • ELECMECH SWITCHGEAR & INSTRUMENT • ENPRO INDUSTRIAL • GE • GEC • GEMCO CONTROLS LTD • GEPC • HAVELLS, • HENSEL ELECIC 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 	<ul style="list-style-type: none"> • STERLING GENERATORS • SUPERNOVA ENGINEERS LTD • VOLTECH • ADVANCE ENGG. COMPAN • Sterling Generators Pvt. Ltd. • ELEXPRO ELECTRICALS PVT/ LTD. • AVAIODS TECHNOVATORS LTD
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NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • AMP CONTROL • EQUIPMENTS PVT LTD. • LACHHMAN ELECTRONICS • NATIONAL RESISTORS • NATIONAL SWITCHGEAR • RESITECH • RSI INDIA PVT LTD • SR NARKHEDE 	
22.	Numerical Protection Relays	<ul style="list-style-type: none"> • ABB • ALSTOM • C & S • EASUN REYRALLE • GE (ALSTOM) • L&T • SCHNEIDER • SIEMENS 	<ul style="list-style-type: none"> • GEC • JYOTI RE-300 • TM • SEL
23.	Plante Battery	<ul style="list-style-type: none"> • EXIDE • HOPPECKE, GERMANY 	<ul style="list-style-type: none"> • AMARA RAJA • CUMMINS • HBL – NIFE • HBL POWER SYSTEMS LTD • PULSELITE
24.	UPS	<ul style="list-style-type: none"> • HITACHI HI-REL POWER 	<ul style="list-style-type: none"> • Consul Neowatt Power Solutions

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> ELECTRONICS Vertiv Energy (formerly EMERSON Network Power) KELTRON POWER ELECTRONICS 	<ul style="list-style-type: none"> GUTOR
25.	Variable Frequency Drive (VFD)		
26.	VCB	<ul style="list-style-type: none"> ABB ALSTOM BEL BHEL CGL GE-T&D L&T SCHNEIDER SIEMENS BHEL 	<ul style="list-style-type: none"> C&S Eaton Corporation

Class II items

Sl. No	Item Description	Cat1	Cat2
1.	AC/DC Control Contactors	<ul style="list-style-type: none"> ABB C&S GE POWER L&T SCHNEIDER SIEMENS 	
2.	AC/DC Power Contactors	<ul style="list-style-type: none"> ABB C&S GE POWER L&T SCHNEIDER SIEMENS 	<ul style="list-style-type: none"> BCH
3.	Cable Glands	<ul style="list-style-type: none"> 3D BRACO ELECTRICALS (INDIA) PVT. LTD. Commet COSMOS DOWELLS Jainson SUNIL & COMPANY 	<ul style="list-style-type: none"> HMI SMI
4.	Cable Lugs	<ul style="list-style-type: none"> 3D Commet COSMOS DOWELLS HEX Jainson 	<ul style="list-style-type: none"> A.F.Noman& Co Excel Enterprises Chennai Fomra Electricals Goodwill Hardware Stores Industrial Equipment Suppliers



NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • Sunil & Co. 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 3M ELECTRICALS • 3M Electro and Communication India P.Ltd • RAYCHEM – RPG 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Ind mark Formtech • Premier Power • T.R.G

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NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • RatanEngg • Rukani • RUKMANI ELECTRICAL • Sterlite • Techno Engg • Unitech Fabricators & Engineers • VATCO • Mahavir 	
7.	Control Transformers	<ul style="list-style-type: none"> • Automatic Electric • Gujrat plug in • Indcoils • KALPA • Kappa Electricals • Precise Electricals • SILCON • Pragati 	<ul style="list-style-type: none"> • Newtek Electricals • POWER PACK
8.	Current Measuring Modules	<ul style="list-style-type: none"> • ABB • ALSTOM • EASUN REYRALLE • GEC • JYOTI RE-300 • L&T • SCHNEIDER • SIEMENS • TM 	
9.	Energy Meters/Multi Function Meters	<ul style="list-style-type: none"> • AE • CONZERVE • L&T • MECO • RISHAB • Secure • SIEMENS • SCHNEIDER 	<ul style="list-style-type: none"> • ABB • ELMEASURE • IMP
10.	High Mast	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • CHENNAI POLES • KUMARAN INDUSTRIES • METAL COATS • PONDICHERI POLES & FABRICATORS
11.	Intelligent Controllers	<ul style="list-style-type: none"> • ABB 	<ul style="list-style-type: none"> • EASUN REYROLLE

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • ALSTOM • GE • L&T • Schneider Electric • SIEMENS 	<ul style="list-style-type: none"> • GEC • JYOTI RE-300 • TM
12.	LED Lighting	<ul style="list-style-type: none"> • BAJAJ ELECTRICALS LIMITED • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • PHILIPS INDIA LIMITED • WIPRO ENTERPRISES PVT. LTD. • HAVELL'S INDIA LTD., NEW DELHI 	<ul style="list-style-type: none"> • CANARA LIGHTING INDUSTRIES, MANGALORE • VINTUS SYSTEMS
13.	Lighting Fixtures (Flame Proof)	<ul style="list-style-type: none"> • BAJAJ ELECTRICALS LIMITED • BaliGA • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • FCG • GE HAVELL'S INDIA LTD., NEW DELHI • PHILIPS INDIA LIMITED • WIPRO ENTERPRISES PVT. LTD. 	<ul style="list-style-type: none"> • HAVELL'S INDIA LTD., NEW DELHI • CANARA LIGHTING INDUSTRIES, MANGALORE • K-LITE • SURYA ROSHINI LIMITED • THORN • VINTUS SYSTEMS
14.	Lighting Fixtures (General)	<ul style="list-style-type: none"> • BAJAJ • CANARA LIGHTING INDUSTRIES, • CROMPTON • GE • PHILIPS • WIPRO 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • ABB • ALSTOM, • BCH Electric • C & S Electric • CGL, • GE-POWER • HAVELLS, • L&T, • LEGRAND • MDS, 	<ul style="list-style-type: none"> • HYUNDAI, • NGEF

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none"> • Schneider • SIEMENS • STANDARD 	
16.	Meters (Analog/Digital)	<ul style="list-style-type: none"> • ABB • AE • CGL • Konzerv • ENERCON • GE POWER • IMP • INDUSTRIAL METERS • L&T • MECO • NIPPON • RISHAB • SCHNEIDER • Secure • SIEMENS • SILKAANS • STANDARD 	<ul style="list-style-type: none"> • GEC • SIMCO
17.	Street Light Poles	<ul style="list-style-type: none"> • BAJAJ • BOMBAY TUBES & POLES • CHENNAI POLE • CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED • PHILIPS INDIA LIMITED • WIPRO 	<ul style="list-style-type: none"> • CANARA LIGHTING INDUSTRIES • HAVELL'S INDIA LTD., • KUMARAN INDUSTRIES • METAL COATS • MIKA ENGINEERS • PONDICHERI POLES & FABRICATORS • VINTUS SYSTEMS
18.	Transducer	<ul style="list-style-type: none"> • ABB • AE • ALSTOM • ELESTER • MECO • PERFECT CONTROL • PYROTECH • RISHAB • SECURE • SIEMENS • SOUTHREN 	<ul style="list-style-type: none"> • C&S • Elesta • Guardian • HEL • Jyothi • L&T • OEN • Omran • Paramount
19.	CT/PT	<ul style="list-style-type: none"> • A.E • ABB • BHEL • CGL • Gujrat plug in • IND COIL • KALPA • KAPPA • PRAGATI 	<ul style="list-style-type: none"> • JYOTI LTD • Newtek Electricals • PRAYOG • WSI

NTPL FGD_Electrical Sub-vendor List

		<ul style="list-style-type: none">• PRECISE• SIEMENS• SILCON• TELK	
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**FGD FOR NTPL TUTICORIN THERMAL
POWER PROJECT(2X500MW)**

**TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR**

SPECIFICATION NO. : SBD-TS-CPBG-FGD-TUT

DATE: 14.02.2022

REV 00

21. SINGLE LINE DIAGRAM FOR LT SWITCHGEAR





**FGD FOR NTPL TUTICORIN THERMAL
POWER PROJECT(2X500MW)**

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REV 00

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 handling 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