BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-363-558-014	Rev	00		Prepared	Checked	Approved
CUSTOMER Doc. No.				NAME	VP	VK	RS / PKM
TYPE OF DOC.	TECHNICAL SPECIFICATION			SIGN			
TITLE	ILLUMINATION SYSTEM			DATE	09.05.14	09.05.14	09.05.14
				GROUP	TBEM		
				W.O. No	83003		
CUSTOMER	TAMIL NADU TRANSMISSION CORPORATION LIMITED						
PROJECT	400/110 KV Substation at Thappagundu & 400/230-110 KV Substation at Anikadavu						

COPYRIGHT & CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
THIS MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY MANNER DETRIMENTAL TO THE INTEREST OF THE COMPANY

List of Contents — No. of Pages

Annexure: Layout for 400/110 KV S/STN at Thappagundu & 400/230-110 KV S/STN at Anikadavu and Control Room Panel layout for Thappagundu and Anikadavu.

Rev.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution	CUSTOMER	TBMM	O/C	
	-			

SECTION – 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND QUANTITIES

1. SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing, dispatch, storage, erection, testing & commissioning of complete **Illumination and associated electrical auxiliary system, complete with accessories**. No deviation from the requirements specified in various clauses of this specification shall be allowed. A certificate to this effect shall have to be furnished along with the offer as per Appendix –A given in Section-3.

The Contract shall be on Bill of Quantity basis for the package. In case of change in scope after award of the contract, the additions/ deletions to the scope shall be as per the breakup unit rates for all the equipment and services furnished by the bidder in his offer. The Contractor shall be responsible for the design and verification of the Illumination system, demonstration of lux levels and other criteria at site.

After placement of order, the bidder has to design the system as per relevant standard/codes to the satisfaction of BHEL/TANTRANSCO.

The term " Owner" appearing in this specification shall refer to ultimate Customer, the term " Purchaser " shall refer to BHEL and the term " Contractor " shall refer to the successful Bidder

It is not the intent to specify herein all the details of design and manufacturing. The equipment and the system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject material, which in his judgment is not in full accordance herewith.

The Bidder shall have deemed to have understood completely all the Tender drawings and documents and quoted accordingly.

The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification. For environmental conditions, refer Section-3 carefully

The specification comprise of following sections:

Section-1: Scope, specific technical requirements & Bill of Quantities.
Section-2: Equipment specifications
Section-3: General technical requirements for all equipments under the project.

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

Wherever bidder offers any spare/ item/ fitment in lieu of the same being "Built-in feature" of any fitment or the same being "Not applicable" is subject to approval by TANTRANSCO. No price

implication will be entertained by BHEL at contract stage if any separate item is insisted by TANTRANSCO to meet the contract requirement.

Bidder to note that the GTP, Make & type of fitments, Bill of material of the offered Luminaries /Panels and their spares/ accessories are subject to TANTRANSCO approval at the contract stage. No price implications will be entertained by BHEL at contract stage.

The equipment is required for the following projects:

Name of the Customer : M/s Tamil Nadu Transmission Corporation Limited
Name of the Project : 400/110kV S/S at Thappagundu
400/230-110 KV Substation at Anikadavu

2. SPECIFIC TECHNICAL REQUIREMENTS

2.1 ILLUMINATION & SMALL POWER SYSTEM REQUIREMENT FOR VARIOUS AREAS

The illumination system shall be provided for the following areas:

(i) Switchyard area – Equipped area inside boundary wall of 400/110 kV Substation at Thapagundu as per layout drawing (Drg. No. TB-0-363-316-002,Rev 02).
(ii) Switchyard area – Equipped area inside boundary wall of 400/110 kV Substation at Anikadavu as per layout drawing (Drg. No. TB-0-364-316-002, Rev03).
(iii) Switchyard Control Room Building as per CONTROL ROOM PANEL LAYOUT FOR THAPAGUNDU AND ANIKADAVU S/STNS (Drg. No. TB-2-363-316-005).

2.2 Lighting transformers:

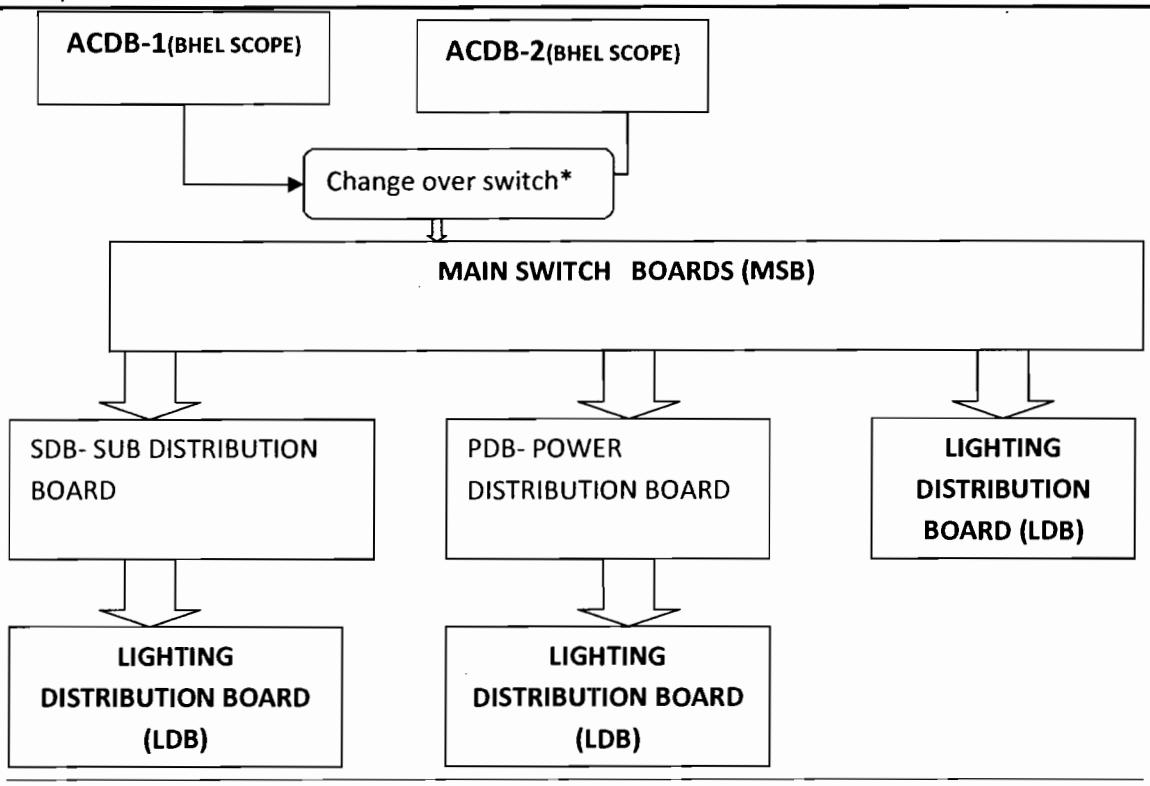
Main Switch Board (MSB) shall be fed from 150 kVA Lighting transformer which is, in turn, fed from AC switchgear. The lighting transformer may, preferably be located inside LDB panel itself. Otherwise, the side of respective LDB shall locate the same. Lighting transformers shall be **dry type, natural air cooled** with **class F** insulation or better. Impedance of lighting transformer shall be so selected that the fault level of lighting system shall be reduced to 3 to 5 KA. Lighting transformers shall be tested as per IS: 2026. Off-circuit tap changer with ± 2.5% and ± 5% tapping shall be provided. In case the transformers are not mounted inside the LDB panels, the same shall be housed in a separate 2 mm thick CR sheet steel enclosure with IP-42 degree of protection as per IS : 13947. However, the transformer terminal box shall have IP-52 degree of protection.

2.3 Lighting Circuit Design

- In an area, the lighting fixtures will be arranged in different phase/LPs such that even in case one lighting panel is faulty complete lighting is not affected.
- The circuit loading shall be restricted to 80% of the MCB rating.
- The voltage drop from LDB to any fixture shall not exceed 3%.
- 3-phase distribution shall be equally distributed/ loaded.
- Normal cum emergency lighting shall also be distributed in all the 3-phases and they shall be equally distributed/ loaded.
- 20% of lighting shall be done from emergency supply.

2.4 AC Power Supply Arrangement

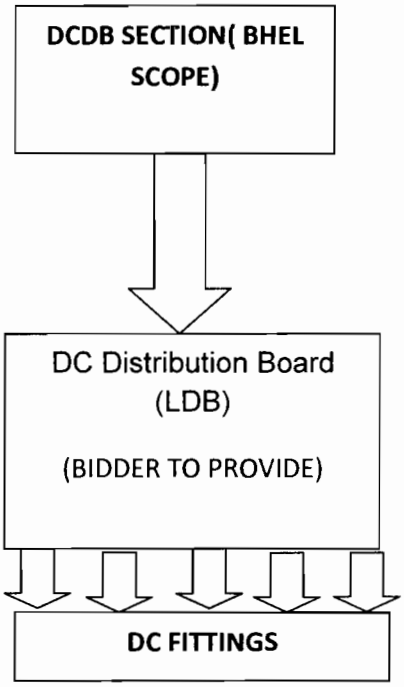
- The power supply arrangement envisaged shall as follows:
- ACDB (In BHEL's scope) shall feed AC Lighting Distribution Boards (In Bidder's scope).
- Lighting Distribution Boards shall feed to Lighting Panels (In Bidder's scope).
- The proposed power supply distribution for the package shall as per schematic presented hereunder.



* Change over switch shall be part of main switch board.

2.5 DC Power Supply Arrangement

- The power supply arrangement envisaged shall follow as:
- One no. DC Distribution Board (LDB) (In bidders scope).
- The aforesaid LDB shall feed to DC Emergency Lighting fixtures which are to be supplied by bidder.



3.1 FREE ISSUE ITEMS FROM PURCHASER

Power Cables: Following are the various cable sizes that may be used for project execution. Bidder shall estimate the cables required for successful completion of the full scope of works and furnish the break up of quantity as an annexure to the un-priced schedule. The quantity of the cables shall be free issued to the successful bidder as per this annexure. The laying and termination of the estimated quantities of cables shall be in the scope of the bidder. No variation shall be admissible to the contractor so far the input remains unchanged.

1) 2C x 2.5 sq mm PVC/ Cu
2) 2 C x 16 sq mm PVC/ Cu
3) 2 C x 35 sq mm PVC/ Cu
4) 4 C x 25 sq mm XLPE/ Al
5) 4C x 120 sq mm XLPE / Al
6) 4 C x 300 sq mm XLPE / Al

Earthing Flats: Galvanised Earthing Flat of 75x12mm and 50x8mm GI Flats shall be available with the purchaser. Any other size of Flats and GI wire is in bidder scope. Bidder shall estimate the GI Flats for successful completion of the full scope of works and furnish the quantity as an annexure to the unpriced schedule. The quantity of the GI Flat shall be free issued to the successful bidder as per this annexure. The installation of the estimated quantities of GI flats shall be in the scope of the bidder. No variation shall be admissible to the Contractor so far the input remains unchanged. Sizes available are 75x12mm and 50x8mm GI Flats.

3.2 SCOPE OF SERVICES & DESIGN

The bidder shall quote for ETC, civil works, cable/ wire termination & earthing against each item as applicable. The list is attached as BOQ.

The designing work shall be including but not limited to making of the detailed drawings showing lighting layout, disposition and location of lighting fixtures, receptacles, switchboards, ceiling fan points etc, wiring scheme, wiring & conduit layout, fixing details, OGAs of all equipment, Cable schedule for lighting, BOQ for conduit and wires etc and these shall be submitted for approval. Any other drawing / document required to carry out Erection testing work at site shall be scope of supply and work.

Technical Support whenever needed to site shall be provided by bidder for execution of ETC work as per approved drawings to achieve the desired **Lux** level **of illumination system**.

3.2.1 Erection Commissioning & Testing

The Contractor shall give the offer for Erection, Testing and Commissioning of the Illumination Equipment at Site.

The scope of ETC shall include receipt of material at site, safe storage of material, handling of equipment/ material at site, erection of equipment / material at site including fabrication, equipment and system testing, commissioning of the entire system.

Conducting Lux level measurement as per approved designs to the satisfaction of **BHEL/TANTRANSCO**

All material and consumables required for erection work shall be in Contractor's scope. Erection material shall cover, but not limited to, Clamps etc for Luminaries, Connections between Junction Boxes and Luminaries in outdoor area, All lugs and ferrules require for cabling/ wiring. Any other material required for erection shall deemed to be in Contractor's scope. Holes shall not be drilled on the Galvanised substation gantry and LM structures.

3.2.2 Earthing of lighting installation:-

Lighting fixtures, receptacles, switches, conduits and junction boxes will be properly earthed using galvanised iron wire of 16 SWG. Earth wire shall run along the entire length of the conduit between the fixture and the corresponding lighting panel where it will be connected to the station earth.

For earthing of outdoor lighting poles and masts, 50 x 8 mm MS flat shall be run buried in ground along with road lighting cable and 16 SWG wire shall be tapped at each lighting pole.

All lighting panels, junction boxes, receptacles fixtures, conduits etc. shall be grounded in compliance with the provision of I.E. rules.

A continuous ground conductor of 16 SWG GI wire shall be run all along each conduit run. The conductor shall be connected to each panel ground bus. All junction boxes, receptacles, switches, lighting fixtures etc. shall be connected to this 16 SWG ground conductor.

3.2.3 Civil Works

a. Civil works such as foundation for lighting panel etc. shall be done by the bidder. The rates for these civil works shall be included in the erection rates of respective items.
b. All final adjustment of foundation levels, chipping and dressing of foundation surfaces, setting and grounding of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil works as may be required for erection.
c. Any cutting of masonry / concrete work, which is necessary shall be done by the contractor at his own cost and shall be made good to match the original work.
d. Wall openings at suitable locations for ventilation fans shall be made by the contractor. Civil works such as grouting, filling up of crevices/ cut outs etc during installation of equipment shall also be in contractor's scope. Any other damage caused to civil works during ETC work of the equipment/ system shall be made good to the original finish by the Contractor at no extra cost to the Purchaser.

4.0 BILL OF QUANTITIES (Station –wise breakup)

A. 400/110 kV THAPAGUNDU S/STN
BOQ as per Annexure A for Indoor and Annexure B for Outdoor.

B. 400/230/110 kV ANIKADAVU S/STN
BOQ as per Annexure A for Indoor and Annexure B for Outdoor.

Note – Quantity Variation shall be +/-20% during detailed engineering.

5.0 TYPE TESTING

All the tests as per relevant IS/IEC shall be carried out and reports to be submitted.

The Type Test for offered equipments/materials used for this project should have been conducted in any approved Government/Govt. recognized laboratories conforming to latest IS/IEC. The above type test certificates should accompany the drawings of the materials equipments, duly signed under seal by the Institution, who have issued the type test certificate.

The above type test should have been conducted not earlier than five (5) years as on the date of technical bid opening, which is 05/4/2013 for Anikadavu & 10/4/2013 for Thappagundu substations.

The original type test certificates shall be furnished for verification.

Non furnishing of type test certificates by the tenderers , will be liable for rejection.

6.0 TECHNICAL QUALIFYING REQUIREMENT

QR for Luminaries and Lighting Fixture:-

The qualified supplier should have supplied (Reputed make Bajaj/Philips /CGL) at least 50% of the required quantity of the Luminaries and Lighting Fixture of same or higher rating to any of the 420KV, 245kV or 132 kV Switchyards of Electricity Boards/Power Utilities in India in any one year during the last five years.

The same should have been in satisfactory operation for a minimum period of two years as on date of technical bid opening, which is 05/4/13 for Anikadavu & 10/4/13 for Thappagundu substations.

QR for Lighting Panel :-

The qualified supplier should have Designed, manufactured, type tested and supplied at least 50% of the required quantity of the Lighting panel of same or higher rating to any of the 420KV, 245kV or 132 kV Switchyards of Electricity Boards/Power Utilities in India in any one year during the last five years.

The same should have been in satisfactory operation for a minimum period of two years as on date of technical bid opening, which is 05/4/13 for Anikadavu & 10/4/13 for Thappagundu substations.

7.0 QUALITY PLAN

Bidder to follow valid TANTRANSCO approved Quality Plan as per TANTRANSCO procedure. In case the bidder doesn't have approved QP, it will be the bidder's responsibility to get its QP approved directly from the ultimate customer.

ANNEXURE A

Sl. No.	Description	unit	Quantity for Anikadavu	Quantity for Thappagundu
	Electrification:- (Indoor)			
1	Supply of 20Amps DP plug and socket in sheet enclosure with 5 Nos. 32 A DP MCB in flush with wall with earth connection (AC plug) [legrand MDS]/Hager (L&T) .	Nos	1	1
2	ETC of 20Amps DP plug and socket in sheet enclosure with 5 Nos. 32 A DP MCB in flush with wall with earth connection (AC plug) [legrand MDS]/Hager (L&T) make including cost of wiring.	Nos	1	1
3	Supply of 6 of 4 sqmm PVC unsheathed multi- strand copper conductor cable of 1100V grade in suitable PVC rigid pipe in wall or ceiling with continuous earth wire connection of 14 SWG TC wire for AC	Rm	100	100
4	ETC for Laying of 6 of 4 sqmm PVC unsheathed multi- strand copper conductor cable of 1100V grade in suitable PVC rigid pipe in wall or ceiling with continuous earth wire connection of 14 SWG TC wire for AC	Rm	100	100
5	Supplying of down fall rod for ceiling fan	Nos	14	14
6	ETC of down fall rod for ceiling fan including cost of material, labour, lead, lift etc .	Nos	14	14
7	Supply of 4'x28 W Twin type Mirror optic suspension type fitting for fixing in false ceiling (Philips/Crompton / Wipro) complete with louvers cover complete with copper chokes and condenser with conduit pipe suspension, with PVC unsheathed copper leads from the terminals to the fittings with flu. tubes.	Nos	12	20
8	ETC of 4'x28 W Twin type Mirror optic suspension type fitting for fixing in false ceiling (Philips/Crompton / Wipro) complete with louvers cover complete with copper chokes and condenser with conduit pipe suspension, with PVC unsheathed copper leads from the terminals to the fittings with flu. tubes.	Nos	12	20
9	Supply of down fall rod for twin mirror optic fittings	Nos	20	20
10	ETC of down fall rod for twin mirror optic fittings including cost of material, labour, lead, lift etc.	Nos	20	20
11	Supply of 1400mm sweep AC ceiling fan with electronic regulator with 300mm down rod on the existing clamps of approved quality of Crompton/Rally/Usha/Bajaj)	Nos	8	8
12	ETC of 1400mm sweep AC ceiling fan with electronic regulator with 300mm down rod on the existing clamps of approved quality of Crompton/Rally/Usha/Bajaj including cost of all materials lead lift etc.	Nos	8	8
13	Supply of 1200mm sweep AC ceiling fan with electronic regulator with 300mm down rod on the existing clamps of approved quality of Crompton/Rally/ Usha/Bajaj)	Nos	6	6
14	ETC of 1200mm sweep AC ceiling fan with electronic regulator with 300mm down rod on the existing clamps of approved quality of Crompton/Rally/ Usha/Bajaj including cost of all materials lead lift etc .	Nos	6	6
15	Supply 450mm sweap AC exhaust fan heavy duty	No	4	4
16	ETC of 450mm sweap AC exhaust fan heavy duty including providing necessary holes with wall labour, fixing charges lead, lift etc. complete, as per standard specification	No	4	4
17	Supply of 300 mm (12") sweep (light duty) AC exhaust fan com	No	2	2
18	ETC of 300 mm (12") sweep (light duty) AC exhaust fan complete with necessary wall opening and making good of the wall.	No	2	2
19	ETC:- Earthing as per P.W.D standard with an earth electrode of2 Mtr. Class 'B' GI pipe of dia not less than 32mm complete with necessary masonry work.(SD-228)	No	1	1
20	Supply of light fitting CFL NON-INTEGRATED WARM WHITE 2 PIN 26W suitable for 220 V AC operation. PVC insulated copper wire of 15 sq.mm size in PVC pipes with 5 amps flush type switch including supply of all materials (including supply of light fittings for false ceiling with lamps)etc.	Nos	60	60
21	ETC of light fitting CFL NON-INTEGRATED WARM WHITE 2 PIN 26W suitable for 220 V AC operation. PVC insulated copper wire of 15 sq mm size in PVC pipes with 5 amps flush type switch including supply of all materials (including supply of light fittings for false ceiling with lamps)etc.	Nos	60	60
22	Supply of CFL Non Integrated, Master PLC 2 pin , cool white (13PLC8402P) with 13 Watts fluorescent lamps for 220 AC operation . with PVC insulated copper wire of 2.5 sq.mm size in PVC pipes with 5 amps flush type switch including supply of all materials (including supply of light fittings with lamps)etc. complete.	Nos	30	30
23	ETC and concealed wiring of CFL Non Integrated, Master PLC 2 pin , cool white (13PLC8402P) with 13 Watts fluorescent lamps for 220 AC operation with PVC insulated copper wire of 2.5 sq.mm size in PVC pipes with 5 amps flush type switch including supply of all materials (including supply of light fittings with lamps)etc. complete.	Nos	30	30
24	Supply of decorative type fittings with dished opal cover with necessary chokes and capacitors etc with 2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site) .	Nos	6	6
25	ETC of decorative type fittings with dished opal cover with necessary chokes and capacitors etc with 2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site) .	Nos	6	6
26	Supply CFL Dulux T/E Plus, Non-Integrated Interna, 4pin, GX24q-4, 42 W lamps for 220 V AC operation. Suitable for 220 V AC operation (Reputed make approved by department Engineer at site).	Nos	5	5
27	ETC of CFL Dulux T/E Plus, Non-Integrated Interna, 4pin, GX24q-4, 42 W lamps for 220 V AC operation. Suitable for 220 V AC operation (Reputed make approved by department Engineer at site)	Nos	5	5
28	Supply of Decorative type fitting with polystyrene louver assembly with necessary chokes & capacitors etc with2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site)	Nos	6	6

29	ETC of Decorative type fitting with polystyrene louver assembly with necessary chokes & capacitors etc with2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site)	Nos	6	6
30	Supply of Decorative type fitting with opal acrylic cover with necessary chokes and capacitors etc with 2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site)	Nos	10	10
31	ETC of Decorative type fitting with opal acrylic cover with necessary chokes and capacitors etc with 2x40W fluorescent lamps (HPF) suitable for 220 V AC operation (Reputed make approved by department Engineer at site)	Nos	10	10
32	Supply of basic mounting rail type fittings with necessary choke with single 40W fluorescent lamps suitable for 220V AC operation (Reputed make approved by department Engineer at site)	Nos	10	10
33	ETC of basic mounting rail type fittings with necessary choke with single 40W fluorescent lamps suitable for 220V AC operation (Reputed make approved by department Engineer at site)	Nos	10	10
34	Supply of sub-distribution board having 1 No. 63 A, TPN isolator as incomer and 3 Nos. MCB 32 A (Reputed make), DP HRC fuse as outgoing. (Supply)	Nos	2	2
35	ETC of sub distribution board having 1No. 63 A, TPN isolator as incomer and 3 Nos. 63 A, DP HRC fuse as outgoing etc. complete sample to be approved by department Engineer.	set	2	2
36	Supply of 60 Amps DP isolator as incoming and 4 Way TPN miniature circuit breaker 10 Nos 5 Amps as outgoing lighting distribution board.	Nos	6	6
37	ETC of 60 Amps DP isolator as incoming 4 way miniature circuit breaker of 10 Amps as outgoing lighting distribution board etc. complete sample to be approved by department Engineer.	Nos	6	6
38	Supply main switch board shall be of indoor, industrial wall mounted, vermin proof, dust proof and suitable for 400/440 V, 3 phase, 4 wire system with bus bar chamber, interconnections to sub circuit MCBs and cable glands with the following ratings of INCOMER : 1 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63Amps Main Switch and 16 A MCB -10 Nos for each sub circuit complete with angle iron frame all labour ,lead and lift etc complete.	No.	1	1
39	ETC of Lighting Switch Board with 1No. 200 A, TPN fuse switch as incoming and 3 Nos. 63 A TPN, 2 Nos. 63A DP, 1 No. 32A DP switch fuse etc. complete.	set	1	1
40	Supply of power Distribution Board (incoming 63 A DPisolator - 1 No. and outgoing 15 A SPN Switch fuse -12 Nos.	Nos	2	2
41	ETC of Power Distribution Board (incomer:63A DP, isolator 1 No. DP switch fuse as outgoing 1SA SPN switch fuse - 12 Nos. etc complete.sample to be approved by department Engineer	Nos	2	2
42	Supply of 8 SWG copper conductor (Insulated Tinned copper wire) for distribution board and switch board earthing approved quality.	RM	200	200
43	Supply of MS BOX for peripheral lighting cable termination with suitable terminal blocks approved quality.	Nos.	7	7
44	ETC of MS Box for peripheral lighting cable termination with suitable terminal blocks etc. complete. sample to be approved by department Engineer.	Nos	7	7
45	Supply of light fitting CFL NON-INTEGRATED WARM WHITE 2 PIN 26W suitable for 220 V DC operation(Reputed make) including cost of fitting all labour ,lead and lift etc. complete. (Supply and ETC)	Nos.	15	15
46	ETC of light fitting CFL NON-INTEGRATED WARM WHITE 2 PIN 26W suitable for 220 V DC operation(Reputed make) including cost of fitting all labour ,lead and lift etc. complete.	Nos.	15	15
47	Supply of 2 KV Inverter with suitable 220 V DC operation including 4 way double pole emergency distribution board having 1 NO (Reputed make)	Nos	2	2
48	ETC of 2 KV Inverter with suitable 220 V DC operation including 4 way double pole emergency distribution board having 1 NO (Reputed make)	Nos	2	2
49	ETC:- Wiring with 2x1.5 sq.mm PVC insulated single core copper conductor cable 1100 V grade in suitable PVC rigid pipe on wall and ceiling with reputed make switch boxes earthwire connection in 14 SWG TC wire for light point / Fan point including cost of wire ,labour lead etc. complete of approved quality.	Pts	55	55
50	ETC:- wiring with 2 x 1.5 sqmm(22/0.3mm) PVC insulated single core copper conductor cable 1100 v grade with multi strand approved quality in suitable PVC rigid pipe for concealed wiring on wall and ceiling with reputed make switch boxes concealed type with 3mm thick hylum sheet cover with 5 amps flush type switch with continuous earth wire connection of 14swg TC wire and making good of the concealed portion with wire and making good of the concealed portion with suitable colour including supply of all materials ,labour,etc complete.	Pts	110	110
51	ETC: Wiring with 2 x 4 sqmm (56/0.3mm) PVC insulatedsingle core unsheathed copper conductor cable 1100 v grade multi strand approved quality in suitable PVC rigid pipe on wall and ceiling with accessories with suitable switch box concealed type with 3 mm thick hylum sheet cover for 15 A 3 PIN non interlocking CS plug with continuous earth wire connection of 14 swg TC wire and making good of the concealed portion with suitable colour including supply of all materials ,labour etc complete.	Pts	10	10
52	Supply of concealed wiring 5 Amps 3 pin plug points with combined switch plug with PVC insulated Copper wire of 1.50 Sq mm size in PVC pipe.	Pts	46	46
53	ETC for concealed wiring a 5 Amps 3 pin plug points with combined switch plug with PVC insulated Copper wire of 1.50 Sq mm size in PVC pipe.	Pts	46	46
54	Supply, and concealed wiring metal clad with cast Aluminium enclosure 20A, 10, 3 pin full inter-locked switches socket with PVC insulated Copper wire of 4 Sq mm size in PVC pipe with one run of 14 guage copper wire for earthing. sample to be approved by department Engineer.	Pts	15	15

ANNEXURE B

Sl No.	Item Description	unit	Quantity for Anikadavu	Quantity for Thappagundu
1	Supply 2 x 36 W CFL with fitting fixture of reputed make	Nos.	40	40
2	Supply 2 x 36 W CFL with fitting fixture of reputed make	Nos.	40	40
3	8 Mtrs Stepped tubular poles with single bracket.	Nos.	15	17
4	ETC of 8 Mtrs Stepped tubular poles with single bracket.	Nos.	15	17
5	8Mtrs Stepped tubular poles with double bracket	Nos.	5	6
6	ETC of 8Mtrs Stepped tubular poles with double bracket	Nos.	5	6
7	Supply of Flood Light of 2X 400 W HPSV Lamp with fitting Fixture of Reputed make	Nos.	130	130
8	ETC of 2X 400 W HPSV Lamp with fitting Fixture of Reputed make	Nos.	130	130
9	Supply of Flood Light of 1 X 400 W HPSV Lamp with fitting Fixture of Reputed make	Nos.	15	15
10	ETC of Flood Light of 1 X 400 W HPSV Lamp with fitting Fixture of Reputed make	Nos.	15	15
11	Supply of Normal Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 6 nos- 20 A single pole MCB and 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos. .	5	5
12	ETC of Normal Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 6 nos- 20 A single pole MCB and 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos. .	5	5
13	Supply of Emergency Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 6 nos- 20 A single pole MCB and 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos.	3	3
14	ETC of Emergency Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 6 nos- 20 A single pole MCB and 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos.	3	3
15	Supply of Street Lighting Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos.	2	2
16	ETC of Street Lighting Sub Distribution Board (63A, 3 phase 4 wire bus and one no. 63A, TPN, MCB with neutral unit as incomer Detail Of Outgoing Feeders 3No. 32 A Triple pole MCB with Neutral and suitable timer and contactor for automatic switching.)	Nos.	2	2
17	Supply of Sub Lighting Panel (SLP) : 4 pole 32A Isolator suitable for 415V,50 cycles AC supply, wlith LILOfacility using 8 nos terminal blockssuitable for cable upto 16 mm sq cableEnclosure shall be suitable for outdooruse with IP-55 degree of protection as per IS:13947 (Part-1).	Nos.	16	16
18	ETC of Sub Lighting Panel (SLP) : 4 pole 32A Isolator suitable for 415V,50 cycles AC supply, wlith LILOfacility using 8 nos terminal blockssuitable for cable upto 16 mm sq cableEnclosure shall be suitable for outdooruse with IP-55 degree of protection as per IS:13947 (Part-1).	Nos.	16	16
15	Supply of Junction Boxes (with 5 Nos. terminal block)	Nos.	55	55
16	ETC for Junction Box(with 5 Nos. terminal block)	Nos.	55	55
17	Supply of 15A, 240V, Receptacle 2 pole, 3- pin	Nos.	20	20
18	ETC of 15A, 240V, Receptacle 2 pole, 3- pin	Nos.	20	20
19	Supply of 63A, 415V, Interlocked switch socket, receptacle	Nos.	10	10
20	ETC of 63A, 415V, Interlocked switch socket, receptacle	Nos.	10	10

21	Supply main switch board shall be of indoor, industrial wall mounted, vermin proof, dust proof and suitable for 400/440 V, 3 phase, 4 wire system with bus bar chamber, interconnections to sub circuit MCBs and cable glands with the following ratings of INCOMER : 1 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63Amps Main Switch and 16 A MCB -10 Nos for each sub circuit complete with angle iron frame all labour ,lead and lift etc complete.	Nos.	1	1
22	ETC of main switch board shall be of indoor, industrial wall mounted, vermin proof, dust proof and suitable for 400/440 V, 3 phase, 4 wire system with bus bar chamber, interconnections to sub circuit MCBs and cable glands with the following ratings of INCOMER : 1 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63 No. 200 Amps TPN Fuse switch (with HRC fuse).and outgoing circuits bus bars shall be rated for 4 pole 63Amps Main Switch and 16 A MCB -10 Nos for each sub circuit complete with angle iron frame all labour ,lead and lift etc complete.	Nos.	1	1

55	ETC of concealed wiring metal clad with cast Aluminium enclosure 20A, 10, 3 pin full inter-locked switches socket with PVC insulated Copper wire of 4 Sq mm size in PVC pipe with one run of 14 guage copper wire for earthing. sample to be approved by department Engineer.	Pts	15	15
56	Fixing and concealed wiring for exhaust fans with PVC insulated copper wire of 4 sq.mm size in PVC pipe with 5 amps flush type switch etc complete. (Only ETC)	Pts	6	6
57	ETC and concealed wiring for exhaust fans with PVC insulated copper wire of 4 sq.mm size in PVC pipe with 5 amps flush type switch etc complete.	Pts	6	6
58	Supply of 4 of 4 sqmm (56/0.3mm) PVCinsulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe concealed in wall and ceiling with continuous earth wire connection 14 SWG TC wire and making good of the concealed portion with suitable colour."	m	150	150
59	ETC for Laying of 4 of 4 sqmm (56/0.3mm) PVC insulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe concealed in wall and ceiling with continuous earth wire connection 14 SWG TC wire and making good of the concealed portion with suitable colour	m	150	150
60	Supply of 4 of 4 sqmm PVC insulated multistrand unsheathed copper conductor of 1100 V grade in suitable PVC pie concealed in wall and ceiling with continuous earth wire 14 SWG TC wire for power pulg point on wall and ceiling with reputed make switch boxes etc. complete.	RM	300	300
61	ETC for Laying of 4 of 4 sqmm PVC insulated multistrand unsheathed copper conductor of 1100 V grade in suitable PVC pie concealed in wall and ceiling with continuous earth wire 14 SWG TC wire for power pulg point on wall and ceiling with reputed make switch boxes etc. complete.	RM	300	300
62	Supply of 4 of 6 sqmm (84/0.3mm) PVCinsulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe concealed in wall and ceiling with continuous earth wire 14 SWG TC wire and making good of the concealed portion with suitable colour.	RM	100	100
63	ETC for Laying of 4 of 6 sqmm (84/0.3mm) PVCinsulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe concealed in wall and ceiling with continuous earth wire 14 SWG TC wire and making good of the concealed portion with suitable colour.	RM	100	100

SECTION – 2

Equipment specifications

1.0. YARD LIGHTING:
The contractor shall design the switchyard lighting for the entire substation area. The recommended levels of illumination is

General horizontal : 21.52 Lux.
Specific vertical (on disconnects) : 21.52 Lux.

These levels of illumination shall be designed to be achieved by using CFL bulbs. The lighting cum lightning masts in the substation have lightning platforms for mounting of these lamps at 12.5 metre and 25 metre levels. These platforms have to be made use of for mounting the lightning fixtures. The contractor can propose separate masts for the 110 KV yard lights, 230 KV yard lights and where additional masts are required for 400 KV yard lights. These masts shall be designed by the contractor only after detailed discussion with the purchaser regarding the height, location and numbers etc, and the design shall be submitted within 60 days of award of contract.

The CFL bulb fitting along with fixtures shall be procured by the contractor erected and commissioned with necessary lamp control switches and switch boxes. The brand names of the fittings and lamps should be got approved before ordering. Tentative quantity has been indicated in the schedule.

2. ILLUMINATION OF SWITCHYARD :-
Illumination for the entire switch yard to be designed as per standard practice and lamps to be erected in the sub station structures, Lightening mast,8 Mts stepped GI tubular post. Each fitting has to be provided with necessary Vermin proof junction box, HRC fuse carrier and fuse link. The yard light should be grouped in such a way that minimum lights can be switched on by generator set. Necessary main switches main switches to be erected in the yard by grouping and over all control from control room. The CFL bulb fitting with fixture, of reputed make with ISI mark and only copper cable to be used from fitting to junction box etc. and testing for burning condition.

3. CONTROL ROOM BUILDING LIGHTING, CEILING FANS, EXHAUST FANS ANDEMERGENCY LIGHTING:

The split up details of various requirements have been furnished in the following sections. The entire electrification shall be carried out as per standard PWD practice.

3.1. SPLIT UP QUALITY OF LIGHTS – AREA WISE:

The type of fitting are as per the schedule and sample to be approved by department engineer at site before actual execution. A electrical circuit diagram shall be prepared by the contractor and got approved before commencement of work.

3.2. SWITCH BOARDS:

3.2.1. MAIN SWITCH BOARD:
The main switch board shall be of indoor, industrial wall mounted, vermin proof, dust proof and suitable for 400/440 V, 3 phase, 4 wire system with bus bar chamber, interconnections and cable glands with the following ratings of incoming and outgoing circuits bus bars shall be rated for 200 Amps complete with angle iron frame work shall be provided.

INCOMER : 1 No. 200 Amps TPN Fuse switch (with HRC fuse).
OUTGOING : 3 Nos. 63 Amps TPN switch fuse.
: 1 No. 32 Amps DP switch fuse and
: 2 Nos. 63 Amps DP switch fuse and with HRC fuses.
Lighting transformer of 150KVA : 1 Nos.

QUANTITY : 1 No.

A change over switch for alternate supply shall be installed by the contractor(Shall be part of Main switch Board)

3.2.2. SUB DISTRIBUTION BOARD:

The sub-distribution board shall be of indoor, wall mounted, vermin proof, dust proof and suitable for 400/440V, 3 phase, 4 wire operation complete with bus bar chamber, bus bars, interconnections m cable glans etc., with the following incoming and outgoing.

INCOMER : 1 No. 63 A TPN isolator.
OUTGOING : 3 Nos. 32 A Double pole HRC fuse HRC fuse switch

QUANTITY : 2 Nos.

3.2.3. LIGHTING DISTRIBUTION BOARDS:

The lighting distribution boards shall be of Indoor, vermin proof, dust proof and flush mounting type and suitable for operation on 230 V 1 phase, 50 Hz., complete with bus bar chamber, inter connections and suitable knock-outs 552 for 25 mm dia pipe and glands for incoming cable, shrouds with the following incoming and outgoing minimum circuit breakers.

INCOMER : 1 No. 60 A Double pole.
OUTGOING : 10. Nos. 5A SP, MCBH and 2 Nos. blanking plate

QUANTITY : 6 Nos.

3.2.4. POWER DISTRIBUTION BOARD:

The power distribution board shall be of indoor, wall mounted, vermin proof, dust proof shall be of 230 V 1 phase 50 Hz., with bus bars, interconnections etc., with following incomer and outgoings.

INCOMER : 1 No. 63 A Double pole.
OUTGOING : 12 Nos. 15 A HRC fuse

QUANTITY : 2 Nos.

3.2.6. Convenience sockets like 20 A, 5A sockets shall be provided for essential requirements. For earthing the distribution Board/Switch Board, No.8 SWG Copper from existing main earth bus shall be used. Lighting circuits, Fan, 5 A sockets, bell push and exhaust fans shall be wired with 2 runs of 1.5 sq.mm copper wire in ¾" PVC pipes with 14 DWG T.C. (for earthing). 20 A sockets shall be wired with 2 runs of 6 sq.mm copper wire in ¾" PVC pipe with 14 SWG T.C. (Earthing). Concealed type wiring shall be done. All the fitting sockets, switch Boards shall be provided only at those places marked in the electrification drawing to be supplied by tenderer.

3.2.7. SOCKETS AND SWITCHES:

Totally enclosed, dust and vermin proof, metal clad with cast aluminum enclosure 20 A, 1 phase, 3 pin fully interlocked switch socket suitable for flush mounting. 15 Nos.

5 Amps single pole, single way, porcelain base base flush type switch, suitable for flush mounting 149 Nos.
5 Nos. 1 phase 3 pin switched socket suitable for 220 V AC operation with M.S. Box suitable for flush mounting 46 Nos.
Bell with bell-push switch 3 nos. Staircase switch, 5 Amps, double pole, double throw, porcelain base flush type switch for staircase light control 4 Nos.

SECTION – 3

GENERAL TECHNICAL REQUIREMENTS

3.0 Foreword

The provision under this section is intended to supplement general requirements for the materials, equipment and services covered under other sections.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a) Customer : M/s Tamil Nadu Transmission Corporation Limited
b) Project Title : 400/110 KV Substation at Thappagundu & 400/230/110 KV Substation at Anikadavu
c) Transport facilities : Road/Rail
d) Site location : THAPPAGUNDU IN THENI DISTRICT, MADURAI REGION & ANIKADAVU IN TIRUPPUR DISTRICT, COIMBATORE REGION

The following system parameters shall prevail:

Nominal system voltage	**400 kV**	**230kV**	**110 kV**
Highest system voltage	420 kV	245kV	132 kV
Frequency	50 Hz	50 Hz	50 Hz
Minimum creepage	25mm/kV	25mm/kV	25mm/kV
System Earthing	Effectively Earthed	Effectively Earthed	Effectively Earthed

SITE CONDITIONS

3.1.1 Ambient Temperature
a) Ambient air temp. (max.) : 50 deg C
B) Max Temp. for design : : 50 deg C
b) Ambient air temp. (min.) : 20 deg C
c) Max, Daily average ambient air temp. : 45 deg C
d) Max. yearly average ambient air temp. : 32 deg C

3.1.2 Max. humidity : 100% Max.

3.1.3 Average thunder storm days per annum : 50

3.1.4 Average rainy days per annum : 90

3.1.5 Average Annual rainfall : 1000 mm

3.1.6 No. of months during which tropical monsoon condition prevail: 5
3.1.7 Max, wind Pressure : 150kg/sqmm
3.1.8 Max wind speed : 39m/s
3.1.8 Altitude above MSL : 1000 m

However for design purpose, ambient temperature should be considered as 50º C and relative humidity as 100%.

AUXILIARY POWER SUPPLY

3 phase AC Supply	415V, 3 phase 4 wire 50 Hz, neutral grounded AC supply -15% to +10%
1 phase AC supply	240V, single phase, 50 Hz neutral grounded AC supply
DC supply	220, 2 wire DC supply + 10% to –15% 48V, 2 wire DC supply

3.2 GENERAL REQUIREMENT

3.2.0 ALL THE EQUIPMENTS /MATERIALS TO BE SUPPLIED SHOULD BE IN ACCORDANCE WITH RELEVANT LATEST / AMMENDED ISS /IEC, WHETHER IT HAS BEEN SPECIFICALLY MENTIONED IN THE SPECIFICATION OR NOT".

3.2.1 The supplier shall also furnish drawings for the following:

All EQUIPMENTS and type of clamps, fitting hardware, insulators, bus bar. These designs/ drawing shall be got approved by the BHEL/TANTRANSCO before commencing the manufacture / construction / erection and are to be as per latest IS.

3.2.1 GENERAL:

3.2.1.1 The bidders shall be fully responsible for providing all equipment, materials system and services specified or otherwise which are required to complete the construction and successful commissioning of the substation in all respects.

3.2.1.2 Any other items not specifically mentioned in the specification but which are required for erection of materials/equipments under the scope of work, testing and commissioning are deemed to be included in the scope of the specification unless specifically excluded.

3.2.1.3 All items shall be supplied as per schedule and as specified in the relevant Indian standard of latest revision. The Technical specification of the main materials/equipments is furnished. The Technical specification contained herein for the materials are for the guidance of the tenderer.

3.2.1.4 The Tenderers are requested to procure the equipments/materials/component only from reputed /qualified manufacturer as per Technical requirement stipulated in Section - I of Technical specifications. Approval of make of item shall be taken up by vendor from TANTRANSCO himself.

3.3 SPECIFIC REQUIREMENT

3.3.1 The Supplier shall furnish make/manufacturer, catalogues, engineering data, and technical information, design documents, drawings etc., fully in conformity with the technical specification and get approval from competent authority before commencement of any work.

3.3.2 All steel materials, other than materials for earthing should be of galvanized if not specified.

3.4 SPECIFIC TECHNICAL REQUIREMENTS: / Drawing submission

The successful bidder shall submit all drawings and documents as per clause no. 3.29 along with the list of drawings within 7 days after placement of order to BHEL.

3.5 STANDARD:

The goods supplied under this contract shall conform to the standards mentioned in the Technical Specifications and when no applicable standard is mentioned, to the standard specified by the Institution of Central / State Government or internationally recognized Institutions shall be applicable and such standards shall be the latest issued by the concerned institution.

3.6 TEST CERTIFICATE:

Copies of all test certificates relating to material to be procured by the Supplier for the works shall be forwarded to BHEL.

3.7 Inspection clause :

3.7.1 The BHEL/TANTRANSCO or his representative shall have the right to inspect and/or test the goods /works to confirm their conformity to the supplier. BHEL/TANTRANSCO shall notify the supplier in writing of the identity of any representatives authorized for these purposes.

The inspections and tests may be conducted on the premises of the supplier or his Sub vendor at the point of delivery and /or at the goods' final destination. Where tests are conducted in the premises of Supplier, all reasonable facility and assistance including access to drawings and production data shall be furnished at no charge to the BHEL.

Should any inspected or tested goods fail to conform to specifications, the BHEL/TANTRANSCO may reject them and the supplier shall either replace the rejected goods or make all alterations necessary to meet specification requirements free of cost to the BHEL/TANTRANSCO within one week of intimation.

The BHEL/TANTRANSCO's right to inspect, test and where necessary reject the goods after the goods; arrival at the site, shall in no way be limited or waived by reason of the goods having been previously inspected. Tested and passed by the BHEL/TANTRANSCO or his representative prior to the goods dispatch.

3.7.2 Not less than 15 (Fifteen) days advance intimation shall be given about the quantity of materials that will be ready for inspection by the officers of TANTRANSCO/ BHEL/Third agency authorized by the Corporation. The materials should not be dispatched without instruction from the Corporation.

3.8 GUARANTEE:

3.8.1 The supplier shall guarantee that the goods under the Contract are new, unused of the most recent or current models and incorporated all recent improvements in design and materials unless provided otherwise in the Contract. The supplier shall further guarantee that the goods supplied under this Contract shall have no defects arising from design, materials or workmanship, installation and erection, if that may develop under normal use of the supplied goods. The supplier shall also guarantee the performance of the works executed by him including the performance of all the materials/goods supplied by him.

3.8.2 BHEL shall promptly notify supplier in writing of any claims arising under guarantee in respect of goods. Upon receipt of such notice, the supplier shall, with all reasonable speed, repair or replace the defective works or parts thereof, free of cost at site. All the expenses towards transportation of defective parts to supplier's works and of repaired/replaced parts to site shall be borne by the Supplier.

3.8.3 If the Supplier, having been notified, fails to remedy the defects within 14 days, the BHEL will proceed to take such remedial action as may be necessary, at the supplier's risk and expenses. All expenses in this regard will be recovered from Supplier.

3.9 PRE COMMISSIONING TESTING :(if applicable)

On completion of erection of equipments and before charging each item of equipments shall be thoroughly cleaned and inspected jointly by the TANTRANSCO and the BHEL for correctness and completeness of installation and acceptability for charging leading to initial pre commissioning test. The pre commissioning testing to be carried all equipments in the presence of Board Engineers. Necessary tools, testing kits are to be arranged by the Supplier.

3.10 PACKING:

3.10.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit to their final destination as indicated in the Contract and exposure to extreme temperatures, salt and precipitation etc., during transport and open storage. Packing case size and weights shall be taken into consideration wherever appropriate, the remoteness of the 'goods' final destination and absence of heavy mechanized handling facilities, at all points in transit.

3.10.2 The packing, marking and documentation within and outside the package shall comply strictly with such special requirements as shall be expressly provided for in the Contract or in any subsequent instructions issued by BHEL.

3.11 COLOUR SCHEME AND CODES FOR PIPE SERVICE/PANELS

The supplier shall propose a color scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of BHEL/TANTRANSCO. The decision of BHEL/TANTRANSCO shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.
Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.
All the steel works shall be thoroughly cleaned of rust , scale , oil , grease, dirt and scarf by pickling , emulsion cleaning , etc. The sheet steel shall be phosphated /oven dried and then painted with two coats of zinc rich primer paints . After application of the primer, two coats of finished synthetic enamel paint shall be applied. The colour of the finished coats inside shall be glossy white and exterior of the treated sheet steel shall be shade 631 of IS 5 /RAL 7032 for all switchboard /MCC/distribution board , control panels etc.
Sufficient quantities of touch paint shall be furnished for application at site. All the indoor cubicles shall be the same as exterior surface and for other miscellaneous items, colour scheme will be approved by the BHEL/TANTRANSCO.

3.12 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

3.13 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

3.14 FUNGI-STATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

3.15 GALVANIZING

All nuts and pins shall be adequately locked. Nuts, bolts and pins used inside the transformer and tap-changer compartment where gaskets are not used shall be provided with spring washers or locknuts. Where galvanizing is specified, it shall be applied by the hot dipped process or by electro-galvanizing process and for all parts, other than steel wires, shall consist of a thickness of zinc coating equivalent to not less than 610 gm of zinc per square metre of surface.The zinc coating shall be smooth, of uniform thickness and free from defects.

3.16 DEGREE OF PROTECTION

The supplier shall propose following Degree of protection for those equipment/Items for which the degree of protection has not been specified in the specification for the approval of BHEL/TANTRANSCO. The decision of BHEL/TANTRANSCO shall be final. The enclosures of the Control Cabinets, Junction boxes and Marshalling boxes panels etc to be installed shall be provided with degree of protection as detailed here under:

a) Installed outdoor: IP-55

b) Installed indoor in air conditioned area: IP-42
c) Installed in covered area IP:52
d) For LT switchgear (AC & DC distribution Boards): IP-54

The degree of protection shall be in accordance with IS:13947, (Part-1)/IEC-947(Part-1). Type test report/or degree of protection test on each type of the box shall be submitted for approval.

3.17 RATING PLATES, NAME PLATES AND LABELS

Type or serial number together with details of the loading conditions under which the item of the substation in question has designed to operate and such diagram plates as may be required by the BHEL/TANTRANSCO. The rating plate for each equipment shall be according to IEC requirements.

Alternately two separate plates one with Hindi and other with English inscriptions may be provided.

During approvals drawings of Rating/name plates/lables shall also be submitted.

3.18 EARTHING

Circuit breakers, LA, Isolator, CVT, CT, BPI shall be provided with two grounding pads suitable for connection to galvanized steel flat. Control panels, Relay panel, outdoor marshalling boxes, Junction boxes, Lighting panels and distribution board shall be provided with two grounding pads, for connection to galvanized steel flat. The two pads shall be provided, one each at the middle of the two opposite sides of the bottom frame of the equipment. Earthing of hinged door shall be done by using a separate earth wire.

3.19 TERMINAL BLOCKS AND WIRING

Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All Inter-phase and external connections to equipment or to control cubicles will be made through terminal blocks.

Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current on the terminals. Those shall be of moulded piece complete with insulated barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type equivalent to Elmex type CATM4, Phoenix cage clamp type of Wedge or equivalent. The Insulating material of terminal block shall be nylon 6.6 which shall be free of halogens, fluorocarbons etc.

Terminal block for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.

The terminal shall be that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally. The conducting part in contact with cable shall preferably be tinned or silver plated however Nickel plated copper or zinc plated steel shall also be acceptable. The terminal blocks shall be of extensible design. The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.

Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.

All circuits except CT circuits :	Minimum of 2 nos. of 2.5 sq.mm,copper flexible.
All CT circuits :	Minimum of 4 nos. of 2.5 sq.mm, copper flexible..

The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live. At least 20 % spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminals rows.

There shall be a minimum clearance of 250mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm. The Supplier shall furnish all wire, conduits and terminals for the necessary inter-phase electrical connection (where applicable) as well as between phases and common terminal boxes or control cabinets.

All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The supplier shall also provide all necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

TB sizes for incoming power supply shall be informed/confirmed during drwawing approval stage.

TBs should be suitable for cable sizes all cable sizes.

3.20 CONTROL CABINETS, JUNCTION BOXES, TERMINALS BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENTS

All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039, IS-8623 or IEC-439, as applicable and the clause given below.

Control cabinet, Junction boxes, Marshalling boxes & Terminal boxes shall be made of sheet steel. Sheet steel used shall be at least 3.0 mm thick cold rolled or 3 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements.

Cabinet /boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of gaskets shall be such that it does not get damaged/cracked during the operation of the equipment.

All door, removable covers and plates shall be gasketed all around with suitably profiled Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan. The quality of gasket shall be such that it does not get damaged /cracked during the years of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth, straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.

All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting atleast 150 mm above from the base of the Marshalling Kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland. The gland shall project atleast 25mm above gland plate to prevent entry of moisture in cable crutch. Gland plate shall have provision for some future glands to be provided later, if required

3.21 SPACE HEATERS

The heater shall be suitable for continuous operation at 240 V AC supply voltage and shall be provided with on – off switch and fuse shall be provided for heater.

One or more adequately rated, thermostatically connected heaters shall be supplied to prevent condensation in any compartment.

3.22 DELIVERY OF GOODS AND DOCUMENTS RELATED THERETO:

Delivery of goods shall be made by the supplier in accordance with the terms specified by the BHEL in its schedule of requirements.

3.23 INCIDENTAL SERVICES:

The Supplier is required to provide any or all the services broadly outlined in the Technical specification. Any other minor incidental service related to the scope of work like providing necessary assistance whether specifically mentioned or not must be carried out by the

Supplier at his own cost. All tools, Tackles Plant etc., required for completion of above works shall be brought by the Supplier.

3.24 DISCREPANCIES BETWEEN DRAWING AND SPECIFICATION:

Should there be any discrepancy between the specifications and/or schedule of prices and/or drawings or any inconsistency, error or omission in either of them, reference must be made to the BHEL/TANTRANSCO for an explanation and the Supplier will be held responsible for any errors that may occur in the work through neglect of this precaution. The explanation of the BHEL/TANTRANSCO shall be final and binding on the Supplier.

3.25 APPROVAL PROCEDURE

The scheduled dates for the submission of drawings as well as for, any data/information to be furnished by the Employer would be as per the following schedule. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	First Submission	7 days after LOI/PO
ii.	Approval/comments/by employer on Initial submission	Reasonable time
iii.	Resubmission	Within 7 days (whenever from date of comments required) Including both ways postal time.
iv.	Approval or comments	Within 2 weeks of receipt of resubmission.
v.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The supplier may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

3.26 TITLE BLOCK

Following Title Blocks to be used in drawings at the time of drawing approvals

For Thappagundu

Customer	M/s Tamil Nadu Transmission Corporation Limited

Project:	400/110 KV Substation at Thappagundu
Contractor	BHEL

For Anikadavu

Customer	M/s Tamil Nadu Transmission Corporation Limited
Project:	400/230-110 KV Substation at Anikadavu
Contractor	BHEL

3.27 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

1) Drawings
2) Guaranteed Technical Particulars
3) Type Test Reports
4) List of Part Supplies with rating

Drawings & Documents submitted at the time of offer shall be subject to review at contract stage.

3.28 DOCUMENTATION SCHEDULE

Following Documentation schedule to be followed per project.

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	7	10	5
2	Drawings "As Built "	-	-	10	
3	Type Test Reports	1	7	10	
4	Erection Manuals	-	7	10	
5	Operation and Maintenance Manuals	-	7	10	
6	Manufacturing Quality Plan	-	7	10	
7	Field Quality Plan	-	7	10	
8	Inspection Test Reports	-	7	10	

Note: Drawings will also be submitted in CD/DVD in Latest AUTOCAD-2004 or Later version or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with details of Customer & Project etc. written on top.

APPENDIX-A

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations/variations/exceptions from the specification:

SECTION	CLAUSE NO. / PAGE NO.	STATEMENT OF DEVIATION / VARIATIONS / EXCEPTIONS

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the specification.

If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place

Date

Signature of the authorized representative of

Bidder's name .....

Designation .....

Company seal .....

APPENDIX-B

BIDDER'S UNDERTAKING FOR TYPE TEST REPORTS

Bidder shall take type test report, MQP, and drawing approval from TANTRANSCO without any commercial / delivery implication to BHEL. In case type test reports are not acceptable to customer due to any technical reason, the same shall be conducted free of cost.

Place Signature of the authorized representative of

Bidder 'name----------

Date

Designation----------

Company seal ----------

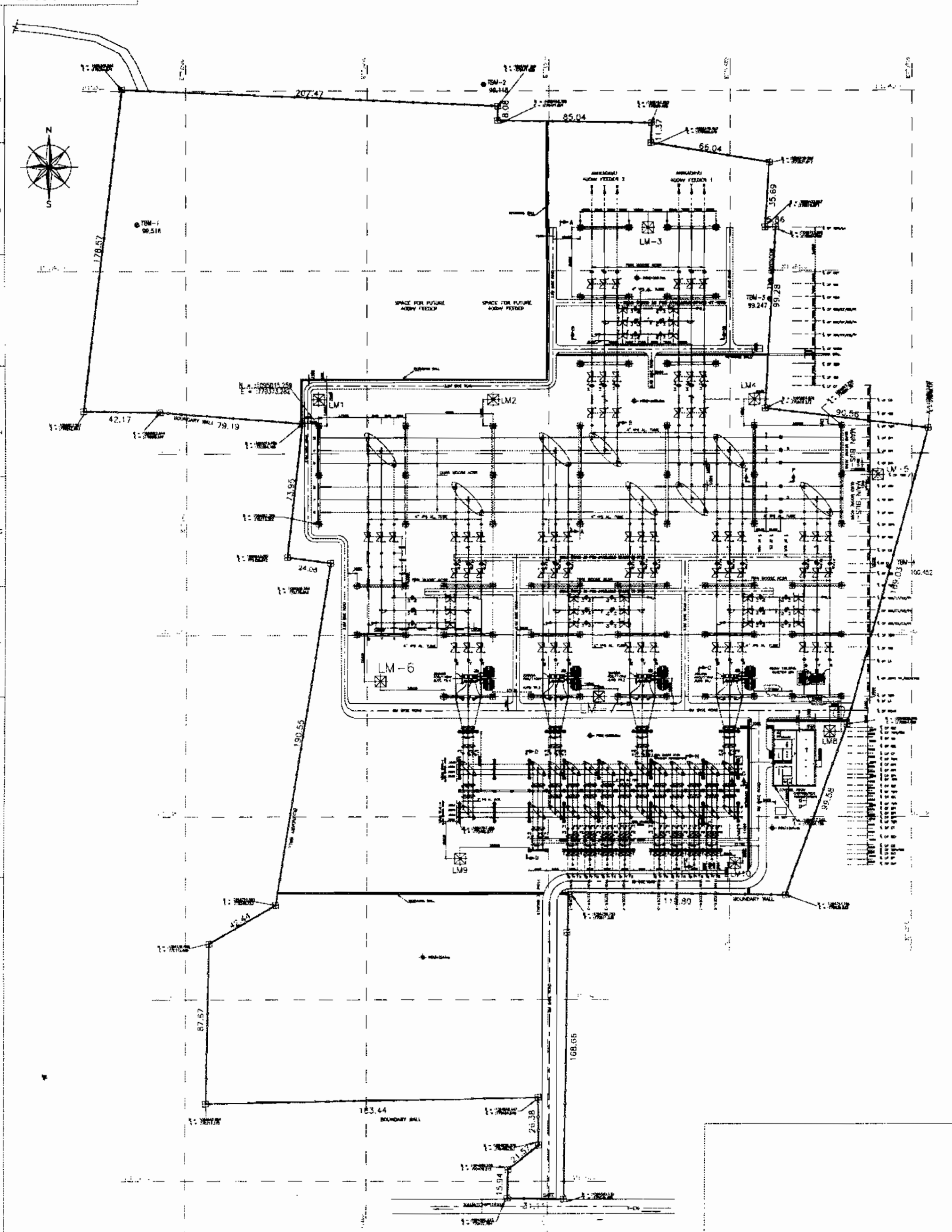
SECTION-4
GENERAL TECHNICAL PARTICULARS

S.N.	ITEM	
1	FIXTURES & ACCESSORIES	
1.1	General	
1.1.1	Name of Manufacturer & Country for fixtures	
1.1.2	Manufacturer's type & Catalogue no. for fixtures	
1.2	Technical details (Separate details of each type of fixtures, each type of components and each type of lamps shall be furnished)	
1.2.1	Fixtures	
1.2.1.1	a) Starting current (A)	
	b) Full load input current at normal working voltage (A)	
1.2.1.2	Temperature rise of the fixture in continuous operation at the design air temp. of 40 deg. C	
1.2.1.3	Maximum estimated working temp. of the fixture, with the fixture mounted close to ceiling and operating in still air ambient temp. as specified.	
	a) Ambient within fixture housing	
	b) Ballast case hot spot temp. (deg C)	
	c) Average Ballast winding temp. (deg C)	
1.2.1.4	Estimate average life expectancy of complete fixture, including control gear continuously mounted.	
	a) In still air at ambient temp of 25 deg. C (Years)	
	b) In still air at 40 deg. C ambient temp. (Years)	
1.2.1.5	Average total light output per fixture as percentage of combined lamp light output at normal working voltage and frequency	
	a) In still air at ambient temp of 25 deg. C (Years)	
	b) In still air at 40 deg. C ambient temp. (Years)	
1.2.1.6	Average downward (0-90) light output per fixture as percentage of total fixture light output (%)	
1.2.1.7	Average downward (90-180) light output per fixture as percentage of total fixture light output (%)	
1.2.1.8	Maximum withstand voltage of fixture (50 Hz sine wave test) (V)	
1.2.1.9	Beam angle for flood light fixture in	
	a) Horizontal plane (Deg.)	
	b) Vertical plane (Deg.)	
1.2.2	Ballasts	
1.2.2.1	Type	
1.2.2.2	Make	
1.2.2.3	Catalogue No.	
1.2.2.4	Maximum permissible supply voltage variation (%)	
1.2.2.5	Power loss per Ballast at nominal working voltage and frequency (Watt)	

1.2.2.6	Recommended/ Designed maximum hot spot temp. of ballast case (deg C)	
1.2.2.7	Recommended/ Designed maximum average ballast winding temp (deg C)	
1.2.2.8	Conductor material of ballast	
1.2.2.9	Insulation class of ballast winding	
1.2.2.10	Average life of ballast (Hrs)	
1.2.3	Starters	
1.2.3.1	Type	
1.2.3.2	Make	
1.2.3.3	Catalogue No.	
1.2.3.4	Average life of starters (Hrs)	
1.2.3.5	Enclosure material of starters	
1.2.4	Capacitors	
1.2.4.1	Type	
1.2.4.2	Make	
1.2.4.3	Catalogue No.	
1.2.4.4	Power factor at nominal working voltage and frequency	
1.2.4.5	Type of capacitor	
1.2.4.6	Rating of capacitor (micro F)	
1.2.4.7	Tangent of loss angle per capacitor at nominal working voltage and frequency	
1.2.4.8	Recommended maximum working temp. of capacitor measured on case (deg C)	
1.2.5	Ignitors for HPSV lamps	
1.2.5.1	Type	
1.2.5.2	Make	
1.2.5.3	Catalogue No.	
1.2.5.4	Average life of ignitors (Hrs)	
1.2.5.5	Enclosure material of ignitors	
1.2.6	Fuses	
1.2.6.1	Type	
1.2.6.2	Make	
1.2.6.3	Catalogue No.	
1.2.6.4	Category of fuse duty	
1.2.6.5	Rated Current (A)	
1.2.6.6	Maximum prospective rms fault current interruption value of fuse at nominal voltage and frequency (A)	
1.2.7	Louvers	
1.2.7.1	Material of louvers	
1.2.7.2	Size of louvers	
1.2.7.3	Shielding angle of louver (Deg.)	
1.2.8	Diffusers	
1.2.8.1	Material of diffusers	
1.2.8.2	Thickness of diffuser (mm)	
1.2.9	Reflectors	

1.2.9.1	Material of reflector	
1.2.9.2	Thickness of reflector (mm)	
1.2.10	Lamps	
1.2.10.1	Type	
1.2.10.2	Make	
1.2.10.3	Catalogue No.	
1.2.10.4	Nominal voltage (V)	
1.2.10.5	Maximum permissible supply voltage variation	
	a) Incandescent (+/-) (%)	
	b) Fluorescent (+/-) (%)	
	c) HPSV (+/-) (%)	
1.2.10.6	Luminous output at specified design temp.	
	a) After 100 burning hours (Lumens)	
	b) After 1000 burning hours (Lumens)	
1.2.10.7	Average life expectancy of each type and each wattage of lamp when operated continuously	
1.2.10.8	Burning position of lamp	
1.2.10.9	Color of the light rendered by the lamps	
1.2.11	Lamp holders	
1.2.11.1	Type	
1.2.11.2	Make	
1.2.11.3	Material	
1.2.12	Termination at fixtures suitable for	
	a) Cable/ Conduit entry size	
	b) Size & type of cable	
1.2.13	Earthing terminal	
	a) Material	
	b) Suitable for earthing conductors of size (Sq. mm)	
1.2.14	Internal wiring size (Sq. mm)	
1.2.15	Terminal Blocks	
1.2.15.1	Type	
1.2.15.2	Make	
1.2.15.3	Material	
1.2.15.4	Rating	
1.2.15.5	Suitable for conductor size (Sq. mm)	
1.2.16	Aluminum/ Sheet Steel thickness of	
	a) Housing (SWG)	
	b) Reflector (SWG)	
1.2.16	Wire Guard	
1.2.17.1	Material	
1.2.17.2	Thickness	
1.2.17.3	Painting	
1.2.18	Weight of the fixture (Kg)	
2	LIGHTING SYSTEM INSTALLATION	
2.1	Point Wiring	
2.1.1	Wires/ Cables	

	a) Make	
	b) Galvanised (Yes/ No)	
	c) Minimum size/ gauge	
	d) Applicable standards	
2.1.3	Accessories	
2.1.3.1	Material and gauge for	
	a) Saddles	
	b) Spacers plates	
	c) Fixing hardware	
2.1.3.2	Accessories and hardware galvanized (Yes/ No)	
2.1.3.3	Junction/ Pull Boxes provided with necessary terminals	
	a) Material	
	b) Thickness	
	c) Dimensions	
	d) Galvanised (Yes/No)	
2.1.3.4	Applicable Standards	
2.1.4	Mounting/ Suspension Conduits	
2.1.4.1	Make	
2.1.4.2	Material and gauge for each size	
2.1.4.3	Size (mm)	
2.1.4.4	Galvanised (Yes/No)	
2.1.4.5	Applicable Standards	
2.1.5	Flexible Conduit	
	a) Material	
	b) Size	
	c) Make	
	d) Applicable Standards	
	e) Domestic type (Yes/ No)	
2.2	RECEPTACLES WITH MCB	
2.2.1	Receptacles	
	a) Make	
	b) Applicable Standards	
	c) Ratings as specified (Yes/No)	
2.2.2	MCBs	
	a) Make	
	b) Rating	
	c) Applicable Standards	
2.2.3	Catalogue enclosed (Yes/No)	
2.2.4	Boxes with Sunmica sheet top for housing switches/ receptacles/ MCBs	
	a) Applicable Standards	
	b) Material and gauge of Box	
	c) Galvanise (Yes/No)	
	d) Thickness of Sunmica Sheet	
	e) Earthing terminal provided (Yes/ No)	
	f) Material and thickness of cover sheet	



400kV BILL OF QUANTITY (MAIN EQUIPMENT)

S.L.	ITEM DESCRIPTION	QTY.	SYMBOL	SUPPORT STRUCTURE TYPE
1.	200 MVA, 3 PHASE 50C/S, 400 / 110 /33 KV YNaod11 AUTO TRANSFORMER	04		NA
2.	63 MVAR, 400KV REACTOR WITH GROUNDING TRANSFORMER	01		NA
3	400 KV, 3150 A, 63 KA OUTDOOR SF6 BREAKER 1Φ & 3Φ RECLOSING.	58		PIPE/LATTICE
4.	400 KV, 3150 A, 63 KA OUTDOOR SF6 BREAKER, 1Φ & 3Φ RECLOSING WITH PRE INSERTION RESISTOR (FOR LINES)	03		PIPE/LATTICE
5.	420 KV, 3000A, 63 KA, 5 CORE SINGLE PHASE CURRENT TRANSFORMER	42		LATTICE
6.	390 KV LIGHTNING ARRESTER	21		PIPE
7.	400 KV SINGLE PHASE CVT	12		PIPE
8.	420 KV, 3150 A, 63KA ISOLATOR WITH DOUBLE EARTH SWITCH	07		PIPE/LATTICE
9	420 KV, 3150 A, 63 KA ISOLATOR WITH SINGLE EARTH SWITCH	22		PIPE/LATTICE
10	420 KV BUS EARTH SWITCH (SINGLE PHASE).	06		PIPE
11	420 KV BUS POST INSULATOR	138		PIPE/LATTICE

110kV BILL OF QUANTITY (MAIN EQUIPMENT)

S.L.	ITEM DESCRIPTION	QTY.	SYMBOL	SUPPORT STRUCTURE TYPE
12	132 KV, 2000A, 40 KA OUTDOOR SF6 BREAKER GANG OPERATED 3Φ RECLOSING.	13		PIPE/LATTICE
13	132 KV, 2000 A, 40 KA, 5 CORE SINGLE PHASE CURRENT TRANSFORMER	39		PIPE/LATTICE
14	132 KV, 2000 A, 40 KA ISOLATOR WITH SINGLE EARTH SWITCH	06		PIPE/LATTICE
15	132 KV, 2000 A, 40 KA ISOLATOR WITHOUT EARTH SWITCH	54		PIPE/LATTICE
16	98 KV LIGHTNING ARRESTER	12		PIPE
17	110 KV SINGLE PHASE 1 CORE BUS VT	06		PIPE
18	110 KV 6400pF SINGLE PHASE CVT	08		PIPE
19	110 KV, 0.5 MH, 2000A WAVE TRAP	08		PIPE
20	132KV BUS POST INSULATOR	104		PIPE/LATTICE
21	132KV UNDER HUNG SOLID CORE INSULATOR	57		NA

MINIMUM CLEARANCE (AS PER [illegible]) AND SPACING	400kV	110kV
MINIMUM CLEARANCE PHASE TO PHASE (P-P)	4000	1100
MINIMUM CLEARANCE PHASE TO EARTH (P-E)	3500	1100
PHASE TO PHASE SPACING	7000	2800
PHASE TO EARTH (C.L. OF DUMMY TOWER) SPACING	4750	1100
MINIMUM SECTION CLEARANCES (SC)	6500	4000
TO NEAREST PART OF AN INSULATOR SUPPORTING LIVE CONDUCTOR (NOT AT EARTH POTENTIAL)	2500	2500
HEIGHT OF TUBE / COND. CENTER LINE OF FIRST LEVEL FROM PLINTH LEVEL	8000	4600
CREEPAGE DISTANCE	25 mm/kV	25 mm/kV

NOTE :-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED
2. SYSTEM PARAMETERS

S. NOS.	DESCRIPTION	UNIT		
1.	NOMINAL SYSTEM VOLTAGE	kV	400	110
2.	HIGHEST SYSTEM VOLTAGE	kV	420	132
3.	BASIC IMPULSE LEVEL	kVP	1425	550
4.	POWER FREQUENCY WITHSTAND	kVrms	630	230
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVrms	1050	-
6.	CREEPAGE DISTANCE (MINIMUM)	mm/kV	25	25
7.	SYSTEM FAULT LEVEL	kA/Sec.	63/1	40/3

3. CONDUCTOR DETAIL

S. NOS.	DESCRIPTION	400kV	110kV
1	MAIN BUS	QUAD ACSR MOOSE	QUAD ACSR MOOSE
2	EQUIPMENT INTERCONNECTION	4"IPS AL TUBE/TWIN MOOSE ACSR	3" IPS AL. TUBE
3.	JUMPER /DROPPERS	TWIN MOOSE ACSR	TWIN MOOSE ACSR

4. ALL THE DIMENSIONS ARE IN MM.
5. LOCATION OF LIGHTNING MAST IS SHOWN AS PER DSLP CALCULATION FOR LIGHTNING PROTECTION OF SWITCHYARD.
6. DIMENSIONS AND FENCE CLEARANCES ARE AS PER TANTRANSCO INPUT DRAWINGS.
7. SEPARATE DRAWING SHALL BE REFERRED FOR ERECTION KEY DIAGRAM, TRENCH LAYOUT, EARTHMAT LAYOUT, CONTROL ROOM, TOWER/ BEAM, FIRE FIGHTING SYSTEM, ILLUMINATION SYSTEM, AIR CONDITIONING & VENTILATION SYSTEM, FENCE, GATE, GRAVEL ETC.
8. F.G.L. AS DECIDED AT SITE WITH TANTRANSCO = 99.7M, 100.2M AND 101M AS SHOWN.
9. THE HEIGHT OF FENCE AND GATE WOULD BE SHOWN IN THE CORRESPONDING CIVIL DRAWING
10. BOUNDARY WALL LAYOUT AND COORDINATES ARE SHOWN AS PER SURVEY REPORT DRAWING.
11. WHEREVER SPACE IS NOT AVAILABLE ROAD REQUIREMENT SHALL BE FINALISED AT SITE.
12. 110KV UNDERHUNG INSULATORS SHALL BE SUSPENDED FROM TOP ROD.
13. LOCATION OF DG SET AND DISTRIBUTION TRANSFORMER MAY CHANGE TO SUIT SITE CONDITION.
14. COORDINATES OF TOWER / BUILDING IN LAYOUT ARE TO BE REFERRED AT SITE IN CONJUNCTIONS WITH DIMENSIONS MARKED.

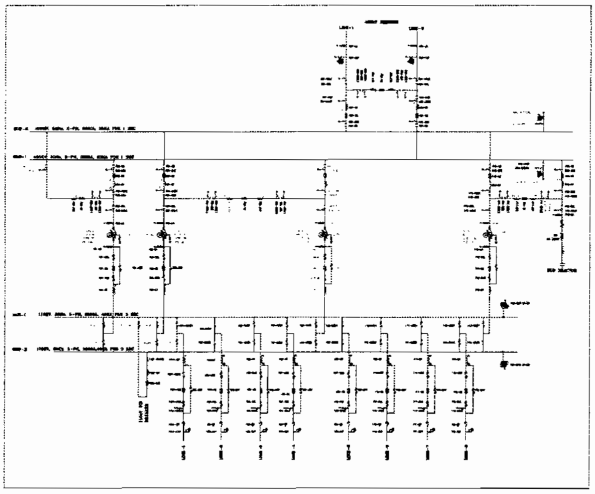
BILL OF QUANTITY STRING INSULATOR

Sl. No.	ITEM DESCRIPTION	Quantity (SETS)
1	400 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x25 discs with tension clamp, Corona Ring and Turn Buckle set suitable for Quade ACSR Moose Conductor (sub conductor spacing 450mm).	36
2	400 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x25 discs with tension clamp, Corona Ring and without Turn Buckle set suitable for Quade ACSR Moose Conductor (sub conductor spacing 450mm).	36
3	400 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x25 discs with tension clamp, Corona Ring and Turn Buckle set suitable for Twin ACSR Moose Conductor (sub conductor spacing 450mm).	45
4	400 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x25 discs with tension clamp, Corona Ring and without Turn Buckle set suitable for Twin ACSR Moose Conductor (sub conductor spacing 450mm).	45
5	400 kV Single Suspension String insulator, with 25 discs, Corona Ring, drop type clamp suitable for Twin ACSR Moose Conductor (sub conductor spacing 450mm).	51
6	110 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x8 discs with tension clamp and Turn Buckle set suitable for Quade ACSR Moose Conductor (sub conductor spacing 225mm).	45
7	110 kV Double Tension String insulator with double anchoring point(anchor spacing 450mm), 2x8 discs with tension clamp and without Turn Buckle set suitable for Quade ACSR Moose Conductor (sub conductor spacing 225mm).	45
8	110 kV Double Tension String insulator with Double anchoring point, 2x8 discs with tension clamp and Turn Buckle set suitable for Twin ACSR Moose Conductor (sub conductor spacing 225mm).	48
9	110 kV Double Tension String insulator with Double anchoring point, 2x8 discs with tension clamp and without Turn Buckle set suitable for Twin ACSR Moose Conductor (sub conductor spacing 225mm).	48
10	Both side Bolted type Tension Clamp for mid span isolation with 3Discs suitable for Twin Moose Conductor (For 110kV ICT and Line Bays)	36
11	Single Suspension String insulator, with 2 discs, drop type clamp suitable for Twin ACSR Moose Conductor (sub conductor spacing 225mm). (for 110KV Lines)	6

LEGENDS:-

------- BHEL SCOPE

— - — NOT IN BHEL SCOPE



SINGLE LINE DIAGRAM

ADDITIONAL INFORMATION
W.O.No.

STATUS OF DRAWING
DISTRIBUTION OF PRINTS

TAMILNADU TRANSMISSION CORP. LTD.

400/110kV SUBSTATION
THAPPAGUNDU

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

SCALE

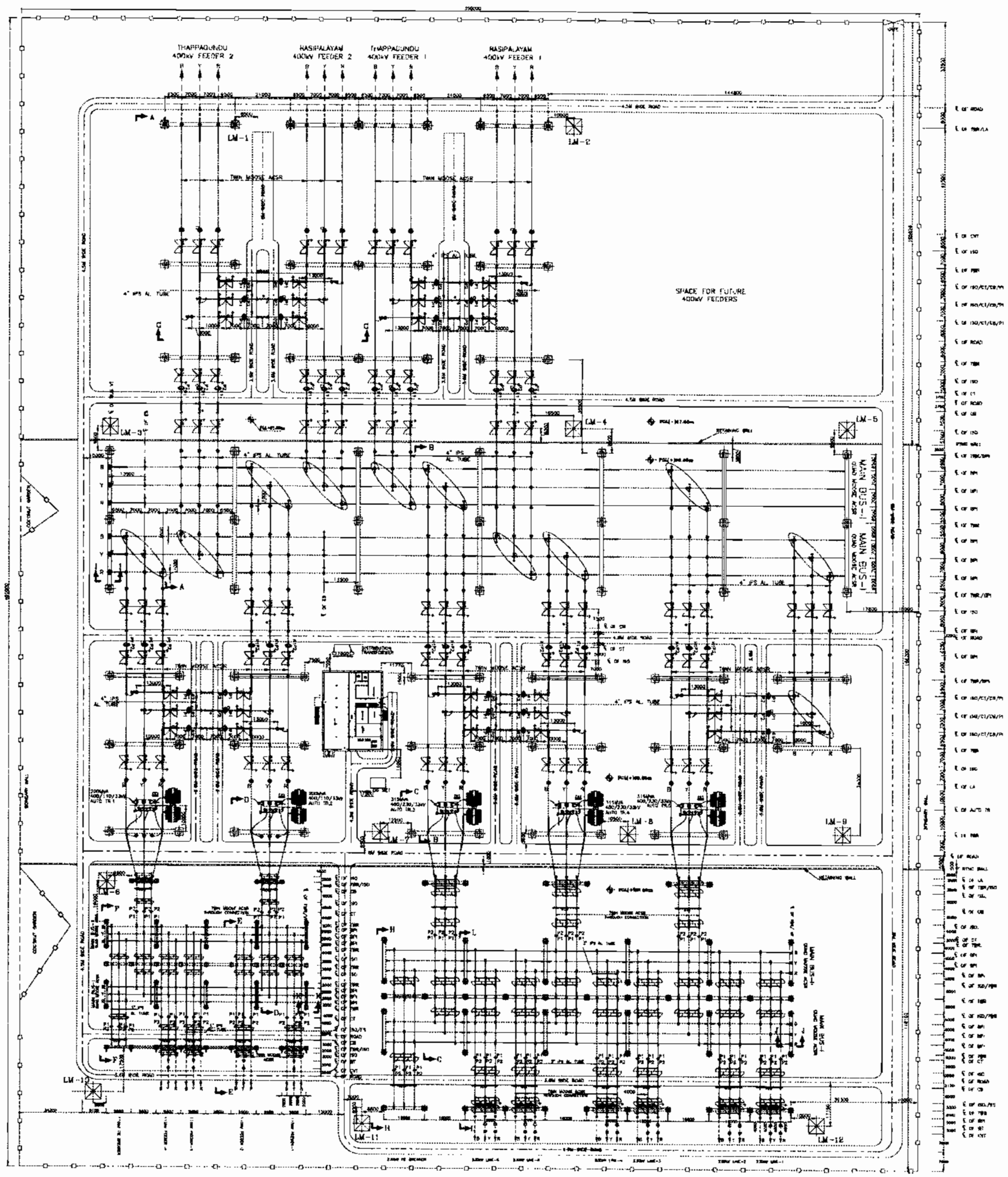
REVISED IN LINE WITH TANTRANSCO COMMENT DATED [illegible] AND [illegible] AS SHOWN.

TITLE
LAYOUT PLAN FOR 400/110kV THAPPAGUNDU SUBSTATION

DRAWING NO.
TB-0-353-316-002

REV.
02

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)



400kV BILL OF QUANTITY (MAIN EQUIPMENT)

S.L	ITEM DESCRIPTION	SYMBOL	QTY	SPARE QTY	SUPPORT STRUCTURE TYPE
1	315 MVA, 3 PHASE 50Hz, 400 /230/33 KV YNaod11, AUTO TRANSFORMER		03	--	NA
2	200 MVA, 3 PHASE 50Hz 400/110/33 KV YNaod11, AUTO TRANSFORMER		02	--	NA
3	400 KV, 3150 A, 63KA/1S OUTDOOR SF 6 BREAKER 1Φ & 3Φ RECLOSING WITHOUT PRE INSERTION RESISTOR		06	--	PIPE/LATTICE
4.	400 KV, 3150 A, 63KA/1S OUTDOOR SF 6 BREAKER 1Φ & 3Φ RECLOSING WITH PRE INSERTION RESISTOR		06	01	PIPE/LATTICE
5.	420 KV, 3000A, 63KA/1S, 5 CORE SINGLE PHASE CURRENT TRANSFORMER		54	02	LATTICE
6.	390 KV LIGHTNING ARRESTER		27	02	PIPE
7.	400 KV 4400pF SINGLE PHASE CVT		18	02	PIPE
8.	420 KV, 3150 A, 63KA/1S HCB ISOLATOR WITH DOUBLE EARTH SWITCH		09	01	PIPE/LATTICE
9.	420 KV, 3150 A, 63KA/1S HCB ISOLATOR WITH SINGLE EARTH SWITCH		26	--	PIPE/LATTICE
10	420 KV BUS EARTH SWITCH (SINGLE PHASE).		06	--	PIPE/LATTICE
11	420 KV BUS POST INSULATOR		187		PIPE/LATTICE

230kV BILL OF QUANTITY (MAIN EQUIPMENT)

S.L	ITEM DESCRIPTION	SYMBOL	QTY.	SPARE QTY.	SUPPORT STRUCTURE TYPE
1	245 KV, 2000A, 40KA/3S OUTDOOR SF6 BREAKER 1Φ & 3Φ RECLOSING.		10	----	PIPE/LATTICE
2.	245 KV, 2000 A, 40KA/3S, 5 CORE SINGLE PHASE CURRENT TRANSFORMER		30	--	PIPE/LATTICE
3	245 KV, 2000 A, 40KA/3S HCB ISOLATOR WITH SINGLE EARTH SWITCH		06	--	PIPE/LATTICE
4.	245 KV, 2000 A, 40KA/3S HCB ISOLATOR WITHOUT EARTH SWITCH		41	--	PIPE/LATTICE
5.	216 KV LIGHTNING ARRESTER		06	--	PIPE
6.	230 KV SINGLE PHASE 3 CORE BUS VT		06	--	PIPE
7.	230 KV 4400pF SINGLE PHASE CVT		12	--	PIPE
8.	230 KV, 0.5 MH, 2000A WAVE TRAP		12	--	PIPE
9.	230kV BUS POST INSULATOR		118	--	PIPE/LATTICE
10	230 kV UNDER HUNG SOLID CORE INSULATOR		39	--	NA

110kV BILL OF QUANTITY (MAIN EQUIPMENT)

S.L	ITEM DESCRIPTION	SYMBOL	QTY.	SPARE QTY	SUPPORT STRUCTURE TYPE
1	132 KV, 2000A, 40KA/3S OUTDOOR SF6 BREAKER GANG OPERATED 3Φ RECLOSING.		07	--	PIPE/LATTICE
2.	132 KV, 2000 A, 40KA/3S, 5 CORE SINGLE PHASE CURRENT TRANSFORMER		21	--	PIPE/LATTICE
3.	132 KV, 2000 A, 40KA/3S HCB ISOLATOR WITH SINGLE EARTH SWITCH		04	--	PIPE/LATTICE
4.	132 KV, 2000 A, 40KA/3S HCB ISOLATOR WITHOUT EARTH SWITCH		28	--	PIPE/LATTICE
5.	96 KV LIGHTNING ARRESTER		06	--	PIPE
6	110 KV SINGLE PHASE 3 CORE BUS VT		08	--	PIPE
7.	110 KV 6600pF SINGLE PHASE CVT		04	--	PIPE
8	110 KV, 0.5 MH, 2000A WAVE TRAP		04	--	PIPE
9	132kV BUS POST INSULATOR		56		PIPE/LATTICE
10	132 kV UNDER HUNG SOLID CORE INSULATOR		27		NA

MINIMUM CLEARANCE (AS PER IS AND IE RULES) AND SPACING	400kV	230kV	110kV
MINIMUM CLEARANCE PHASE TO PHASE (P-P)	4000	2100	1300
MINIMUM CLEARANCE PHASE TO EARTH (P-E)	3500	2100	1100
PHASE TO PHASE SPACING	7000	4000	3000
PHASE TO EARTH SPACING	6750	2100	1100
MINIMUM SECTION CLEARANCES (SC)	6500	5000	4000
TO NEAREST PART OF AN INSULATOR SUPPORTING LIVE CONDUCTOR(NOT AT EARTH POTENTIAL)	6500	5500	3300
HEIGHT OF EARL / COND. CENTER LINE OF FIRST LEVEL FROM PLINTH LEVEL	8000	5500	4600
CREEPAGE DISTANCE	25 mm/kV	25 mm/kV	25 mm/kV

BOQ FOR STRING INSULATOR & HARDWARE

Sl. No.	ITEM DESCRIPTION	Quantity (SETS)
[illegible]	[illegible]	[illegible]

NOTE :-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED
2. SYSTEM PARAMETERS

S. NO.	DESCRIPTION	UNIT			
1.	NOMINAL SYSTEM VOLTAGE	kV	400	230	110
2	HIGHEST SYSTEM VOLTAGE	kV	420	245	132
3.	BASIC IMPULSE LEVEL	kVP	1425	1050	550
4	POWER FREQUENCY WITHSTAND	kVrms	630	460	230
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVpeak	1050	-	-
6	CREEPAGE DISTANCE (MINIMUM)	mm/kV	25	25	25
7	SYSTEM FAULT LEVEL	kA/Sec	63/1	40/3	40/3

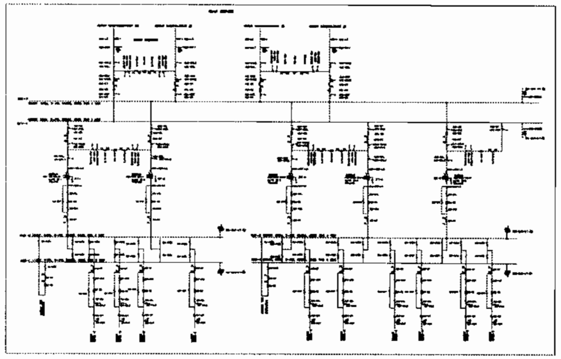
3. CONDUCTOR DETAIL

S. NO.	DESCRIPTION	400kV	230kV	110kV
1	MAIN BUS AND BUS COUPLER BAY	QUAD ACSR MOOSE	QUAD ACSR MOOSE	QUAD ACSR MOOSE
2.	EQUIPMENT INTERCONNECTION	4"IPS AL TUBE/TWIN MOOSE ACSR	3" IPS AL TUBE / TWIN MOOSE ACSR	3" IPS AL TUBE / TWIN MOOSE ACSR
3	JACK BUS/DROPPERS	TWIN MOOSE ACSR	TWIN MOOSE ACSR	TWIN MOOSE ACSR

4. ALL THE DIMENSIONS ARE IN MM.
5. LIGHTNING PROTECTION OF SWITCHYARD SHALL BE DONE BY LIGHTNING MAST AND LOCATION OF LM SHALL BE AS PER DSLP CALCULATION.
6. DIMENSIONS AND HENCE CLEARANCES ARE AS PER TANTRANSCO INPUT DRAWINGS.
7. SEPARATE DRAWING SHALL BE REFERRED FOR ERECTION KEY DIAGRAM, TRENCH LAYOUT, EARTHMAT LAYOUT, CONTROL ROOM, TOWER/ BEAM, FIRE FIGHTING SYSTEM, ILLUMINATION SYSTEM, AIR CONDITIONING & VENTILATION SYSTEM, FENCE, GATE, GRAVEL ETC.
8. F.G.L. AS DECIDED AT SITE WITH TANTRANSCO = 95.85M, 96.85M AND 97.85M AS SHOWN.
9. THE HEIGHT OF FENCE AND GATE WOULD BE SHOWN IN THE CORRESPONDING CIVIL DRAWING.
10. STATIC TENSION ON THE BUSES AND SHIELD WIRE SHALL BE SHOWN IN THE STRUCTURE LOADING DIAGRAM SEPARATELY.
11. TANTRANSCO TO GIVE THE COORDINATES OF FENCE / BOUNDARY WALL AND DIMENSIONS BETWEEN FENCE/BOUNDARY WALL AND SWITCHYARD.
12. WHEREVER SPACE IS NOT AVAILABLE ROAD REQUIREMENT SHALL BE FINALISED AT SITE
13. UNDERHUNG INSULATORS SHALL BE SUSPENDED FROM TOP PCD.
14. LOCATION OF DG SET AND DISTRIBUTION TRANSFORMER MAY CHANGE TO SUIT SITE CONDITION.

LEGENDS:-

- BHEL SCOPE
- NOT IN BHEL SCOPE
- BOUNDARY WALL



SINGLE LINE DIAGRAM

BHEL
RELEASED FOR CONSTRUCTION DESTROY EARLIER PRINTS
Transmission Projects Engineering Management

ADDITIONAL INFORMATION
STATUS OF DRAWING
DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TAMILNADU TRANSMISSION CORP. LTD. 400/230-110kV SUBSTATION ANIKADAVU

NAME OF CONSULTANT

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

SCALE

REV. 03 — REVISED IN LINE WITH TANTRANSCO COMMENT DATED 08.10.15, 24.10.15 AND 08.11.15. AS SHOWN.

TITLE: LAYOUT PLAN 400/230-110kV SUBSTATION ANIKADAVU

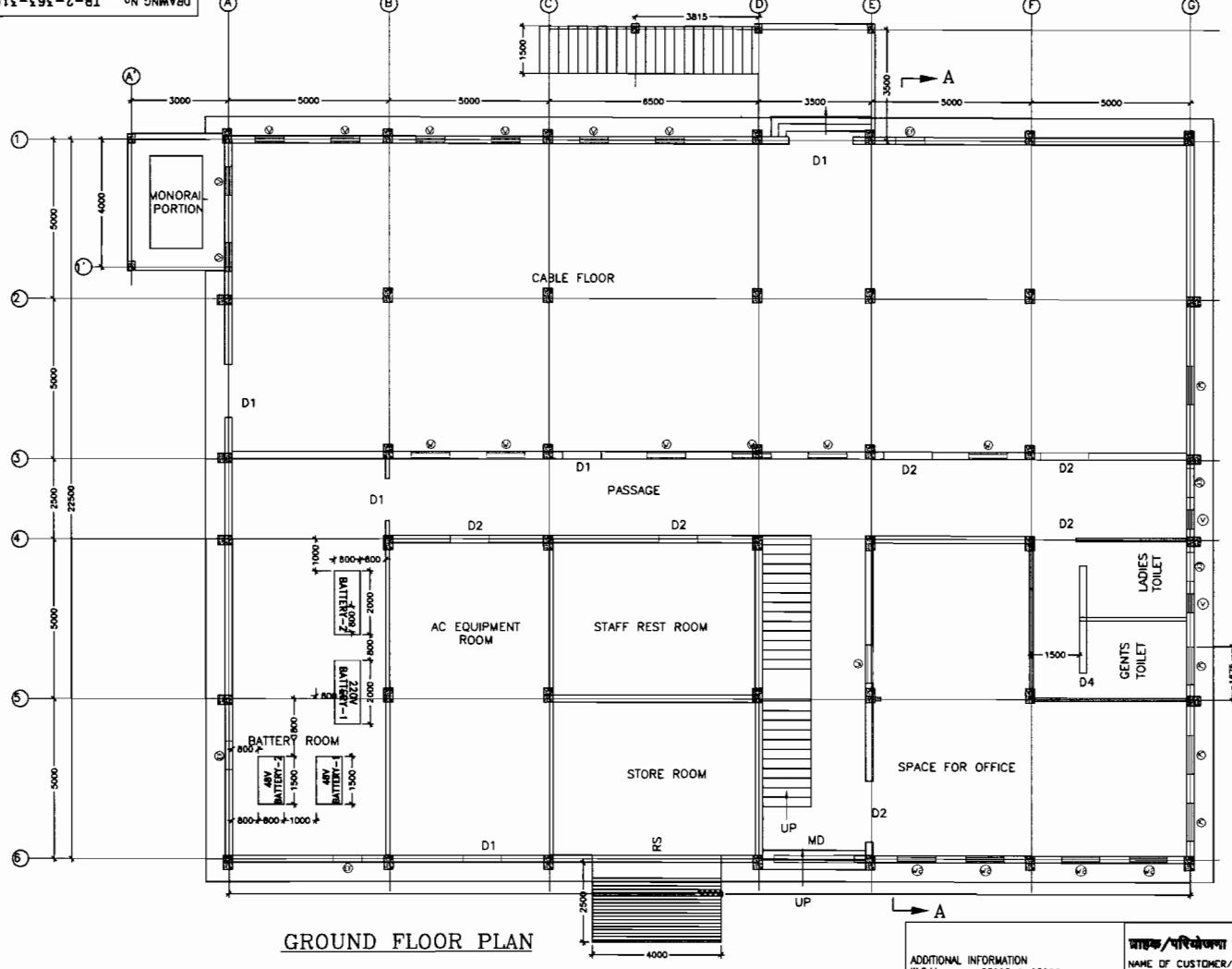
DRAWING NO. TB-0-384-316-008 REV. 03

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-2-363-316-005

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
It must not be used directly or indirectly in any way detrimental to the interest of the company.

COMPUTER DRG. PATH NAME : w4/-



GROUND FLOOR PLAN

INVENTORY No.	SIGN. & DATE	REF. DRG. No.	

ADDITIONAL INFORMATION
W.O.No. 83003 & 83006

STATUS OF DRAWING -

DISTRIBUTION OF PRINTS

REV.	DATE	ALTERED / CHECKED / APPROVED
01	17.12.13	ALTERED RKP
		CHECKED
		APPROVED
ZONE		REVISED IN LINE WITH DISCUSSION WITH TANTRANSCO.

ग्राहक/परियोजना का नाम
NAME OF CUSTOMER/PROJECT

TAMILNADU TRANSMISSION CORPORATION LTD.
400/110kV SUBSTATION THAPPAGUNDU AND
400/230-110kV SUBSTATION ANIKADAVU

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता /SIGN.	दि./DATE
बनाया DRAWN	RKP		03.12.13
जाँचा CHECKED	SKS/VK		
स्वीकृत APPROVED	RS		

विभाग DEPT. TBEM
कोड CODE 422
उत्पाद / SCALE N/A
कार्ड कोड CARD CODE
PGCIL ORG. NO. - 00

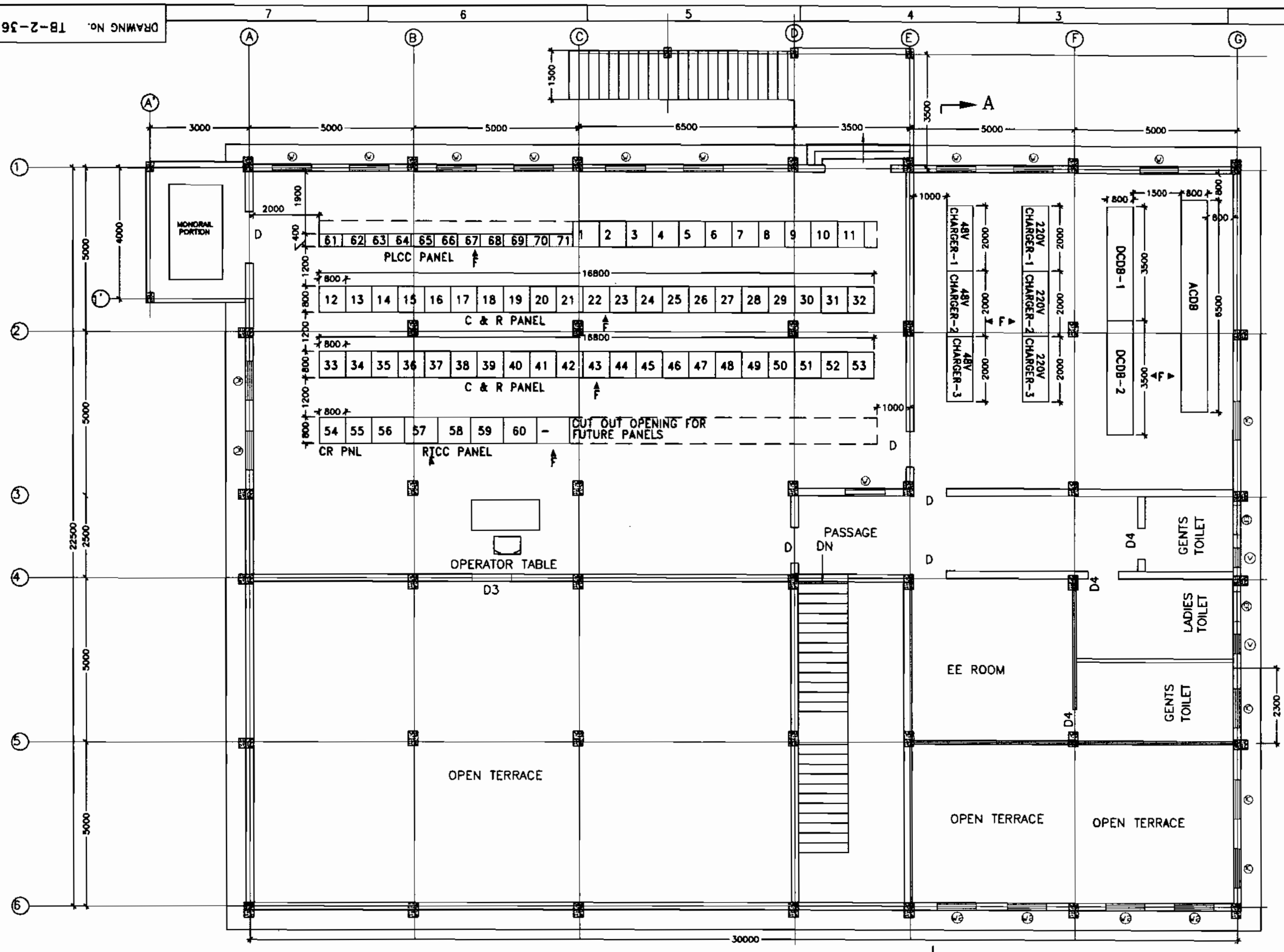
शीर्षक/TITLE
CONTROL ROOM LAYOUT FOR THAPPAGUNDU AND ANIKADAVU SUBSTATION

ड्राईंग सं./DRAWING NO. TB-2-363-316-005
पुनः/REV. 01
पृष्ठ सं./SHEET No. 1 अगला पृष्ठ/NEXT SHEET 2

A2 SIZE

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-2-363-316-005



FIRST FLOOR PLAN

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
It must not be used directly or indirectly in anyway detrimental to the interest of the company.

COMPUTER DRG. PATH NAME : sd/-

INVENTORY No. | SIGN. & DATE | REF. DRG. No.

ADDITIONAL INFORMATION
W.O.No. 83003 & 83006

STATUS OF DRAWING -

DISTRIBUTION OF PRINTS

REV. 01 | DATE 17.12.13 | ALTERED RKP | CHECKED | APPROVED

ZONE | REVISED IN LINE WITH DISCUSSION WITH TANTRANSCO.

ग्राहक/परियोजना का नाम
NAME OF CUSTOMER/PROJECT

TAMILNADU TRANSMISSION CORPORATION LTD.
400/110kV SUBSTATION THAPPAGUNDU AND
400/230-110kV SUBSTATION ANIKADAVU

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता./SIGN.	दि./DATE
DRAWN	RKP		03.12.13
CHECKED	SKS/VK		
APPROVED	RS		

विभाग DEPT. TBEM
कोड CODE 422

अनुपात / SCALE N/A

कार्ड कोड CARD CODE

PGCIL DRG. NO. -

00

शीर्षक/TITLE
CONTROL ROOM PANEL LAYOUT FOR
THAPPAGUNDU AND ANIKADAVU SUBSTATION

ड्राइंग.क्र./DRAWING NO.
TB-2-363-316-005

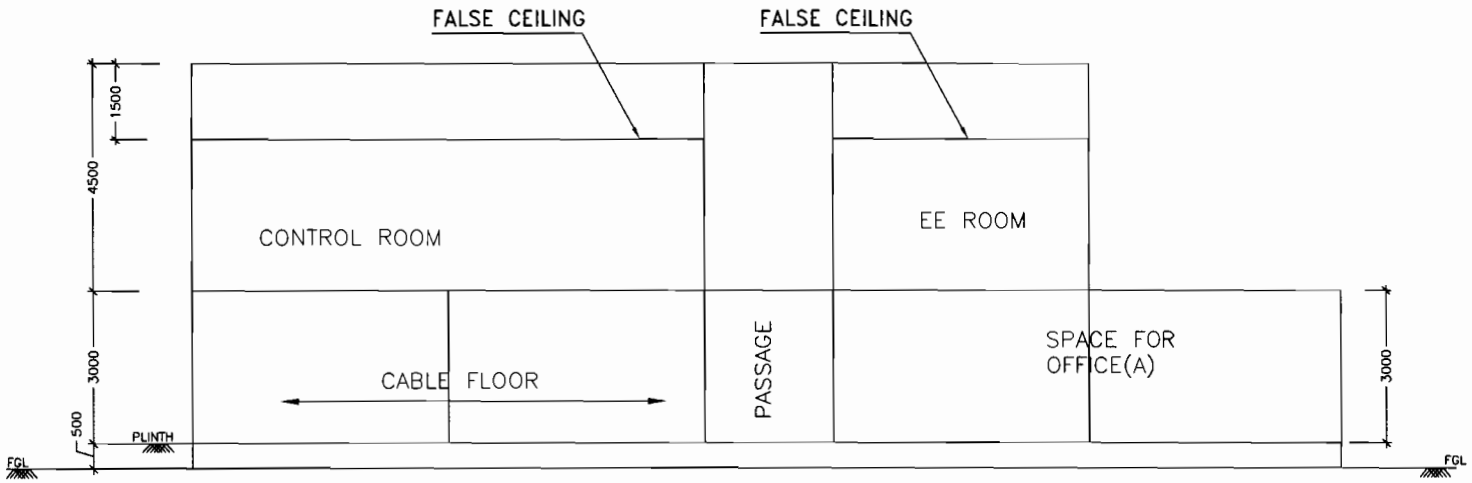
पुन:/REV. 01

पृष्ठ क्र./SHEET No. 2 | अगला पृष्ठ/NEXT SHEET 3

A2 SIZE

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-2-363-316-005



SECTION A–A
ELEVATION

NOTES:–

1. FALSE CEILING SHALL BE PROVIDED IN AIR CONDITIONED AREA OF CONTROL BUILDING.
2. ELEVATION SHOWN ABOVE IS FOR INDICATION OF HEIGHTS ONLY.
   ALL OTHER DETAILS SHALL BE AS CIVIL / ARCHITECTURAL DRAWINGS.
3. HEIGHTS SHOWN IN ELEVATION ARE CLEAR HEIGHTS.
4. CONTROL ROOM AND EE ROOM SHALL BE AIR CONDITIONED ROOM.
5. SIZES OF PANELS / EQUIPMENTS ARE TENTATIVE AND MAY CHANGE AS FINAL OGA DRAWINGS OF EQUIPMENTS.
6. DOOR, WINDOW AND OTHER CIVIL DETAILS SHALL BE AS PER CIVIL / ARCHITECTURAL DRAWING.
7. NUMBERS OF PANELS ARE TENTATIVE AND MAY CHANGE AS PER FINAL REQUIREMENT.

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
It must not be used directly or indirectly in anyway detrimental to the interest of the company.

COMPUTER DRG. PATH NAME :

INVENTORY No.	SIGN. & DATE	REF. DRG. No.
	A	

ADDITIONAL INFORMATION
W.O.No. 83003 & 83006

STATUS OF DRAWING –

DISTRIBUTION OF PRINTS

REV.	DATE	ALTERED / CHECKED / APPROVED
ZONE		

REV.	DATE	ALTERED / CHECKED / APPROVED
ZONE		

REV.	DATE	ALTERED RKP / CHECKED / APPROVED
01	17.12.13	
ZONE		REVISED IN LINE WITH DISCUSSION WITH TANTRANSCO.

ग्राहक/परियोजना का नाम
NAME OF CUSTOMER/PROJECT

TAMILNADU TRANSMISSION CORPORATION LTD.
400/110kV SUBSTATION THAPPAGUNDU AND
400/230–110kV SUBSTATION ANIKADAVU

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	RKP		03.12.13
जाँचा CHECKED	SKS/VK		
स्वीकृत APPROVED	RS		

विभाग DEPT. TBEM | कोड CODE 422 | अनुपात / SCALE N/A | कार्ड कोड CARD CODE

PGCIL DRG. NO. – 01

शीर्षक/TITLE
CONTROL ROOM ELEVATION FOR THAPPAGUNDU AND ANIKADAVU SUBSTATION

ड्रा.सं./DRAWING NO. TB-2-363-316-005 | पुनः/REV. 01

पृष्ठ सं./SHEET No. 3 | अगला पृष्ठ/NEXT SHEET –

A2 SIZE