BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

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TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	MVK	MVK	AS
TITLE				SIGN			
ILLUMINATION SYSTEM				DATE	21.07.16	21.07.16	21.07.16
				GROUP	TBEM		

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD
PROJECTS	**400 kV Switchyard at 1X800MW Kothagudem TPS, Stage-VII, Unit#12** **400 kV Switchyard at Bhadradri TPS, Units 1 to 4 (4x270MW)**

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Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
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SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0.1 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 attached Annexure-A.

1.0.2 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.

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

1.0.4 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.

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

1.0.6 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.

1.0.7 It is the responsibility of the successful Bidder to obtain necessary approval/clearance from statutory organizations wherever applicable for the equipment/systems under the scope specified.

Name of the Customer	:	Telangana State Power Generation Corp. Ltd.
Name of the Project1	:	400 kV Switchyard at 1X800MW Kothagudem TPS, Stage-VII, Unit#12
Consultant	:	Development Consultants Private Limited
Name of the Project2	:	400 kV Switchyard at Bhadradri TPS, Units 1 to 4 (4x270MW)
Consultant	:	Desein Private Limited

Refer Section-3 for Project Details and General Specifications.

1.1 ILLUMINATION & SMALL POWER SYSTEM REQUIREMENT FOR VARIOUS AREAS

The Illumination system shall be provided for the following areas:

- Switchyard Area
- Switchyard Control Room Building
- Street lighting

The roads & the area of the outdoor switchyard to be illuminated are as marked on the enclosed drawings under Annexure-3. Other relevant drawings are also enclosed under Annexure-3.

1.2 DESIGN CRITERIA

The illumination System for outdoor Switchyard shall comprise of:

- Normal AC lighting
- Emergency AC Lighting

The illumination System for Control room building shall comprise of:

- Normal AC Lighting
- Emergency AC Lighting
- Emergency DC Lighting

20% of lighting fixtures shall be connected on AC emergency lighting.

In an area, the lighting fixtures shall be arranged in different phase / LPs such that even in case one lighting panel is faulty complete lighting is not affected. In case of any location the lighting shall be arranged from all three phases for normal as well as normal/emergency supply.

Detailed lighting design calculations considering the number of fittings as per BOQ shall be submitted by contractor for approval of BHEL / ultimate customer.

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 switchyard etc shall be submitted for approval.

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

Refer Section-1, Annexure-2 for further details.

1.3 SCOPE OF SUPPLIES & SERVICES

1.3.1 SCOPE OF SUPPLY MATERIAL & ERECTION MATERIAL

a) The main items to be furnished for Substation under this contract are detailed in Bill of Quantity (Annexure-1/Kothagudem S/s & Bhadradri S/s) and shall be read in conjunction with other clauses of this specification.

b) All associated items, though not specifically mentioned but required to meet specification and for safe and satisfactory operation of equipment/ system will also be treated as included and the same shall be supplied at NO EXTRA COST to Purchaser.

c) Further, in case any type of luminaries/ panels etc not included below but are required to meet the technical specification shall be specifically brought out in the offer/shall be supplied.

d) 415V ACDB & 220V DCDB boards are being supplied and erected by the owner. lllumination contractor will terminate the cables in these panels.

e) Supply of necessary cable for consumption within the street light/lighting pole assembly, such as pole mounted JB to respective light fittings, battery etc shall be in Contractor's Scope.

f) LIGHTING JUNCTION BOX - The Contractor shall supply and install junction boxes complete with terminals as required. The brackets, bolts, nuts, screws etc required for erection are also included in the scope of the Contractor.

g) Where cables are to be laid in GI Pipe, excavation, filling etc. deemed to be included in erection cost quoted.

h) Buried cable trench can be used in outdoor area. Contractor shall construct the cable trenches required for directly buried cables. The scope of work shall include excavation, preparation of sand bedding, soil cover, supply and installation of brick or concrete protective covers, back filling and ramming, supply and installation of route markers and joint markers.

i) Commissioning Spares :
Contractor shall take commissioning spares required to site to commission the system without delay. The Contractor shall finalize the list with BHEL during detailed engineering stage.

1.3.2 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) 2core x 2.5 sq.mm (HRPVC/ Cu.)
2) 4 core x 16 sq.mm (XLPE / Al.)
3) 4 core x 35 sq.mm (XLPE / Al.)

4) 3.5 core x 70 sq.mm (XLPE / Al.)
5) 3.5 core x 95 sq.mm (XLPE / Al.)
6) 3.5 core x 300 sq.mm (XLPE / Al.)
7) 1 core x 630 sq.mm (XLPE/ Al.)

40mm Dia. MS Rod

Earthing Flats: Galvanised Earthing Flat shall be available with the purchaser. Bidder shall estimate the GI Flats for successful completion of the full scope of works and furnish the quantity as an annexure to the un-priced 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 75x10mm and 50x6mm GI Flats.

Erection, testing and commissioning of these cables, MS Rod & earth strip will be in bidder's scope. Supply of all other items such as cables, wires, steel wire, lugs, Cable glands, earthing material etc required to complete the works are in bidder's scope.

1.3.3 SCOPE OF SERVICES

The bidder shall quote for ETC, civil works, cabling including termination & earthing against each item as applicable. The list is attached as Annexure-1 (BOQ).

1.3.3.1 Erection, Testing & Commissioning

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

b) 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.

c) Conducting lux level measurement as per approved designs to the satisfaction of Owner/ purchaser.

d) Laying and termination of power and control cables from ACDB/DCDB to MLDB/ELDB, MLDB/ELDB to Lighting Panels, Lighting Panels to JB and JB to fittings etc for the equipment under the scope of this specification.

e) All material and consumables required for erection work shall be in Contractor's scope. Erection material shall cover, but not be limited to, Clamps etc for Luminaries, Connections between Junction Boxes and Luminaries in outdoor area, All cable glands, 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.

f) Earthing of all electrical equipment as per requirement is in Contractor's scope.

g) Contractor shall arrange all machinery tools & tackles, instruments and consumables required for erection, testing and commissioning of the system.

h) Contractor shall ensure that sufficient quantity of commissioning spares is made available for timely completion of commissioning of the system. The Contractor shall finalize the list with BHEL during detailed engineering stage. The unused commissioning spares shall be returnable to the Bidder.

1.3.3.2 Civil Works

a. Civil works such as foundation for Street Lighting Poles, 30m Lighting Mast, Lighting Panels etc. shall be done by the bidder. The rates for these civil works shall be deemed included in the erection rates of respective items.

b. Wherever cable is laid in buried trench, the excavation and filling shall be done by bidder free of cost.

c. 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.

d. 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.

e. 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.

1.3.4 Scope of work for Air Conditioning & Ventilation System and Fire-fighting in Control room (to be done by Illumination contractor)

Bidder shall supply and lay conduits in Control Room Building for fire detection panels, Air conditioning & Ventilation system.

It shall be bidders' responsibility to supply and provide wiring & single supply points for Split AC units. Typical power supply distribution has been shown in Single Line Diagram for LT AC & DC System (Refer Annexure-3). Tentative no. of 2 TR AC units in Control room and provisional AC Power supply point requirement are as follows:

Sl no.	Name of the Area	No. x Capacity of AC Units	Details of Power supply point required.
1.	Conference room	7 x 2 TR	7 Nos. DPMCB (32 A)
2.	Office room - 1	2 x 2 TR	2 Nos. DPMCB (32 A)
3.	Office room - 2	2 x 2 TR	2 Nos. DPMCB (32 A)
4.	Electronic Test Lab	2 x 2 TR	2 Nos. DPMCB (32 A)

5.	Staff room	3 x 2 TR	3 Nos. DPMCB (32 A)

There shall be single supply point required for each 2 TR split AC inside control building. Power supply points to split AC units through DPMCB (32A) shall be provided in individual rooms as per the above distribution.

Further, for Ventilation System, it shall be the responsibility of bidder to provide power supply points in each of the rooms to feed small exhaust fans in these rooms. Ampere rating of power supply points to ventilation fans to be ensured is listed as below:

Sl. No.	Rooms	Power supply requirement
1	Store room	1 no, 20A 1-ph. MCB with receptacle
2	Record room	1 no, 20A 1-ph. MCB with receptacle
3	Gents Toilet	1 no. 20A,1-ph. MCB with receptacle
4	Ladies Toilet	1 no. 20A, 1-ph. MCB with receptacle
5	Pantry	1 no. 20A,1-ph. MCB with receptacle

1.3.5 Scope of work for DC Panels in Switchyard AC Kiosk (to be done by Illumination contractor)

Bidder shall supply and erect wall mounted DC distribution Panels in Switchyard AC Kiosks for distribution of DC Supply to Switchyard equipment. However, Cabling from Control Room to DC Panel in Kiosk shall be done by BHEL.

1.4 TYPE TESTS

The type test reports shall not be more than ten (10) years prior from the date of LOA (i.e. 27.12.2014 for Kothagudem S/s & 21.03.2015 for Bhadradri S/s). If any or all test reports are more than ten years old or are not valid then type tests shall be conducted free of charge.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design / manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification on any/all additional type tests not carried out, same shall be carried out without any additional cost implication to the Purchaser.

All type tests as per relevant standards shall be submitted for each type rating of lighting fixtures and lamps with adequate details/drawings to establish equivalence with the offered type.

1.5 QUALITY PLAN

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international

standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval. It will be the bidder's responsibility to get its QP approved from the ultimate customer.

1.6 HANDING & TAKING OVER

It is the responsibility of the Contractor to run and maintain the system supplied by them for a period of 3 months and subsequently hand over the same to BHEL/owner. Contractor shall assist BHEL to hand over the system supplied by them to owner.

1.8 TITLE BLOCK

The drawings / documents submitted shall be project and product specific and shall incorporate following details:

A) Kothagudem TPS

a) Project Name : 400 kV Switchyard at 1X800MW Kothagudem TPS, Stage-VII, Unit#12
b) Customer Name : Telangana State Power Generation Corp. Ltd.
c) Consultant Name : Development Consultants Private Limited
d) Contractor : BHEL
e) Customer LOA no.: CEE/111/KTPS-VII(1X800MW)/D.No.150/14, Dt.: 27/12/2014

B) Bhadradri TPS

a) Project Name : 400 kV Switchyard at Bhadradri TPS, Units 1 to 4 (4x270MW)
b) Customer Name : Telangana State Power Generation Corp. Ltd.
c) Consultant Name : Desein Private Limited
d) Contractor : BHEL
e) Customer LOA no.: CEE/SE-IV/BHADRADRI TPS (4X270MW)/D.No.72/15, Dt.: 21/03/2015

1.9 LIST OF DRAWINGS ENCLOSED (Refer Annexure-3)

A. <u>Drawings for Kothagudem Project:</u>

Sl No	Drwg. No.	Description
1	TB-0-377-510-002 (2 Sheets)	400kV Switchyard Layout Plan & Sectional Elevation
2	TB-0-377-316-005	Cable Trench layout for 400kV Switchyard
3	TB-0-377-510-007	Single Line Diagram for LT AC & DC System
4	TB-3-377-316-008 (3 Sheets)	Conceptual 400kV Switchyard Control Room Building Layout

B. Drawings for Bhadradri Project:

Sl No	Drwg. No.	Description
1	TB-0-380-510-002 (2 Sheets)	400kV Switchyard Layout Plan & Sectional Elevation
2	TB-0-380-316-004	Cable Trench layout for 400kV Switchyard
3	TB-0-380-510-007	Single Line Diagram for LT AC & DC System
4	TB-3-380-316-008 (3 Sheets)	Conceptual 400kV Switchyard Control Room Building Layout

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ANNEXURE-A

It is confirmed that there are no deviations and the offer is in full compliance with the specification. It is also confirmed that there are no deviations in any other form such as comments, variations and/ or exceptions. Further it is confirmed that at all drawings / data sheets/QP/ type tests reports shall be submitted to BHEL for organizing approval of ultimate customer. Also, furnishing of all relevant information / repetition of type tests (if required for meeting the specification requirement) shall be carried out by us at no extra cost to BHEL & without affecting delivery requirements.

Signature of the authorized representative of Bidder
Name _____
Designation _____
Place _____
Date _____

Company seal

A. 400 kV Switchyard at Bhadradri TPS			
Sl. No.	DESCRIPTION	UNIT	BHAD (Qty.)
1	**Supply** of Main Lighting Distribution Board (MLDB) comprising 415V, 400A, 3-Ph, 4-wire bus and two (2) no. Lighting transformer: 250kVA with Two (2) No. Incomer 400A TPN MCCB, One (1) No. Bus Coupler, Ougoing feeders 6 No. 100A TPN MCCB on each Bus Section (Inclusive of CT, Voltmeter, Ammeter, Contactor with timer, indicating lamps etc)	Nos.	1
2	**ETC** of Main Lighting Distribution Board (MLDB) comprising 415V, 400A, 3-Ph, 4-wire bus and two (2) no. Lighting transformer: 250kVA with Two (2) No. Incomer 400A TPN MCCB, One (1) No. Bus Coupler, Ougoing feeders 6 No. 100A TPN MCCB on each Bus Section (Inclusive of CT, Voltmeter, Ammeter, Contactor with timer, indicating lamps etc)	Nos.	1
3	**Supply** of Emergency Lighting Distribution Board (ELDB) comprising 415V, 150A, 3-Ph, 4-wire bus and one (1) no. Lighting transformer: 100kVA with One (1) No. Incomer 150A TPN MCCB, Outgoing feeders 6 No. 63A TPN MCCB (Inclusive of CT, Voltmeter, Ammeter, Contactor with timer, indicating lamps etc)	Nos.	1
4	**ETC** of Emergency Lighting Distribution Board (ELDB) comprising 415V, 150A, 3-Ph, 4-wire bus and one (1) no. Lighting transformer: 100kVA with One (1) No. Incomer 150A TPN MCCB, Outgoing feeders 6 No. 63A TPN MCCB (Inclusive of CT, Voltmeter, Ammeter, Contactor with timer, indicating lamps etc)	Nos.	1
5	**Supply** of 415 V A.C. Indoor type Lighting Panel (Normal) (Type LP-2)	Nos.	2
6	**ETC** of 415 V A.C. Indoor type Lighting Panel (Normal) (Type LP-2)	Nos.	2
7	**Supply** of 415 V A.C. Indoor Lighting panel (Emergency) (Type LP-3)	Nos.	1
8	**ETC** of 415 V A.C. Indoor Lighting panel (Emergency) (Type LP-3)	Nos.	1
9	**Supply** of Indoor type emergency lighting panel (DCLP) (Type DCLP)	Nos.	1
10	**ETC** of Indoor type emergency lighting panel (DCLP) (Type DCLP)	Nos.	1
11	**Supply** of switchboard - Type S-1	Nos.	10
12	**ETC** of switchboard - Type S-1	Nos.	10
13	**Supply** of switchboard - Type S-2	Nos.	20
14	**ETC** of switchboard - Type S-2	Nos.	20
15	**Supply** of switchboard - Type S-3	Nos.	5
16	**ETC** of switchboard - Type S-3	Nos.	5
17	**Supply** of Indoor Receptacle (Type RA)	Nos.	10
18	**ETC** of Indoor Receptacle (Type RA)	Nos.	10
19	**Supply** of Indoor Receptacle (Type RB)	Nos.	10
20	**ETC** of Indoor Receptacle (Type RB)	Nos.	10
21	**Supply** of Indoor lighting fixtures (Type DA)	Nos.	77
22	**ETC** of Indoor lighting fixtures (Type DA)	Nos.	77
23	**Supply** of Indoor lighting fixtures (Type DD)	Nos.	78
24	**ETC** of Indoor lighting fixtures (Type DD)	Nos.	78
25	**Supply** of Indoor lighting fixtures (Type DE)	Nos.	26
26	**ETC** of Indoor lighting fixtures (Type DE)	Nos.	26
27	**Supply** of Indoor lighting fixtures (Type CA)	Nos.	11
28	**ETC** of Indoor lighting fixtures (Type CA)	Nos.	11
29	**Supply** of Emergency DC lighting fixtures (Type CD)	Nos.	17
30	**ETC** of Emergency DC lighting fixtures (Type CD)	Nos.	17
31	**Supply** of Emergency DC lighting fixtures (Type IA)	Nos.	32
32	**ETC** of Emergency DC lighting fixtures (Type IA)	Nos.	32
33	**Supply** of Ceiling fans 1200mm sweep with regulator, down rod and canopy (Type FA)	No.	5
34	**ETC** of Ceiling fans 1200mm sweep with regulator, down rod and canopy (Type FA)	No.	5
35	**Supply** of Ceiling fans 1400mm sweep with regulator, down rod and canopy (Type FB)	No.	5
36	**ETC** of Ceiling fans 1400mm sweep with regulator, down rod and canopy (Type FB)	No.	5
37	**Supply** of Wall mounted fans 400mm sweep	No.	5
38	**ETC** of Wall mounted fans 400mm sweep	No.	5
39	**Supply** of Exhaust fans - 500 CMH Exhaust fans with metal sheet crawl for Toilet & Pantry	No.	5
40	**ETC** of Exhaust fans - 500 CMH Exhaust fans with metal sheet crawl for Toilet & Pantry	No.	5
41	**Supply** of wheel mounted adjustable aluminium ladder for the maintenance of street lights	No.	1
42	**Supply** of adjustable free-standing aluminium ladder	No.	1
43	**Supply** of Portable Emergency Light (Type M3)	No.	2
44	**Supply** of Escape lighting luminaire with "EXIT" sign fitted (Type EX)	Nos.	5
45	**ETC** of Escape lighting luminaire with "EXIT" sign fitted (Type EX)	Nos.	5
46	**Supply** of wall mounted panels for supply to Air Conditioner & Ventilation fans comprising of 415V, 100A, 3-Phase TPN MCCB Incomer & 8 No. 32A DPMCB as outgoing feeders	No.	3
47	**ETC** of wall mounted panels for supply to Air Conditioner & Ventilation fans comprising of 415V, 100A, 3-Phase TPN MCCB Incomer & 8 No. 32A TPN MCB as outgoing feeders	No.	3
48	**Supply** of 32A DPMCB with Receptacle for split AC unit	Nos.	16
49	**ETC** of 32A DPMCB with Receptacle for split AC unit	Nos.	16
50	**Supply** of 20A MCB with Receptacle for ventilation fans	Nos.	5
51	**ETC** of 20A MCB with Receptacle for ventilation fans	Nos.	5
52	**Supply** of 415 V A.C. Outdoor type Lighting Panel (Normal) (Type SLP)	Nos.	4
53	**ETC** of 415 V A.C. Outdoor type Lighting Panel (Normal) (Type SLP)	Nos.	4
54	**Supply** of 415 V A.C. Outdoor type Lighting Panel (Emergency) (Type SLP)	Nos.	1
55	**ETC** of 415 V A.C. Outdoor type Lighting Panel (Emergency) (Type SLP)	Nos.	1
56	**Supply** of 415 V A.C. Outdoor type Street Lighting Panel (Type SLP)	Nos.	3

Sl. No.	DESCRIPTION	UNIT	BHAD (Qty.)
57	**ETC** of 415 V A.C. Outdoor type Street Lighting Panel (Type SLP)	Nos.	3
58	**Supply** of 415 V A.C. Outdoor, lockable type Isolating switch (Type FLP)	Nos.	3
59	**ETC** of 415 V A.C. Outdoor, lockable type Isolating switch (Type FLP)	Nos.	3
60	**Supply** of DB with Trasformer (for welding Receptacles)	Nos.	1
61	**ETC** of DB with Trasformer (for welding Receptacles)	Nos.	1
62	**SUPPLY** of Outdoor Junction boxes with 4-way terminals suitable for loop-in loop-out upto 4Cx16 sq. mm. Al conductor and tap off of two nos 10 Sqmm wire (JB shall be suitable for conduit size of upto 50mm)	Nos.	35
63	**ETC** of Outdoor Junction boxes with 4-way terminals suitable for loop-in loop-out upto 4Cx16 sq. mm. Al conductor and tap off of two nos 10 Sqmm wire (JB shall be suitable for conduit size of upto 50mm)	Nos.	35
64	**Supply** of Outdoor Receptacle (Type RC)	Nos.	2
65	**ETC** of Outdoor Receptacle (Type RC)	Nos.	2
66	**Supply** of 2x400W Switchyard Flood-lighting luminaire with HPSV lamp and control gear (Type PD)	Nos.	45
67	**ETC** of 2x400W Switchyard Flood-lighting luminaire with HPSV lamp and control gear (Type PD)	Nos.	45
68	**Supply** of 2x250W Switchyard Flood-lighting luminaire with HPSV lamp and control gear (Type PC)	Nos.	55
69	**ETC** of 2x250W Switchyard Flood-lighting luminaire with HPSV lamp and control gear (Type PC)	Nos.	55
70	**Supply** of 1x150 Watts luminarie with HPSV lamp and control gear for building periphery and street-lighting (Type TA)	No.	55
71	**ETC** of 1x150 Watts luminarie with HPSV lamp and control gear for building periphery and street-lighting (Type TA)	No.	55
72	**Supply** of 125W HPMV Post Top Lantern fixture	No.	5
73	**Civil works & ETC** of 125W HPMV Post Top Lantern fixture	No.	5
74	**Supply** of 30m high Lighting Tower/ Mast with Lantern Carriage (Double Drum Winch type) for Switchyard Lighting	Nos.	2
75	**Civil works & ETC** of 30m high Lighting Tower/ Mast with Lantern Carriage (Double Drum Winch type) for Switchyard Lighting	Nos.	2
76	**Supply** of Single arm swaged and welded steel pole with junction box and all accessories (11m high Lighting Pole with 1.8m over-hang projection for Street-Lighting)	Nos.	55
77	**Civil works & ETC** of Single arm swaged and welded steel pole with junction box and all accessories (11m high Lighting Pole with 1.8m over-hang projection for Street-Lighting)	Nos.	55
78	**Supply** of 4.5m high Lighting Pole for Post-top Lantern	Nos.	5
79	**Civil works & ETC** of 4.5m high Lighting Pole for Post-top Lantern	Nos.	5
80	**Supply** of Galvanized rigid steel conduit of 20mm size with accessories	Mtr.	500
81	**ETC** of Galvanized rigid steel conduit of 20mm size with accessories	Mtr.	500
82	**Supply** of Galvanized rigid steel conduit of 25mm size with accessories	Mtr.	500
83	**ETC** of Galvanized rigid steel conduit of 25mm size with accessories	Mtr.	500
84	**Supply** of Galvanized rigid steel conduit of 40mm size with accessories	Mtr.	250
85	**ETC** of Galvanized rigid steel conduit of 40mm size with accessories	Mtr.	250
86	**Supply** of 1C, 2.5 sqmm PVC insulated stranded Cu. Wire	Mtr.	1000
87	**ETC** of 1C, 2.5 sqmm PVC insulated stranded Cu. Wire	Mtr.	1000
88	**Supply** of 1C, 4 sqmm PVC insulated stranded Cu. Wire	Mtr.	1000
89	**ETC** of 1C, 4 sqmm PVC insulated stranded Cu. Wire	Mtr.	1000
90	**Laying, Testing & Commissioning** of 2C, 2.5 sqmm HRPVC insulated, Armoured Cu. Cable	Mtr.	10000
91	**Laying, Testing & Commissioning** of 4C, 16 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	2500
92	**Laying, Testing & Commissioning** of 4C, 35 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	500
93	**Laying, Testing & Commissioning** of 3.5C, 70 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	2500
94	**Laying, Testing & Commissioning** of 3.5C, 95 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	2500
95	**Laying, Testing & Commissioning** of 3.5C, 300 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	150
96	**Laying, Testing & Commissioning** of 1C, 630 sqmm XLPE insulated, Armoured Al. Cable	Mtr.	150
97	**Supply** of 50 mm GI conduits	Mtr.	750
98	**Laying** of 50 mm GI conduits at a depth of 300 mm including excavation, backfilling, making & repairing of walls in trenches, cutting, threading, fixing of sockets/bends where required etc to complete. Also between pull pit boxes to JB/LP.	Mtr.	750
99	**Supply** of 100 mm GI conduits	Mtr.	750
100	**Laying** of 100 mm GI conduits at a depth of 300 mm including excavation, backfilling, making & repairing of walls in trenches, cutting, threading, fixing of sockets/bends where required etc to complete. Also between pull pit boxes to JB/LP.	Mtr.	750
101	**Construction** of Pull Pit Boxes of sizes 400mmx400mmx400mm at the free ends and turning of GI pipes if pipe length exceeds 4M	No.	20
102	**Supply of** 35x6 mm GI Flat for earthing.	Mtr.	125
103	**Earthing using** 35x6 mm GI Flat	Mtr.	125
104	**Supply of** 25x3 mm GI Flat for earthing.	Mtr.	125
105	**Earthing using** 25x3 mm GI Flat	Mtr.	125
106	**Earthing using** 40 mm dia. MS Rod Electrodes (provided by BHEL)	No.	55
107	**Earthing using** 50x6mm GI Flat (provided by BHEL)	Mtr.	625
108	**Earthing using** 75x10mm GI Flat (provided by BHEL)	Mtr.	125
109	**Supply** of 16 SWG GI Wire (For earthing of Lighting fixtures, switches conduits etc.)	Mtr.	2500
110	**Earthing of Fixtures, Exhaust Fans etc. using** 16 SWG GI Wire	Mtr.	2500
111	**Supply** of 12 SWG GI Wire (For earthing of Power receptacles Junction Boxes etc.)	Mtr.	100

Sl. No.	DESCRIPTION	UNIT	BHAD (Qty.)
112	**Earthing of Fixtures, Exhaust Fans etc. using** 12 SWG GI Wire	Mtr.	100
113	**Supply** of wall mounted DC Distribution panel (for distribution of DC Supply to switchyard equipment) comprising 240V bus, Two(2) No. 63A MCCB as incomer, One (1) No. Bus Coupler and 4 nos 32A two pole MCCB as outgoing feeders	No.	6
114	**ETC** of wall mounted DC Distribution panel (for distribution of DC Supply to switchyard equipment) comprising 240V bus, Two(2) No. 63A MCCB as incomer, One (1) No. Bus Coupler and 4 nos 32A two pole MCCB as outgoing feeders	No.	6
115	**Supply & ETC** of EXTRA ITEMS REQUIRED FOR COMPLETION OF JOB AS PER SPECIFICATION BUT NOT COVERED ABOVE, SHALL BE QUOTED SEPARATELY. DETAILS TO BE PROVIDED BY BIDDER AT TENDER STAGE. (Price to be quoted on Lumpsum basis)	Lot	1
116	**Services** - Lux measurement at site	Lot	1

Notes:

1 The above quantities(BOQ) are as per preliminary design only. The detail design wll be submitted by Vendor and subject to approval by Customer. The BOQ quantities which are finalised after approval has to be supplied. BHEL reserves the right for quantity variation due to any reason upto ±30% of total value at same unit rate and terms during execution of contract. The quantity of individual items may however vary upto any extent.

2 ETC items mentioned above are deemed to be inclusive of all the materials required for the erection of the item mentioned in supply i.e. structural steel, brackets, nut, bolts, washers, al flat, cleat, rubber bush etc.

3 All fixtures shall be of reputed make as specifed in Annexure-B 'TYPES OF LIGHTING EQUIPMENT' enclosed with Annexure-1 of Section-1 (Customer Specification).

4 All Boards/ LPs shall be as per customer technical specification, unless other explicitly specified.

5 Civil Works such as foundation for Lighting Poles, 30m Lighting Mast and minor civil works are deemed to be included in erection rates of respective items.

6 Calculation of KVA Rating of lighting transformers to be submitted by bidder during tender stage.

VOLUME : V-B

SECTION-VII

TECHNICAL SPECIFICATION
FOR
ILLUMINATION SYSTEM

CONTENT

ATTACHMENTS

SECTION-VII

TECHNICAL SPECIFICATION FOR ILLUMINATION SYSTEM

1.00.00 SCOPE OF WORK

1.01.00 This scope of work shall cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport F.O.R. site of STATION LIGHTING SYSTEM, complete with all materials and accessories for efficient and trouble-free operation.

1.02.00 The scope of work shall also include complete installation, testing, commissioning and putting into successful commercial operation of the Lighting System of all the buildings and facilities included under this Contract inclusive of supply of all labour, tools, implements and supplies.

2.00.00 SCOPE OF SUPPLY

2.01.00 The equipment and materials within the scope of supply shall include but not limited to:

a) Lighting / ~~Welding~~ Transformer.

b) Lighting fixtures with lamps and accessories.

c) Main lighting distribution boards, Lighting panels/boards, Emergency lighting boards, emergency DC lighting panels, street lighting panels etc. All panels shall be provided with energy saving system.

d) Street light poles, flood lighting tower/poles/high masts.

e) Ceiling fans, receptacles, switches, switchboards, portable emergency lights, portable 24V supply module including handset maintenance equipment etc.

f) Separate DB for 1ph, 240 V power supply is required to be indicated suitably for miscellaneous services supplies.

g) ~~Separate DB for 24 V power supply is required to be indicated suitable for 24 V lighting supply.~~

h) Separate DB with transformers is required to be considered for welding receptacles.

i) Cables, wires, splicing/termination/connection accessories.

j) Conduit and accessories, junction and pull boxes, terminal blocks.

k) Grounding materials and connections.

l) All fittings, supports, brackets, anchors, clamps and connections.

m) Steel for field fabrication of supports and brackets.

2.01.01 Data sheets and technical leaflets on each piece of equipments / devices

3.00.00 SCOPE OF SERVICE

3.01.00 Carrying out of detail engineering including detail design calculations, preparation of lighting layouts showing location of fixtures, cable wires and conduit routing, preparation of cable schedule, and other related drawings as detailed in subsequent clauses and also consider the energy saving system.

3.01.01 Furnishing of all labour, skilled and unskilled, supervisory personnel, erection tools and tackles, testing equipment, implements, supplies, consumables & hardware, and transport for timely and efficient execution of the contract work.

3.01.02 Preparation of AS-BUILT drawings showing field modifications, if any.

4.00.00 GENERAL REQUIREMENTS

4.01.00 Codes and Standards

Major standards, which shall be followed, are listed below. Other applicable Indian standards even if not covered in the listed standard shall be followed.

a) IS-1913

b) IS-1977

c) IS-10322

d) IS-8623

e) IS-6064

f) IS-8828

g) IEC-598

h) IS-13703

i) IS-13947

j) IS-1248

k) IS-2705

l) IS-4160

m) IS-2713

n) IS-800

o) IS-2026

p) IS-2099

q) IS-694

r) IS-1554

s) IS-9537

t) IS-14772

u) IS-5133

5.00.00 **DESIGN CRITERIA**

5.01.00 **Design Basis**

5.01.01 The system provides lighting and electric power supply to ~~Main plant & BOP areas, extension part of~~ 400kV switchyard, peripheral roads inside boundary ~~wall, non service areas,~~ etc. under the scope of this contract. In addition, it also provides lighting to selected areas during plant emergency conditions.

5.01.02 The system will be installed in an adverse industrial environment. Equipment in some areas will be subject to vibration, coal-dust, fly-ash, oil/water vapours as prevalent in a thermal generating plant.

5.01.03 The design shall be such as to provide minimum lighting levels as specified for different areas. The Bidder shall carefully consider these lighting levels and layouts in making the offer and shall clearly indicate if any change is required to achieve the design lighting levels with the equipment offered.

5.01.04 The systems shall be suitable for operation on available power supply having characteristics as given in the annexure.

5.01.05 All fittings of control room / office shall be energy efficient type.

5.01.06 The ~~main plant/auxiliary building/other~~ BOP area shall generally be provided with :

- Main lighting system for full illumination under normal power supply conditions and shall operate from 415V/240V AC power supply tapped from respective MLDB/lighting panels.

- Emergency lighting system for reduced illumination operated by DG supply feeders during failure of main power supply. It shall cover 20% of fixtures in the building and associated area.

- Minimum emergency lighting system for reduced illumination during failure of main power supply with the help of 220V DC batteries/supply feeders. ~~This is applicable for Coal Handling Plant also. Regarding lux level of emergency lighting in CHP area, refer to Annexure-B.~~

5.01.07 Various lighting panel shall be fed directly from nearest Main Lighting Distribution Board and these MLDB s shall be subsequently fed from respective 415V switchgear/PMCC through 1:1 transformers to reduce fault level. If the fault level can be contained within 9 kA by virtue of cable impedances, use of 1:1 transformer can be dispensed with.

5.02.00 **System Concept**

The lighting system shall comprise following sub-systems:

5.02.01 Normal A.C. Lighting

This will be provided by A.C. lighting fixtures distributed throughout the plant area. These lights will be ON as long as the station A.C. supply is available.

A.C. lighting fixtures will be fed from respective area lighting panels, which in turn will be connected to main lighting distribution board. The main lighting distribution boards (MLDB) shall have 2x100% incomers and bus-coupler and be fed through 2x100% lighting transformers, which forms a part of the MLDB. Normal A.C. supply thus made available by the MLDB is 415V-3ph-4W-50HZ effectively grounded. Both the MLDB & the lighting panels shall be provided with at least 20% spare outlets.

Arrangement shall be made for automatic light control in switchyard, ~~boiler gallery, ESP area, turbine floor (high bay) area~~ as required during day time.

5.02.02 Normal cum Emergency A.C. Lighting

a) On failure of normal A.C. Supply, emergency A.C. lighting will be provided in selected areas ~~of the powerhouse, boiler area, boiler galleries etc~~ for general visibility, safe movements and operation of important auxiliaries.

b) The emergency MLDBs (EMLDB) are similar to the MLDB except that lighting transformers in this case are fed from station A.C. Emergency bus having D.G. System backup. Thus power for A.C. emergency lighting is 415V-3ph-4W, 50HZ, effectively grounded.

These lights will be kept "ON" from normal power supply source and upon its failure will be fed from DG.

c) A.C. emergency lighting fixture will account for 20% of the total lighting fixtures provided in the above mentioned area. ~~In main control room 30% emergency lighting shall be provided.~~

5.02.03 Emergency D.C. Lighting

a) This will be provided by emergency D.C. lighting fixtures located strategically in critical operating areas and emergency exits to enable safe movement of operating personnel access to important control points when both the normal AC and Emergency lighting system fails. These lighting fixtures will be fed from DC lighting panels which in turn will be fed from 220V DC LDB. The supply to DC lighting panels will be automatically switched ON in case of loss of plant normal &

emergency AC supply. The DC lights will be switched OFF after about 3 minutes following restoration of normal AC or emergency AC supply.

~~b) Emergency DC Lighting (CHP Area)~~

~~100W, 220V DC lighting fixture shall be provided in underground portion of conveyor, each switchgear room, control room, office room, pump house, each drive floor of TPs, staircase of TPs, buildings and local control area. DC lighting fixtures will be fed from 220V DC LDB, which in turn will be fed from CHP DC system.~~

5.02.04 ~~24V, 1 ph AC maintenance lighting system~~

~~Separate DB for 24V power supply shall be provided for 24V maintenance lighting.~~

5.02.05 Street/Area Lighting

Time switch and photocell will be used for controlling area lights with provision for manual override and also have the provision of latest Energy Saving Systems.

~~Same arrangement will also be used for controlling, boiler gallery, ESP area, turbine floor (high bay) area illumination.~~

5.02.06 Remote Emergency Lighting

This will be provided in auxiliary/off-site buildings except CHP where D.C. supply is not available by self-contained battery / automatic charger/inverter/flood light units. These portable emergency light units will be energized automatically on loss of normal A.C. supply.

5.03.00 **Ratings & Requirements**

5.03.01 All equipment and accessories shall be designed for continuous operation under site conditions without exceeding permissible temperature rise as stipulated in relevant standards.

5.03.02 Switch, fuses, MCCB, miniature circuit breakers (MCB), busbar shall be fully rated for short circuit level at the point of application. MCB shall have back-up HRC fuse if its rating is less than the available short circuit current.

5.03.03 All equipment and accessories shall have proper enclosure to suit the site conditions. Hazardous areas shall have flame-proof enclosure.

5.03.04 All wiring from lighting panels to fixtures and receptacles shall be carried out by PVC wires in G.I. Conduits.

5.03.05 Heavy duty XLPE FRLS cables as pre cable specification will be used for connections :

a) From main lighting board to area lighting panels

b) From street/area lighting panel to street light poles.

c) From Welding DBs to receptacles of 63A and above

5.03.06 The lighting system will be supplied from 415V/415V ± 5%, indoor, dry type lighting transformers. However it shall be so chosen to limit the fault level within 9kA.

5.03.07 Suitable number of Flood Lighting Towers / Lighting Masts with adequate HPSV Flood Light will be provided for necessary outdoor areas as required.

5.03.08 Lighting of all main streets, approach roads to various buildings shall be included.

5.03.09 Each lighting panel shall be provided with adequate number of outgoing miniature circuit breaker for controlling fixtures. 5A, 5 Pin sockets shall be fed from the lighting panel through separate circuits.

5.03.10 All A.C. Normal and Emergency A.C. lighting shall be provided with Energy Saving System.

5.04.00 **Method of Calculation**

5.04.01 Standard Lumen method shall be adopted for interior & exterior lighting in order to determine the number of lighting fixtures for obtaining the desired average level of illumination.

5.04.02 The coefficient of utilization shall be considered to take care of Lumen loss due to :

a) effect of room dimensions.

b) absorption of light in luminaires.

c) absorption of light at various room surfaces, i.e ceiling wall etc.

d) floor cavity, ceiling cavity.

e) mounting height.

5.04.03 Moreover a maintenance factor shall also be considered to account for the fall of illumination due to aging, pollution like dust deposit etc. Maintenance factors to be considered for various areas shall be as follows :

Area	**Maintenance factor**
Control Room	0.75
Switchgear/MCC Room	0.65
General indoor area	0.60
Dusty Area	0.55

Light loss Factor

It is recommended that in interiors with fairly clean atmosphere, for example, offices, air conditioned control rooms etc, a light loss factor of 0.8, in interiors which are prone to accumulate dust faster, for example, most in industrial interior an LLF of 0.7 and in high dirt prone interiors an LLF of 0.6 may be adopted for calculating the no. of luminaires to be installed for a particular service illuminance.

5.04.04 To achieve the recommended luminance relationship, it is necessary to select the reflectance of all finishes of the room surfaces. The recommended reflectance values for industrial interiors and equipment are given below for bidder's guide lines:

(For ~~station / other~~ BOP area ~~except CHP~~)

Surface	Reflectance Percentage
Ceiling	80-90
Wall	40-60
Desk and Bench tops, machines And equipment	25-45
Floor	not less than 20

~~**CHP Requirement:-**~~

~~For Dusty area such as conveyor galleries, TPs, crusher house etc.:~~

~~Surface~~	~~Reflectance Percentage~~
~~Ceiling~~	~~50~~
~~Wall~~	~~30~~
~~Floor~~	~~10~~

5.04.05 Lux level to be considered for various areas are given in Annexure-C.

5.04.06 Voltage drop at the fixture from the MLDB bus shall not exceed 3%.

5.04.07 Circuit loading of each lighting Panel shall be done in such a way that almost balanced loading in all the phases i.e. R, Y & B is achieved.

5.04.08 At least two sub circuits shall be used for illumination of a particular area.

5.04.09 Sub circuit loading of each lighting panel shall be restricted to 2000 Watts.

6.00.00 SPECIFIC REQUIREMENTS - SUPPLY

6.01.00 Equipment and Material

6.01.01 Equipment and material shall comply with description, rating, type and size as detailed in this specification, drawings and annexures.

6.01.02 Equipment and materials furnished shall be complete and operative in all details.

6.01.03 All accessories, control devices, internal wiring, fittings, supports, hangers, anchor bolts etc. which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

6.01.04 All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

6.02.00 **Lighting/Welding Transformers & Lighting Fixtures**

6.02.01 Each AC Lighting Distribution Board (MLDB) / Welding DB shall be fed from a transformer. The transformers shall be dry type, indoor type dusty vermin proof having 415V / 415V ± 2 x 2.5% with off load tap-changer on primary side. The vector-group shall be Dyn11. (The secondary side shall be solidly grounded through an additional neutral bushing exclusively used for grounding.)The casing of the transformer shall be grounded at least at two (2) points. The transformer may be located inside the lighting / welding DB itself or by the side of respective DB. Impedance of the transformer shall be so selected such that fault level of lighting/welding system is reduced to 3-5 kA.

6.02.02 If necessary, apart from the main lighting transformers, separate small additional lighting transformers may be used at distance lighting points.

6.02.03 Lighting fixtures shall be designed for minimum glare. The surface finish shall be smooth, unobtrusive and scratch resistant.

6.02.04 Reflector shall be of sheet steel or aluminium, minimum 20 SWG thick, securely fixed by fastening device of captive type.

6.02.05 Fixture shall be suitable for 20 mm conduit entry and 16 SWG G.I. earth wire connection.

6.02.06 High bay fixtures shall have provision for vibration damper to ensure rated lamp life. Cost of each damper shall be separately indicated.

6.02.07 Fixture shall be furnished complete with lamps and integrally/non integrally or separately mounted control gear & accessories as applicable for different types of fixtures. These shall include holders, ballast, capacitor, starter, ignitors, etc.

6.02.08 Fixtures shall be fully wired up to respective terminal blocks, suitable for loop in and loop out connection of PVC wires of following sizes :

a) Lighting fixture : 2.5 mm^2 Copper

b) Flood Light fixture : 2x2.5 mm^2 Copper

6.03.00 **Lamps**

6.03.01 General lighting service (GLS) lamps shall be with clear glass and screwed caps.

6.03.02 All fluorescent lamp shall be bi-pin rotary type. Lamp holder shall be spring loaded, low contact resistance type and shall have resistance to wear. CFL and T5 fluorescent tube with electronic ballast or tri-phosphorous tube

Fluorescent lamp will be used in indoor application having low height like 3 to 5 metres requiring good colour rendering. All control rooms, electrical panel room, auxiliary building, laboratories, office area, etc. will be provided with fluorescent lamp fixtures. The fluorescent lamp will be tubular, cool daylight type of 28W as per annexure.

6.03.03 Mercury/Sodium vapour lamp shall be colour corrected type with screwed cap.

HPSV lamp has the advantage of very high efficiency (lumens/watt) and hence recommended for indoor application with elevation more than 4 meters such as TG Hall, Boiler & ESP platform, Pump House and all outdoor application such as area lighting, roads, boundary wall, etc. Flameproof fixtures will be used for hazardous areas with HPMV lamps. The HPSV/ HPMV lamps will be elliptical of rating 70W/150W/250W/400W as required depending on application. For all indoor application in CHP area such as conveyor galleries / tunnels and floor below 4m, 35W low pressure sodium vapour / 70W HPSV shall be considered.

6.03.04 Lamps shall be suitable for use in position and capable of withstanding small vibrations. Restrictions and special features, if any, shall be clearly indicated in the bid.

6.04.00 **Ballast/Electronic Ballast**

6.04.01 Ballasts shall be heavy duty, low loss, polyester-filled type with copper winding. Ballast shall be free from hum.

6.04.02 Ballast for Mercury/Sodium vapour lamp shall be provided with suitable tapping to set the voltage within range specified.

6.04.03 In multi-lamp fixture, each lamp shall be provided with individual ballast.

6.04.04 Ballast windings shall have maximum operating temperature of 120°C without rated temperature rise marking.

6.04.05 Electronic Ballast shall be suitable for 220 V DC and also 240 V AC.

6.04.06 Electronic Ballast shall be compact, lightweight, high frequency electronic standard ballast for fluorescent lamps.

6.04.07 It shall be Flicker-free warm start, ideal for areas with high switching frequency.

6.04.08 Electronic Ballast shall be of such design that minimum 25% reduction in energy consumption at constant luminous flux compared with conventional gear.

6.04.09 Electronic Ballast shall not cause high harmonic distortion.

6.04.11 Electronic Ballast shall provide constant light independent of mains voltage fluctuation.

6.05.00 **Lighting Panel/Distribution Boards**

6.05.01 Lighting Distribution Boards/panels shall be metal-enclosed, cabinet type, fabricated from CRCA sheet steel minimum 2 mm thick, suitable for either wall/column mounting on brackets or floor mounting on channel sills.

6.05.02 Indoor Lighting Distribution Boards & Lighting Panels shall be dust and vermin-proof, IP-52 or better; outdoor panels shall be weather-proof with canopy, IPW-55 or better. The cubicle-housing transformer shall be minimum IP-42.

6.05.03 Lighting Distribution Boards and Lighting Panels shall be so constructed as to permit free access to the terminal connections and easy replacement of parts. Front access doors shall have padlocking arrangements.

6.05.04 Lighting Distribution Boards shall have provision of cable entry from bottom and, panels shall have provision of cable entry from top and bottom, as required, with removable gland plates. Necessary double compression type brass cable glands, tinned copper/Aluminium cable lugs are to be furnished.

6.05.05 Two ground pads with M10 G.I. bolts and nuts shall be provided on each Lighting Distribution Board and Lighting Panel for connection to ground conductor.

6.05.06 Each Lighting Distribution Board shall be complete with designation and caution notice plates fixed on front cover and a directory plate fixed on inside of the front cover. This directory plate shall contain details of the Lighting Panels being fed from the Distribution Board including their designation, location, loading etc.

Each Lighting Panel shall be complete with designation and caution notice plates fixed on front cover and a circuit directory plate fixed on inside of the front cover. Circuit directory plate shall contain details of the points to be controlled by each circuit including the location of the point controlled, rating of the protective units and loading of each circuit.

The plates shall be of anodized aluminium with inscriptions indelibly etched on it.

6.05.07 Bus bar shall be electrolytic grade hard drawn aluminium, colour coded for easy identification and designed for a maximum temperature of 85°C. Minimum size shall be 25 x 6 mm.

6.05.08 Incoming and outgoing circuits shall be terminated in suitable terminal blocks.

6.06.00 **Board/Panel Equipment**

6.06.01 Each Distribution Board shall consist of one dry type transformer housed in the cubicle, voltmeter with selector switch, C.T. operated ammeter and incoming triple pole MCCB. Outgoing feeder from the Lighting Distribution

Board shall have MCCB. Proper discrimination between outgoing MCCB of Lighting Distribution Board and downstream MCCB of Lighting Panel should be ensured.

6.06.02 Each lighting panel shall have an incoming triple pole MCCB with neutral link and ELCB and a number of outgoing miniature circuit breakers (MCB) as per annexure.

6.06.03 Board/Panel access door shall be interlocked with incoming MCCB such that the door can be opened only when the MCCB is in OFF position. Means shall be provided to defeat this interlock.

6.06.04 All MCCB shall be single throw, air break, heavy duty type having quick-make quick-break contacts. Fuses shall be HRC link type. Contactors shall be air break electromagnetic type. Push buttons shall be push to actuate type.

6.06.05 MCB shall be suitable for manual closing and opening and also automatic trip on overload and short circuit.

6.06.06 Time switch in street lighting panels shall be clock switch type with ON-OFF time setting facility, which shall ensure respective ON-OFF operation in every 24 Hours cycle. Voltmeter/Ammeter shall be of accuracy class 1.0 or better as per IS: 1248. Voltmeter/Ammeter selector switch shall be of reputed make.

6.07.00 **Receptacles**

6.07.01 Receptacles shall be heavy duty, complete with individual plug and switch as detailed in the annexure.

6.07.02 The conduit box of the receptacle shall be provided with earthing screws with washer and nuts welded on the surface for grounding with 16 SWG G.I. wire. Arrangement shall be provided inside the conduit box for grounding of third pin.

6.07.03 Shrouded type plug shall be provided with corresponding matching arrangement at sockets to prevent accidental contact with finger during plug insertion.

6.08.00 **Fans & Regulators**

6.08.01 The fans shall have three well balanced blades, and shall be reasonably free from noise. Pedestal fans shall also be provided as per requirement.

6.08.02 Fan motor shall be totally enclosed type with copper winding and class E insulation.

6.08.03 Regulator shall have minimum five steps. Electronic regulator with smooth control is to be provided.

6.09.00 **Switch & Switch Board**

6.09.01 All switch boards/boxes shall be of bent steel construction, fabricated of 14 SWG M.S. sheet with 6 mm thick bakelite cover with brass fixing screws.

6.09.02 Switch boards/boxes located in control room and office areas shall be flush mounted type on brick wall with only the switch knob projecting outside.

6.09.03 Switch boards/boxes shall have conduit knock outs on the sides. Adequate provision shall be made for ventilation of these boxes.

6.09.04 Flush type receptacles where provided shall be so located that only the plug projects outside.

6.09.05 Switches shall have quick-make and quick-break mechanism operated by a suitable external handle complete with position indicator.

6.10.00 **Lighting Poles & Flood Light Tower**

6.10.01 Street Light Poles

a) Street light poles shall be swaged and welded steel pole, complete with fixing brackets, weather-proof junction box and all other accessories.

b) The pole shall be coated with bituminous preservative paint on inside as well as embedded outside surface. Exposed surface shall be coated with two coats of metal primer (comprising of red oxide and zinc chromate in synthetic medium).

6.10.02 **Flood Light Tower**

a) Flood light tower shall be a lattice structure with maintenance platform and approach ladder. All structural members and hardware shall be hot-dip galvanized.

b) Structures shall be designed for an additional load of 1500kg for maintenance crew. Deflection under maximum wind pressure shall not exceed 1 in 360. Structural design shall be as per IS-800.

6.10.03 **Lighting High Masts**

Applicable standards :

The following shall be Reference Standards for loading of the High Mast:

a)	IS-875 (Part-III) 1987	-	Code and practice for design loads for Structures.
b)	BSEN 10025/DIN 17100	-	Grade of M.S. Plates.
c)	BS-5135/AWS	-	Welding
d)	BS.ISO 1461	-	Galvanizing
e)	TR. No. 7200 of ILE	-	UK Specification for Mast and foundation.

Structure :

Lighting High Mast shall be of continuously tapered polygonal cross section, at least 20 sided, hot dip galvanized and presenting a good and pleasuring appearance and shall be based on proven In-Tension design confirming to

the standards referred to above, to give an assured performance, and reliable service. The structure shall be suitable for wind loading as per IS-875 Part-III, 1987. The masts dimensions shall be as per standards.

The Mast shall be of 30M height with lantern carriage to enable raising/lowering for ease of maintenance, including the Head Frame, Double Drum Winch, continuous stainless steel wire rope, in built power tool, luminaries, suitable aviation warning light, lightning along with necessary power cables within the mast. The mast shall be delivered only in three sections & shall be joined together by slip stressed fit method at site. No site welding or bolted joints shall be done on the mast.

High mast shall be complete with feeder pillar panel for power distribution to lighting fixtures and winch motor. Feeder pillar panel shall be outdoor type stand mounting with dust and vermin proof, IP 55 and constructed of 14 swg sheet steel.

6.11.00 **Maintenance Equipment**

6.11.01 The Contractor shall supply one (1) no. of wheel mounted adjustable aluminium ladder for the maintenance of street lights.

6.11.02 ~~For the maintenance of lighting fixtures within the power house, the contractor shall also supply four (4) nos. free standing adjustable aluminium ladder, adjustable from 5m. to 10m.~~

6.11.03 ~~For the maintenance of lighting fixtures within the CHP area, the Bidder shall supply two (2) nos. free standing adjustable aluminium ladder, adjustable from 5m. to 10m.~~

6.12.00 **Special Requirement**

6.12.01 All outdoor illumination fixtures, unless it is fed from photo cell/time switch controlled lighting panel, has to be provided with outdoor type local switches.

6.12.02 In all the air filtration units and air handling units, one marine type lamp (of 100 Watt approx.) shall be supplied and the wiring & fixing of the same has to

6.13.00 **Lighting Cables & Wires**

6.13.01 Lighting Cable shall be heavy duty, 1100 Volt grade, multi-core stranded aluminium conductor, XLPE insulated, extruded PVC inner sheath, single round G.I. wire armoured and overall PVC sheathed with FRLS conforming to IS 1554.

6.13.02 Lighting wires shall be 1100 Volt grade, fire resistance PVC insulated, stranded conductor, single core cable conforming to IS 694, colour coded as below :

RED	for	R-Phase	BLACK	for	Neutral
YELLOW	for	Y-Phase	WHITE	for	+'Ve D.C.

BLUE for B-Phase GREY for -'Ve D.C.

6.13.03 Wire size shall be as follows :

For point wiring beyond lighting panel i.e from lighting Panel to junction box (main run)	:	10 Sq.mm. Aluminium. Stranded conductor
From Junction box to lighting fixture	:	2.5 Sq.mm. Copper Stranded conductor

6.14.00 **Conduits and Accessories**

6.14.01 Conduits shall be rigid steel, hot-dip galvanised, furnished in standard length of 3 metres, threaded at both ends.

6.14.02 Thickness of conduits up to and including 25 mm dia shall be of 16 SWG and conduits above 25 mm shall be of 14 SWG. Minimum size of conduits shall be 20 mm.

6.14.03 Each piece of conduit shall be straight, free from blister and other defects and covered with capped bushings at both ends.

6.14.04 Flexible conduits shall be made with bright, cold rolled annealed and electro-galvanised mild steel strips and coated with PVC.

6.15.00 **Junction Box**

6.15.01 Junction boxes shall be of 16 SWG sheet steel hot-dip galvanised, dust and damp proof, generally conforming to IP-55.

6.15.02 Junction boxes shall be complete with gasketed inspection cover, conduit knock out/threaded hub and terminal blocks.

6.15.03 Junction boxes for outdoor use shall be weatherproof IPW-55 and those for hazardous location shall be flame-proof type.

6.15.04 Junction boxes shall have following indelible markings:

Circuit nos. on top

Circuit nos. with ferrules (inside) as per drawing

DANGER sign in case of 415V circuit

6.16.00 **Terminals**

6.16.01 Multi way terminal blocks of approved type, complete with screws, nuts, washers and marking strips shall be furnished for connection of incoming/outgoing wires.

6.16.02 Each terminal shall be suitable for connection up to 2 nos. 10 Sq.mm stranded aluminium conductors without any damage to the conductor or looseness of connectors.

6.17.00 **Portable Emergency Lighting Unit**

The portable emergency lighting unit shall be complete with 6 volt storage battery (rechargeable), inverter, automatic charger, twin 6 watts fluorescents tube lamp and test switch. Contractor shall furnish make, type and catalogue.

6.18.00 ~~**24 V Supply Module**~~

6.18.01 ~~Each 24V A.C. supply module shall have one (1) no air cooled two winding, 500VA, 1-phase, 50Hz, 240/24V transformer with 6A (240V side) and 16A (24V side) HRC fuse and necessary 240V and 24V terminals for incoming and outgoing connections. The 240V terminals of 24V AC supply module shall be fed from respective lighting panels. A group of 6A, 24V AC receptacles located near Boiler access doors and condenser area shall be wired up from 24V side of each 24V A.C. supply module.~~

~~The 24V A.C. supply modules shall be sheet steel enclosed with louvers and shall be suitable for outdoor use. The 24V A.C. supply modules shall be suitable for wall/steel structure/column mounting. Switches shall be mounted at the front on sheet steel enclosure.~~

6.18.01 ~~Portable 24 V AC supply modules having sheet steel enclosure with louvers as per above shall be supplied. 24V halogen automobiles lamps with reflector along with 1100 V, twin core PVC sheathed, 2.5 mm^2 stranded copper wire of 20 m lengths as handset~~

~~Exact requirement will be finalized during detail engineering and accordingly the bidder shall furnish the same.~~

6.19.00 **Not used.**

6.20.00 **Moulded Case Circuit Breaker (MCCB)**

6.20.01 MCCB shall be heavy duty, triple pole, load break-fault-make type conform to the duty as required. MCCB shall be provided with a common trip bar, so as to ensure opening of all phases even when fault occurs in only one phase.

6.20.02 MCCB shall have positive indication in ON and OFF position with indication on each Module.

6.20.03 The MCCB should be housed in a heat resistant moulded insulated housing Overload and Magnetic release of MCCB shall be suitable for setting at site. The Short Circuit release shall be of minimum of 12x In.

6.20.04 ~~For Fuel Oil / hazardous area, one (1) no. 63Amp MCB shall be provided within a Flame-proof enclosure. The enclosure shall be Flame-proof as per the stipulations of relevant standard. It shall have a degree of protection of IPW-55. The enclosure front access door shall be interlocked with the MCB. It shall have grounding facility on opposite sides complete with designation and caution notice plates fixed on the front cover. It shall meet the requirement of IS 5571 & IS – 5572.The MCB enclosure shall suitable for entry of 4/Cx16 sq.mm XLPE Copper cable. The total unit shall have a valid certification for using in the specified zone from statuory authority preferably of CMRI and/or CE Ex II 2 G EEx-D IIB T4/T5/T6; CE Ex II2 2(1) G EEx-d (ia) IIB T5/T6; CE Ex II2 (1) GD EEx-d (ia)IIB T5/T6 or similar.~~

6.21.00 **Nameplate**

Nameplates shall be furnished for identification of devices and circuits. All switches, controls and indications shall be permanently and legibly marked in English as to clearly indicate their functions.

All lighting fixtures, receptacles, fans, junction boxes etc. shall be properly marked up indelibly with corresponding circuit numbers.

6.22.00 **Samples**

Owner reserves the right to call for samples if considered necessary and the same shall be submitted by the Bidder free and without any obligation.

6.23.00 ~~**Street light powered by solar energy**~~

~~Solar PV street lighting system is an innovative system that operates using the light energy available from the sun to provide lighting during nighttime. This system is based on the principle of conversion of solar energy into DC electricity.~~

~~Solar PV street lighting is a reliable and an efficient stand alone system. It presents a package consists of a solar PV module, a lead acid battery, battery charger regulator & dusk to dawn regulator, electronics control unit complete with high frequency inverter and luminaire.~~

~~The energy radiated by sun is converted to DC power by the adjustable solar PV module mounted on the top of the lighting pole. This power is stored in the battery housed in the battery box and powers the street light during the night. The system is automatically switched on at dusk and off at dawn.~~

~~Basic system components as per MNES specification are~~

- ~~Solar PV module (12V, 75Wp)~~
- ~~A hot deep galvanized epoxy coated light pole with module frame structure~~
- ~~Luminaries using CFL 11W lamp with high efficiency inverter and dusk to dawn regulator circuit. Along with water proof cabinet.~~
- ~~A low maintenance 12V, 75AH tubular stationary lead acid battery specially designed for photovoltaic application with suitable battery box.~~
- ~~A complete set of cables and other installation material.~~

~~It shall be featured with bright light, 3/5 non-sun days autonomy, auto on/off and integrated design.~~

7.00.00 **SPECIFIC REQUIREMENTS - SERVICES**

7.01.00 **Consumables and Hardware**

7.01.01 The Contractor shall furnish all erection materials, hardware and consumables required for the complete installation.

7.01.02 The materials shall include but shall not be limited to the following :

a) Consumables : Welding rods & gas, oil and grease, cleaning fluids, paints, electrical tape, soldering materials etc.

b) Hardware : Bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc.

c) Materials : Junction boxes, terminal blocks, connectors, ferrules, lugs, brass glands, rigid/flexible conduits, cables, ground wires etc.

7.01.03 Supply of cement, sand, stone etc. required for the execution of the contract shall be the responsibility of the Contractor.

7.02.00 **Testing Equipment**

7.02.01 The Contractor will provide such checking and testing equipment as test lamp, buzzer, 500-volt meggar, earth meggar, lux-meter etc. and also other testing equipment as required.

7.03.00 **Installation - General**

7.03.01 Installation work shall be carried out in accordance with good engineering practices and also manufacturer's instructions/ recommendations where the same are available.

7.03.02 Equipment shall be installed in a neat workmanlike manner so that it is level, plumb, square and properly aligned and oriented.

7.04.00 **Lighting Fixtures**

7.04.01 Continuous rows of fluorescent tubes shall be mounted on a continuous M.S. angle for each row of lights.

7.04.02 In turbine hall, fixtures shall be mounted to maintain sufficient clearance from the overhead traveling crane trolley.

7.04.03 In boiler galleries, mounting height of fixtures shall be about 2500 mm from platforms except shown otherwise.

Bracket for fixture mounting shall be fabricated at site from 40 mm conduits with a reducing socket to suit the fixtures and clamped on to the handrails. The fixing shall be strong enough to withstand vibration and high wind velocity.

If a roof over platform is available, the fixture can be pendant mounted.

7.04.04 Floodlights shall be mounted on steel base facing the tentative direction shown on drawings. Fixing holes shall be provided with slot to turn the fixture

about 5 Deg on both sides. Bolts shall be finally tightened with spring washer.

The Contractor shall supply and install the steel base for fixing the flood light on the flood light towers.

Terminal connection to the floodlight shall be made through PVC coated flexible metallic conduits.

7.04.05 Fixtures shall be mounted on sub-station structures with suitable clamps. No cutting or drilling of sub-station structures is permitted.

7.04.06 The fixtures after erection shall be marked up indelibly with corresponding circuit number for easy identification of lamp circuit.

7.05.00 **Receptacles**

Receptacles shall be installed at locations shown in approved drawings. As a minimum the following shall be provided –

Atleast one 6/16A, 240V AC universal socket outlet with switch shall be provided in office, cabins, etc.

63A, 3 phase, 4 wire, 5 pin Receptacle shall be provided at the following locations as a minimum –

a) ~~Two (2) nos. at each floor of TG building~~
b) ~~Three (3) nos. in each Boiler platform~~
c) One (1) each in ~~pump houses and~~ switchgear rooms
d) One (1) no. in each ~~ESP, Transformer yard, Cooling Tower,~~ Battery room.
e) ~~Two (2) nos. in each floor of Junction Tower, Transfer Tower, Screen house, Bunker floor, Hopper area, CHP switchgear room. Receptacles in these area will be flame proof type.~~
f) ~~In conveyor gallery Receptacle shall be provided at interval of 50m, atleast one if length is less than 50m.~~

Each circuit of welding DB shall feed a maximum of two (2) nos. welding receptacles.

7.06.00 **MLDB, EMLDB DCELDB and Lighting Panel**

7.06.01 MLDB, EMLDB DCELDB and Lighting panels shall be erected at the locations indicated in approved drawings.

7.07.00 **Street Lighting Poles**

Erection of Street Lighting poles together with all its accessories including civil foundation work, installing lighting fixture, wiring and cabling work are included within scope of contractor.

7.08.00 **Conduit System**

7.08.01 In case of unarmoured cable, all conduits shall originate from the respective lighting panel and terminate in lighting fixtures, receptacles etc.

7.08.02 Exposed conduits shall be run in straight lines parallel to building columns, beams and walls as far as practicable. Unnecessary bends and crossings shall be avoided to present a neat appearance.

7.08.03 Conduit supports shall be provided at an interval of 750 mm for horizontal runs and 1000 mm for vertical runs.

7.08.04 Conduits shall be clamped on to approved type spacer plates or brackets by saddles or U-bolts. The spacer plates or brackets in turn, shall be fixed to the building steel by welding and to concrete or brick work by grouting as shown on drawings.

Wooden plug inserted in the masonry or concrete for conduit support is not acceptable.

7.08.05 Embedded conduits shall be securely fixed in position to preclude any movement. In fixing embedded conduit, if welding or brazing is used, extreme care should be taken to avoid any injury to the inner surface of the conduit.

7.08.06 Spacing of embedded conduits shall be such as to permit flow of concrete between them and in no case shall be less than 40 mm.

7.08.07 Where conduits are run on cable trays they shall be clamped to supporting steel at an interval of 600 mm.

7.08.08 For directly embedding in soil, the conduits shall be coated with an asphalt - base compound. Concrete pier or anchor shall be provided where necessary to support the conduit rigidly and to hold it in place.

7.08.09 Conduits shall be installed in such a way as to ensure against trouble from trapped condensation.

7.08.10 Running threads shall be avoided as far as practicable. Where it is unavoidable, check nuts shall be used.

7.08.11 Conduits shall be kept, wherever possible, at least 300 mm away from hot pipes, heating device etc. when it is evident that such proximity may impair the service life of cables.

7.08.12 Slip joints shall be provided when conduits cross structural expansion joints or where long run of exposed conduits are installed, so that temperature change will cause no distortion due to expansion or contraction of conduit run.

7.08.13 For long run, junction/pull boxes shall be provided at suitable intervals to facilitate wiring.

7.08.14 Conduits shall be securely fastened to junction box or cabinets, each with a locknut and insulated bushing inside the box and locknut outside.

7.08.15 Conduit lengths shall be joined by screwed couplers. Couplers shall be clearly cut.

7.08.16 Conduit joints and connections shall be made thoroughly water-tight and rust-proof by application of a thread compound which will not insulate the joints.

White lead is suitable for application on embedded conduit and red lead for exposed conduit.

7.08.17 The Battery Room installation shall be made with acid fume proof conduits.

7.08.18 Field bends shall have a minimum radius of four (4) times the conduit diameter. All bends shall be free of kinks, indentations or flattened surfaces. Heat shall not be applied in making any conduit bend.

7.08.19 The entire metallic conduit system, whether embedded or exposed, shall be electrically continuous and thoroughly grounded.

7.08.20 Lighting fixture shall not be suspended directly from junction box in the main conduit run.

7.08.21 Conduits and fittings shall be properly protected during construction period against mechanical injury. Conduits ends shall be plugged or capped to prevent entry of foreign material.

7.08.22 After installation the conduits shall be thoroughly cleaned by compressed air before pulling in the wire.

7.08.23 In control rooms and office areas provided with false ceiling conduct run shall be concealed type, embedded in the walls.

7.09.00 **Wiring**

7.09.01 Wiring shall be generally carried out by PVC wires in conduits. All wires in a conduit shall be drawn simultaneously. No subsequent drawing is permissible.

7.09.02 Wire shall not be pulled through more than two equivalent 90° bends in a single conduit run.

7.09.03 Wiring shall be spliced only at junction boxes with approved type connections or terminal strips. Maximum two wires can be connected to each way of the terminal block. Splicing of only one phase shall be done in a junction box.

7.09.04 For lighting fixtures, connection shall be teed off through suitable round conduit or junction box, so that the connection can be attended without taking down the fixture.

7.09.05 For vertical run of wires in conduit, wires shall be suitably supported by means of wooden/hard rubber plugs at each pull/ junction box.

7.09.06 A.C. and D.C. circuits shall not be run in the same conduit and junction boxes. Circuits fed from different transformers shall be run through different conduits and Junction boxes.

7.09.07 Receptacle circuits shall be kept separate and distinct from lighting and fan circuits.

7.09.08 Separate neutral wire shall be provided for each circuit. Wiring throughout the installation shall be such that there is no break in the neutral wire in form of switch or fuse.

7.10.00 **Cabling**

7.10.01 In outdoor areas, main runs from lighting panels shall be by means of XLPE cables, directly buried in ground or laid in trenches for the underground portion and through conduit for the over ground portion.

7.10.02 Buried cables shall be laid and covered with sand/ riddled earth, and protected from damage by bricks at sides and pre cast concrete stab at top. Buried cables shall have cable markers at 50M interval and projecting 150 mm above ground. At cable bends and joints markers shall be provided.

7.10.03 When buried cables cross road/railway track, additional protection to be provided in form of hume / G.I. pipe.

7.11.00 **Grounding**

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

7.11.02 Ground connections shall be made from nearest available station ground grid. All connections to ground grid shall be done by arc welding.

7.11.03 Panels/Boards shall be directly connected to ground grid by two nos. 35 x 6 mm G.I. flats (for panels) / two nos. 50x6 mm G.I. flats (for distribution boards).

7.11.04 All junction boxes, receptacles, lighting fixtures etc. shall be grounded with 16 SWG G.I. wire.

7.11.05 Each street lighting Pole shall be grounded at two points by two nos. 50x6 mm G.I flat risers from two (2) nos. earthing spike 40 mm dia & 3m long directly driven into ground at a depth of 1m from ground level. The junction box at each lighting pole is grounded at two (2) points from two (2) nos. earthing terminals by 16 SWG GI wire. One 16 SWG G.I wire shall be taken up to the junction box from lighting fixtures and connected to grounding point.

7.12.00 **Foundation & Civil Works**

7.12.01 Equipment foundations, panel foundations and all other civil work will be provided by the Contractor.

7.13.00 **Excavation and Back Filling**

7.13.01 The Contractor shall perform all excavation and backfilling as required for buried cable and ground connections.

7.13.02 Excavation shall be performed up to the required depth. Such sheeting and shorting shall be done as may be necessary for protection of the work.

7.13.03 The Contractor shall make use of his own arrangements for pumping out any water that may be accumulated in the excavation.

7.13.04 All excavation shall be backfilled to the original level with good consolidation.

7.14.00 **Steel Fabrication**

7.14.01 All supports, hangers & brackets shall be fabricated by the Contractor. Necessary steel shall be supplied by the Contractor.

7.14.02 Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.

7.14.03 Every effort shall be made to minimize the wastage of steel as far as practicable during fabrication. The wastage in no case shall exceed 3% of the total quantity of steel fabricated.

7.15.00 **Painting**

7.15.01 Street light poles shall be given two coats of aluminium paints after installation.

7.15.02 All steel fabrication shall be given two coats of red oxide primer. Finish paint shall be as mentioned in Section-3.

7.15.03 All equipment shall be given touch-up paint as required after installation.

7.16.00 **Inspection & Testing**

7.16.01 On completion of erection works, the Contractor shall request the Engineer for inspection and tests with minimum fourteen (14) days advance notice.

7.16.02 The Engineer shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.

7.16.03 The installation shall be then tested and commissioned in presence of the Engineer and put on trial run for stipulated contract period.

7.16.04 All rectification, repair or adjustment work found necessary during inspection, testing, commissioning and trial run shall be carried out by the Contractor without any extra cost.

8.00.00 **TESTS**

8.01.00 **Shop Tests**

8.01.01 All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant Indian Standards at manufacturer's works.

8.01.02 Tests on lighting Distribution Boards/Panels shall include :

a) Wiring continuity tests.

b) High voltage and insulation tests.

c) Operational tests.

8.02.00 **Site Tests**

8.02.01 Contractor shall thoroughly test and megger all cables, wires and equipment to prove that the same are free from ground and short circuit.

8.02.02 If any ground or short circuit is found, the fault shall be rectified or the cable and/or equipment replaced.

8.02.03 All equipment shall be demonstrated to operate in accordance with the requirements of this specification.

8.02.04 Illumination in different areas are as per designed lux level should be established.

9.00.00 **DRAWINGS, DATA & MANUALS**

9.01.00 Drawings, data and manuals shall be submitted in triplicate with the bid and in quantities and procedures as specified in the General Condition of Contract and/or elsewhere in this specification for approval and subsequent distribution after the issue of Letter of Intent.

9.02.00 **To be submitted with the Bid**

9.02.01 Make, type and catalogue number of lighting fixtures, lamps and accessories along with technical leaflets, data sheets, polar curves etc.

9.02.02 Typical outline drawings, showing constructional features, cable/ conduit entry, fixing arrangements etc of :

a) Lighting Distribution Board & Panel/receptacles/junction boxes.

b) Street light pole.

9.02.03 Technical leaflets and data sheet on each piece of equipment / device such as MCB, switch fuse, MCCB, receptacle etc.

9.02.04 Type test certificates on lighting fixtures and lighting panels, transformer, ballast, power cables.

9.03.00 **To be submitted after Award of Contract**

9.03.01 All relevant drawings and data pertaining to the lighting system like GTP, GA drawing, BOM, lighting layout drawings showing disposition of fixtures,

panels, conduit/wire routing, schematic drawing, QAP, etc. shall be submitted by the Bidder for the approval of Owner/Owner's consultant.

9.03.02 AS-BUILT lighting layout and erection drawings, properly incorporating the changes/alterations/field modifications, if any, as carried out at field along with circuit distribution schemes of all lighting panels, conduit and cable routing and as acceptable to the Owner.

ANNEXURE-A

AVAILABLE POWER SUPPLY

1.0 **System Voltage**

Lighting equipment and accessories shall be designed for satisfactory operation from the following power supply sources:

1.1	A.C. Supply	:	415 Volt, 3 phase, 50 Hz, 4 wire effectively grounded system. Fault Level 50 KA r.m.s. symmetrical.
1.2	D.C. Supply	:	220 V, 2 wire, ungrounded system. Fault Level 25 * KA

2.0 **Permissible Variation**

Equipment and accessories shall be suitable for operation over the entire range of voltage/frequency variations as listed below:

2.1	A.C. Supply	:	Voltage $\pm$ 10% Frequency +3% to -5% Combined Voltage + Frequency 10% (absolute sum)
	D.C. Supply	:	Voltage 187 to 242 Volt.

* Indicative only; actual value will be decided by the Bidder after substantiating the same by calculation.

ANNEXURE-B

TYPES OF LIGHTING EQUIPMENT

1.0 LIGHTING FIXTURES & LAMPS

Each lighting fixture shall be furnished complete with associated lamp, holder and control gear fully wired up. Control should include copper ballast, electronic choke, capacitor starter, electronic-igniter (separate type), fuse connector block etc.

Well glass fittings for HPSV lamps higher wattage (250/400 W) floodlight luminaire, the control gear will be separate/non-integral type whereas for high bay, streetlight and mini flood light fixture, the control gear shall be integral type.

SL. NO.	FIXTURE TYPE	REFERENCE FIXTURE NO.	DESCRIPTION	AREA OF USE
1.1	SA	GE GET CI 1X28 C/S HF + Reflector 1X28 (ALM) / eqv.	Surface / pendant mounted with Al reflector commercial / decorative type luminaire suitable for 1 x 28W T5 FL	Swgr room / MCC room / Workshop / Maint. Shop / Office / Toilet / Corridor / Pantry / Stores
1.2	SB	GE GET CI 1X28 C/S HF / eqv.	Surface / pendant mounted without reflector commercial / decorative type luminaire suitable for 1 x 28W T5 FL	Swgr room / MCC room / Workshop / Maint. Shop / Office / Toilet / Corridor / Stairs / Pantry / Stores
1.3	DA	GE GET CI 2X28 C/S HF + Reflector 2X28 (ALM) / eqv.	Surface / pendant mounted with Al reflector commercial / decorative type luminaire suitable for 2 x 28W T5 FL	Swgr room / MCC room / Workshop / Maint. Shop / Office / Toilet / Corridor / Pantry / Stores
1.4	DB	GE GET CI 2X28 C/S HF / eqv.	Surface / pendant mounted without reflector commercial / decorative type luminaire suitable for 2 x 28W T5 FL	Swgr room / MCC room / Workshop / Maint. Shop / Office / Toilet / Corridor / Stairs / Pantry / Stores
1.5	DC	Philips TCS 150 2XTL5-28W MIEBT 228 / eqv.	Decorative, surface / pendant mounted mirror optics luminaire housing made up of CRCA sheet steel, powder coated white, accommodating all electrical accessories pre-wired up to a terminal block suitable for 2 x 28W TL5.	Office rooms / Corridor / Conference Room / Engineer's Room
1.6	DD	Philips TMS 669 M 2XTL5-28W HF D6 / eqv.	Decorative, recess mounted mirror optics luminaire, housing made up of CRCA sheet steel, powder coated white,	False Ceiling areas (Control Room / Electronic Eqpt. Room / Office / Conference room /

SL. NO.	FIXTURE TYPE	REFERENCE FIXTURE NO.	DESCRIPTION	AREA OF USE
			accommodating all electrical accessories pre-wired up to a terminal block suitable for 2 x 28W TL5.	Engineer's Room / Corridor)
1.7	DE	GE MAR228FTL HF / eqv.	Indoor, industrial, corrosion resistant, with diffuser and reflector for lamp, ceiling or suspension mounting luminaire suitable for 2 x 28W T5 FTL.	Battery Room / Chemical Plant / Area with corrosive atmosphere
1.8	MA	Philips HPK250 1XSON250W E / eqv.	Medium and High bay non integral luminaire with aluminium anodized reflector and toughened glass cover suitable for 1 x 250W HPSV lamp	General Indoor equipment area / Pump House / Workshop
1.9	MB	Philips HPK225 1XSON150W E / eqv.	Medium and High bay integral luminaire with aluminium anodized reflector and toughened glass cover suitable for 1 x 150W HPSV lamp	General Indoor equipment area / Pump House / Workshop
1.10	MC / MD	Philips HPK225 1XSON250W /400W E / eqv.	Medium and High bay integral luminaire with aluminium anodized reflector and toughened glass cover suitable for 1 x 250W/400W HPSV lamp	General Indoor equipment area / TG Hall / Pump House
1.11	LA / LB	Philips HPK 150 1XSON-I 70W / eqv.	Integral, higher ingress protection, pressure die-cast Aluminium housing, well glass, luminaire with built in control gear suitable for 1 x 70W HPSV lamp	Boiler Platform / ESP Platform / Dust & Vapour laden areas
1.12	JA/JB	Bajaj BJFW-125MV / eqv.	Flamefroof, weatherproof, non-integral wellglass luminaire for indoor / outdoor applications suitable for 1 x 125W MV lamp	Fuel Oil Pump House / Area with explosive atmosphere
1.13	IA	Philips NXC101 1xA60-60W-CL B22 GR/ eqv.	Weatherproof bulkhead luminaire suitable for 1 x 60W GLS lamp.	DC emergency lighting / staircase / exit point
1.14	NA	Philips TRC033 2XTL-D36W IC / eqv.	Road lighting luminaire, Aluminium steel housing, gear tray cum reflector	Building exterior lighting / Outdoor area lighting /

SL. NO.	FIXTURE TYPE	REFERENCE FIXTURE NO.	DESCRIPTION	AREA OF USE
			made of CRCA sheet, with acrylic cover suitable for 2X36W TL-D.	Outdoor eqpt. Area
1.15	TA	Philips SGP 325 1XSON-T 150W FG / eqv.	Street light luminaire with pressure die cast aluminium housing, POT optics reflector and heat resistant toughened flat glass cover (IP 65) with 1 x 150W HPSV lamp - pole mounted	Street lighting / boundary lighting
1.16	TB	Philips SGP 325 1XSON-T 250W FG / eqv.	Street light luminaire with pressure die cast aluminium housing, POT optics reflector and heat resistant toughened flat glass cover (IP 65) with 1 x 250W HPSV lamp - pole mounted	Street lighting / boundary lighting
1.17	CA	Bajaj BJC-111 / eqv.	Surface mounting decorative luminaire with 1 x 11W CFL	Toilet / Wash basin / staircase
1.18	CB	Philips FCS 100 1XPL-C/2P 18W I 240V / eqv.	Surface mounting decorative downlight luminaire, electrochemical brightened reflector with 1 x 18W PL-C	Lobby / Staircase
1.19	CC	Philips FBH 145 M 1XPL-C/2P 18W / 220V / eqv.	Recess, decorative vertical mounting downlighter, high efficiency optics and option of multiple attachment suitable for 1X 13W/18W PL-C	Control Room / Electronic Eqpt. Room for DC emergency light
1.20	CD	Philips FBH 145 M 2XPL-C/4P 18W HF 240V LH / eqv.	Recess, decorative vertical mounting downlighter, high efficiency optics and option of multiple attachment suitable for 2X 18W PL-C	Control Room / Electronic Eqpt. Room / Conference room / Office / Engineer's Room as UPS emergency light
1.21	PA	Philips SWF231 1XSON-T 150W A / eqv.	Compact, sturdy, general purpose with integral gear floodlight luminaire suitable for with 1 x 150W HPSV lamp	Area lighting / Yard lighting / Floodlighting purpose
1.22	PB	Philips SWF331 1XSON-T 250W	Compact, sturdy, general purpose with integral	Area lighting / Yard lighting /

SL. NO.	FIXTURE TYPE	REFERENCE FIXTURE NO.	DESCRIPTION	AREA OF USE
		A / eqv.	gear floodlight luminaire suitable for with 1 x 250W HPSV lamp	Floodlighting purpose
1.23	PC	Philips RVP302 2XSON-T 250W / eqv.	Compact, sturdy non integral, corrosion resistant with pre anodized aluminium reflector, floodlight luminaire suitable for with 2 x 250W HPSV lamp	Area lighting / Yard lighting / Floodlighting purpose
1.24	PD	Philips RVP302 2XSON-T 400W / eqv.	Compact, sturdy non integral, corrosion resistant with pre anodized aluminium reflector, floodlight luminaire suitable for with 2 x 400W HPSV lamp	Area lighting / Yard lighting / Floodlighting purpose
1.25	BA	Philips SWF231 1XMHN-TD 150W A / eqv.	Compact, sturdy, general purpose with integral gear floodlight luminaire suitable for with 1 x 150W metal halide lamp	Area lighting / Yard lighting / Floodlighting purpose
1.26	BB	Philips SWF331 1XMHN-TD 250W A / eqv.	Compact, sturdy, general purpose with integral gear floodlight luminaire suitable for with 1 x 250W metal halide lamp	Area lighting / Yard lighting / Floodlighting purpose
1.27	BC	Philips RVP302 2XMHN-TD 250W / eqv.	Compact, sturdy non integral, corrosion resistant with pre anodized aluminium reflector, floodlight luminaire suitable for with 2 x 250W metal halide lamp	Area lighting / Yard lighting / Floodlighting purpose
1.28	BD	Philips RVP302 2XMHN-TD 400W / eqv.	Compact, sturdy non integral, corrosion resistant with pre anodized aluminium reflector, floodlight luminaire suitable for with 2 x 400W metal halide lamp	Area lighting / Yard lighting / Floodlighting purpose
1.29	EX	Philips (Exit Lamp) / eqv.	Escape lighting luminaire with "EXIT" sign fitted with 1x20 FLT. Each luminaire shall be self contained 6 volt battery, battery charger unit.	Control Room / Electronic Eqpt. Room / Conference room / Office / Engineer's Room as UPS

SL. NO.	FIXTURE TYPE	REFERENCE FIXTURE NO.	DESCRIPTION	AREA OF USE
			Normally the luminaire shall be ON continuously through 240V AC supply. When AC supply goes OFF the in built battery & inverter system automatically takes on to ignite luminaire for duration of two & half (2½) hours. The battery shall be maintenance free and shall be trickle charged when 240 V AC mains supply is available.	
~~1.30~~	~~FA~~	~~GE Evolve™ LED Outdoor Family IBERIA / eqv..~~	~~Die-cast aluminium housing, decorative luminaire using LED technology with symmetric and asymmetric light distribution, IP 65 rated for optical assembly with high brightness LED- pole mounted.~~	Street lighting / boundary lighting
1.31	Ceiling/Column /wall mounted	Bajaj BJDB 100 with 1X100W. GLS/eqv	Bulkhead luminaire with wire guard, die cast Al alloy body, heat resistant prismatic glass cover with specially designed weather proof gasket.	Emergency light-ing in CHP area

Note 1: The supply also includes associated junction boxes, brackets, supports, hangers, and wires wherever applicable.

2.0 LIGHTING PANEL

2.1	LP-1	415 V A.C. Indoor type Lighting Panel with 415 V, 100A, 3 ph, 4 wire bus, one (1) no. 100A TP & N switch/MCCB as incomer along with ELCB, 24 nos. 20A, 240 V, 1 pole MCBs as outgoing feeders.
2.2	LP-2	415 V A.C. Indoor type Lighting Panel with 415 V, 100A, 3 ph, 4 wire bus, one (1) no. 100A TP & N switch/MCCB as incomer along with ELCB, 18 nos. 20A, 240 V, 1 pole MCBs as outgoing feeders.
2.3	LP-3	415 V A.C. Indoor Lighting panel with 415 V, 3ph, 4W bus & one 63A TP & N Switch/MCCB as incomer with ELCB and 12 nos 20A , 240V 1 pole MCBs as outgoing feeder.
2.4	LP-4	415V A.C. Indoor type Lighting Panel with 415V, 63A, 3 ph, 4 wire bus, one (1) no. 32 A TP & N switch/MCCB as incomer with ELCB, 6 nos. 20A, 240V, 1 pole MCBs as outgoing feeders.

2.5	SLP	415 V A.C. Outdoor type Panel with 415 V, 100A, 3 ph, 4 wire bus, one 100A TP & N switch/MCCB as incomer, 18 nos. 20A, 240V, 1 pole MCBs as outgoing feeders. The lighting panel shall be provided with 63A contactor, frequency compensated timer switch, photo-cell switch push- buttons for automatic control of street/area lighting with provision for manual override.
2.6	DCLP	Indoor type emergency lighting panel with 240V bus, one no Fuse switch as incomer and 6 nos 16A two pole MCB as outgoing feeders.
2.7	FLP	Outdoor, lockable type Isolating switch of 415V, 63A, 3 ph, 4 wire TP & N. with 2 mm sheet steel/cast iron cubicle.
3.0	**RECEPTACLE**	
3.1	RA	6A, 240 V, 2 pole, 3 pin with third pin earthed, suitable for flush mounting in office areas and control room. The switch shall be also flush mounted piano type.
3.2	RB	16A, 240V, 2 pole, 3 pin with third pin earthed, wall/ column mounted, metal clad gasketed construction, 20mm conduit entry, screwed metal cover tied to it by a metal chain, weatherproof suitable for indoor/outdoor installation.
3.3	RC	63A, 415 V, 3 phase, 4 pin interlocked plug and switch with earthing contact, wall/column mounted, metal clad gasketed construction, weatherproof, suitable for loop-in/loop-out connection of 4/C-35 Sq.mm XLPE cable. These shall be fed from Welding DB.
3.4	RD	125 A, 415 V, 3 phase 5 pin interlocked plug & switch with fifth pin earthed, wall/column mounted metal clad gasketed construction, weatherproof, suitable for loop in and loop out connection of 3-1/2C -95 Sq.mm XLPE cable. These shall be fed from A.C-Distribution Board/Station MCC.
4.0	**CEILING FANS**	
4.1	FA	1200 mm sweep ceiling fan with regulator, down rod and canopy.
4.2	FB	1400 mm sweep ceiling fan with regulator, down rod and canopy.
5.0	**LIGHTING POLES**	
5.1	TA/TB	Single arm/double arm swaged and welded steel pole with junction box and all accessories.
6.0	**SWITCHBOARD**	
6.1	S-1	Switch board with 2-6A switch.
6.2	S-2	Switch board with 4-6A switch and 1-6/16A receptacle.
6.3	S-3	Switch board with 6-6A switch and 1-6/16A receptacle.
7.0	**MISCELLANEOUS ITEMS**	
7.1	M1	10 m high car wheel mounted aluminium ladder.
7.2	M2	Adjustable free-standing aluminium ladder height adjustable from 5 m to 10 m.+
7.3	M3	Portable Emergency light set complete with one 20W tube light, battery, battery charger and all other accessories.
7.4	M4	24 Volt Supply Module with all accessories.

ANNEXURE-C

ILLUMINATION LEVEL & AREA WISE LIGHT DISTRIBUTION

Sr. No.	Area/Structure	Average Illumination Level in Lux.	Type of Fixture / Luminaire	Type of Lamp
1.0	**Turbine Generator Building :**			
1.1	General Auxiliary Equipment Areas	100	Industrial Well Glass	70W/150W HPSV/125 W HPMV Lamp
1.2	Cable Spreader Room	70	Industrial type fluorescent lamp with vitreous enamel reflectors	Fluorescent tube (T5) with electronic ballast.
1.3	Switchgear Room	200	Industrial type fluorescent lamp with vitreous enamel reflectors	Fluorescent tube (T5) with electronic ballast.
1.4	TG Building Operating Floor	200	Industrial Integral high bay	250 W/400W HPSV / HPMV lamp
1.5	Main Control Rooms	400	Decorative recessed mounted with mirror optics aluminum anodized reflector	2 x 28W FTL
1.6	Battery Rooms	200	Industrial Corrosion proof luminarie.	2 x 28W FTL.
1.7	Unloading and Maintenance bay	250	Industrial integral high bay	250 W / 400W HPSV /HPMV lamp
2.0	**Boiler Area :**			
2.1	Boiler area and platforms	100	Dust proof / dust tight integral well glass luminaire	70 W HPSV/ 125W HPMV lamp
2.2	Coal Bunker and Mill bay area	100	Dust proof / dust tight integral well glass luminaire	1 x 80 W /125 W HPMV lamp
2.3	ESP areas and Platforms	100	Dust proof / dust tight integral well glass luminaire	70 W HPSV/ 125W HPMV lamp
2.4	ESP Control Room	400	Decorative recessed mounted with mirror optics aluminum anodized reflector	2 x 28 W FTL.
3.0	**Transformer Yard :**			
3.1	General	20	General purpose flood light	250 W/400 W HPSV lamp
3.2	Near equipment	50	Dust proof / dust tight integral well glass	1 x 70 W HPSV lamp
4.0	**Laboratory**			

Sr. No.	Area/Structure	Average Illumination Level in Lux.	Type of Fixture / Luminaire	Type of Lamp
4.1	General	100	Decorative recess / surface mounted/ Suspended type mirror optics	Fluorescent tube (T5) with electronic ballast.
4.2	Analysis Area	300	Industrial Corrosion proof luminarie.	2 x 28W FTL.
~~5.0~~	~~**Various Off-site Buildings :**~~			
~~5.1~~	~~Equipment Room / Switchgear Rooms~~	~~200~~	~~Industrial type fluorescent lamp with vitreous enamel reflectors up to mounting height of 3.5 M or Industrial medium bay integral luminaire for mounting heights between 3.5 to 8 M.~~	~~fluorescent tube (T5) with electronic ballast~~
~~5.2~~	~~Pump Houses/ DG room / Compressor room~~	~~200~~	~~Industrial well glass / Industrial Medium bay integral luminaire~~	~~70 W HPSV/ 150W HPSV~~ lamp
~~5.3~~	~~DM Plant, Pre-Treatment~~	~~150~~	~~Industrial trough type fluorescent/ Industrial Medium bay integral luminaire~~	~~2 x 28W FTL. / 125W HPMV / 150W HPSV lamp~~
~~5.4~~	~~Workshop~~	~~150~~	~~Industrial trough type fluorescent/ Industrial Medium bay integral luminaire~~	~~2 x 28W FTL. / 125W HPMV / 150W HPSV lamp~~
~~6.0~~	~~**Cooling Water Pump House Area :**~~			
~~6.1~~	~~Cooling Tower Area~~	~~30~~	~~Industrial well glass~~	~~70 W HPSV/ 125W HPMV lamp~~
~~6.2~~	~~CW PH~~	~~200~~	~~Industrial medium bay integral luminaire for mounting heights between 3.5 to 8 M~~	~~70 /150 W HPSV or 150 / 250 W HPMV lamp~~
7.0	**Road & Yard Lighting:**			
7.1	Main Roads	20	Integral type street Lighting luminaire with aluminium reflector	150 /250W HPSV lamp
7.2	Secondary Roads	10	-do-	-do-
7.3	Perimeter (Compound) Lighting	10	-do-	-do-
8.0	**Service Building, Canteen, etc.**			
8.1	Main Office /Staff Room	300	Decorative recess mounted mirror optics aluminum anodized reflector	2 x 28W FTL
8.2	Non-Office /Service	300	Decorative recess /	Fluorescent tube

Sr. No.	Area/Structure	Average Illumination Level in Lux.	Type of Fixture / Luminaire	Type of Lamp
	Areas		surface mounted/ Suspended type mirror optics	(T5) with electronic ballast.
9.0	**General :**			
9.1	Corridors, Walkways, Staircase, Lockers etc.	70	Industrial type fluorescent lamp with vitreous enamel reflectors	Fluorescent tube (T5) with electronic ballast.
9.2	Toilets, Wash Rooms, etc.	70	Commercial channel mounted box type	Fluorescent tube (T5) with electronic ballast.
10.0	**400kV SWYD (as applicable)**			
10.1	Control Room	400	Decorative recessed mounted with mirror optics aluminum anodized reflector	2 x 28W FTL
10.2	Switchgear/Electrical Equipment room	200	Industrial type fluores-cent lamp with vitreous enamel reflectors up to mounting height of 3.5 M or Industrial medium bay integral luminaire for mounting heights between 3.5 to 8 M.	fluorescent tube (T5) with electronic ballast
10.3	Battery Room	200	Industrial Corrosion proof luminarie.	2 x 28W FTL.
10.4	Outdoor Operating Area	50	General purpose flood light	250 W/400 W HPSV lamp
10.5	General Outdoor Area	20	General purpose flood light	250 W/400 W HPSV lamp
~~11.0~~	~~**CHP Area**~~			
~~11.1~~	~~Transfer Point, Conveyor gallery, pent house, tunnel, Crusher house & Wagon Tippler~~	~~100~~	~~Dust proof / dust tight integral well glass~~	~~70 W HPSV/125 W HPMV lamp~~
~~11.2~~	~~Coal Stack yard/ Open area/ Marshalling yard~~	~~10~~	~~General purpose flood light & Integral type street Lighting luminaire with aluminium reflector~~	~~150 W/250 W/400 W HPSV lamp~~
~~12.0~~	~~Fuel Oil Tank~~	~~20~~	~~Industrial medium bay integral luminaire/ General purpose flood~~	~~250 W/400 W HPSV lamp~~

Sr. No.	Area/Structure	Average Illumination Level in Lux.	Type of Fixture / Luminaire	Type of Lamp
			light	
~~13.0~~	~~DC Emergency area Main Control room~~	~~50~~	~~Downlight luminaire, recessed type with cylindrical reflector~~	~~Incandescent lamp~~
~~14.0~~	~~DC Emergency other area~~	~~20~~	~~Industrial bulkhead luminaire~~	~~Incandescent lamp~~

* Medium bay fixtures shall be used where the room height is 8 M. Otherwise high bay fixtures are to be used.

Lux level for A.C. Emergency lighting in control room shall be 50 and for other areas 20 lux.

Lux level for main road lighting shall be 20 and for secondary road shall be 10 lux.

~~Lux level for D.C. Emergency lighting in main control room shall be 50 and for other areas 20 lux.~~

Area Wise Distribution of Lighting System

Sl.No.	Area	Normal AC	Emergency AC	Emergency DC	Portable DC
~~1.0~~	~~TG Building general~~	~~80%~~	~~20%~~	~~Yes~~	
~~2.0~~	~~Boiler platform~~	~~80%~~	~~20%~~	~~Yes~~	
~~3.0~~	~~DG / Compressor Room~~	~~80%~~	~~20%~~		~~Yes~~
~~4.0~~	~~ESP Control Room~~	~~80%~~	~~20%~~		~~Yes~~
~~5.0~~	~~Main Control Room~~	~~70%~~	~~30%~~	~~Yes~~	
6.0	Switchyard Control Room	~~100%~~ 80%	20%	Yes	Yes
7.0	Battery Room	80%	20%	Yes	
8.0	Cable Spreader	80%	20%	Yes	
~~9.0~~	~~Pump house, Water Treatment Plant, Ash Handling Plant, Chemical house~~	~~100%~~			~~Yes~~
10.0	~~Cooling Tower, Transformer yard, Store,~~ Switchyard, Area/Street lighting	~~100%~~ 80%	20%		
11.0	~~Coal Handling Plant~~	~~100%~~		~~Yes~~	

ANNEXURE-D

RATINGS AND REQUIREMENTS OF LIGHTING / WELDINGTRANSFORMER

Type	:	Cast Resin Dry Type
KVA rating	:	to be finalized during detail engineering
Voltage rating	:	415 V/415 V
Cooling	:	AN
P.U. Impedance	:	0.045 ± 10%
Voltage control	:	Off load tap switch/link with change of ± 5% in step of 2.5% tapping full capacity.
Vector Group	:	Dyn11
Class of Insulation	:	F (155°C)
Maximum Temperature rise over 50°C. ambient in winding by resistance	:	90°C
Neutral	:	Solidly grounded.

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

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

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

ANNEXURE-E

FITTINGS AND ACCESSORIES OF LIGHTING / WELDING TRANSFORMER

Each transformer shall be equipped with fittings and accessories as listed below :

1. 150 mm dia. winding temperature indicator with maximum reading pointer and electrically separate sets of contacts for trip and alarm
2. Handling and lifting lugs both for enclosure and core-coil assembly.
3. Jacking pad for core-coil assembly.
4. Inspection cover for cable and box.
5. Door handle operated safety limit switch with 1NO + 1NC contact.
6. Ground bus.
7. IP-55 junction box.
8. Rating and terminal marking plates.

Note

All indication, alarm, trip contacts provided shall be rated for 2.0A at 220 V D.C. and 5A at 240 V A.C.

ILLUMINATION SYSTEM
NOTES & DETAILS

NKB	DS	AD	NIL	28.06.13
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, ANDHRA PRADESH, INDIA

ANDHRA PRADESH POWER GENERATION CORPORATION LIMITED
HYDERABAD-A.P. INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT.-COVER | REV. NIL

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REFERENCES:

- IS–732: Code of practice for Elecrtical Wiring Installation.
- IS13408: Code of practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Ponentially Explosive Atmospheres (other than Mining Applications or Explosives Processing and Manufacture).
- National Building Code (NBC).
- National Electrical Code (NEC).
- Indian Electricity Rules.

NOTES & DETAILS:

1. The electrical installation work shall meet the requirements of Indian Electricity Rules, relevatn IS codes of practice and safety codes, as amended upto date. In addition, other rules or regulations as applicable to the work shall be followed.

2. These lighting notes and details shall be read and construed in conjunction with the Illumination Layout and drawings.

3. Except specifically approved by site office, installation of exposed conduits, mounting of lighting fixtures etc. shall be taken up only after all other services such as Piping, Air Ducting, Cable Tray/Busduct Hanger, Structural Bracings etc. in a particular area have been installed.

4. Unless otherwise shown, the mounting heights of lighting fixtures and accessories shall be generally as follows :

a)	I)	Low–Bay Lighting Fixtures in general indoor Areas of Industrial plants.	:	3500 mm from bottom to finished floor.
	II)	Medium Bay Type Fixtures.	:	3500 to less than 8000 mm from bottom to finished floor.
	III)	High Bay Type Fixtures	:	8000 mm and above from Bottom to finished floor.
	iv)	General indoor lightign for residential, commerical area	:	2700 mm from Bottom to finished floor.
b)		Lights over door Openings	:	300 mm bottom of fixture above top of opening.
c)		In Boiler Platform/ Platform around reactor column, reformer, cracker etc.	:	Pendant below Boiler platforms or with brackets from handrail 2000mm above platform.

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d) Receptacles –

I) In control room/office	:	450 mm from finished floor to centre
II) Elsewhere	:	900 mm from finished floor to centre
e) Local Switches	:	1500 mm from finished floor to centre
f) Lighting Panels	:	1800 mm from finished floor to top
g) Ceiling Fans	:	200 mm above lighting fixtures

5. Unless otherwise noted, all lighting fixtures shall be fed from respective lighting panels. Normal AC lighting panels will be fed from Main lighting distribution boards (MLDB). Emergency AC lighting panels will be fed from Emergency Main lighting distribution boards (EMLDB). DC Emrgency lighting distribution boards (DCELDB) will be fed from MLDB and Main DC distribution boards.

6. All outdoor lighting poles/towers shall be provided with fuse/MCBs at their base while receiving incoming cable.

7. Separate neutral wire shall be provided for each circuit. Wiring throughout the installation shall be such that there is no break in the neutral wire in the from of switch or fuse.

8. All exposed conduit runs in battery room, chemical feed station area, water treatment building etc. shall be suitably painted with electrolytic/chemical proof paints.

9. The entire metallic conduit system whether embedded or exposed, shall be electrically continuous and thoroughly grounded.

10. Lighting fixtures shall not be suspended directly from junction box in the main conduit run.

11. Separate conduit shall be used for wiring lighting circuits of different lighting distribution system such as normal AC lighting/emergency AC lighting/emergency DC lighting/low voltage lighting.

12. A.C. and D.C. circuits shall not be run in the same conduit and junction boxes. Circuits fed from different transformers and different batteries (D.C. Source) shall not be run through same conduit and junction boxes.

13. Receptacle circuits shall be kept separate and distinct from lighting and fan circuits.

14. Wires/cable shall be spliced only at junction boxes with ring-tongue lugs or approved equal.

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15. For cable/wire numbering, PVC sleeve with cable/wire Tag number of different colour code shall be used.

16. For roads/outdoor areas, main runs from street/area lighting panels shall be by means of AYWY/AYFY/A2XFY cables, directly buried in ground with proper protection as per details shown or through duct bank.

17. When buried cables cross road/railway track, additional protection to be provided in from of Hume/G.I. Pipe/HDPE pipes. GI pipes/Hume pipes shall not be used for single core cable run.

18. All wiring in hazardous areas shall be carried out either with armoured cables or cables drawn in screwed solid or sameless conduit.

19. For classified hazardous area (othe than mines) havining flammable gases and vapors only, all the items and accessories of illumination system shall have enclosure as provided for the hazardous area classification (Zone 0, Zone 1 and Zone 2) as per code of standard IS-5571 and 5572.

    Lamps containing free matallic sodium (e.g. low pressure sodium vapour lamps) are not permitted for use in hazardous areas.

20. In underground mines, the lighting system shall have a mid or neutral point connected with earth and the voltage shall not exceed 125 volts between phases.

    On the surface of a mine or in an open cast mine, the voltage may be rised to 250 volts, if the neutral fo mid point of the system is connected with earth and voltage between the phases does not exceed 250 volts.

    Where portable hand-lamps are used in under ground working of mine, the voltage shall not be exceed 30 volts.

21. Number of receptacles in an area shall be decided based on utility of this area. However, unless otherwise noted, number of receptacles shall generally be selected based on following guidelines:

    a) For Residental Building, 6A and 16/6A single-phase receptacles shall be considered as per NBC.

    b) For general area (e.g. Electrical room, Pump room, Contro room) of Plant Building. 16/6A receptacle shall be considered.

    c) One (1) number 63A three-phase receptacle shall be provided at each generator busduct area, at each generator-transformer area, station-transformer area, transformer area at switchyard, bioler area, major pump rooms.

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d) 63A three phase receptacle shall be provided at each turbine bay, at eachboiler area, etc. for use of welding machine.

e) Inindustrial plants, 63A three-phase receptacles shall be dicided based on the application requirement.

f) 24v singel-phase receptacle shall be used in boiler platform area and vessels platforms (e.g. reactor, reformers etc.) hazardous classified area. The number shall be decided based on application and area.

22. Unless otherwise noted, the minimum size of cables, wires, conduits, junction boxes shall be as below :

A) CABLES

I)	From main lighting distritbution Boards to 400 V normal AC lighting panels	:	1x3-1/2C, 95 Sq.mm AL PVC/XLPE
II)	From Emergency main lighting distritbution Boards (EMLDB) to 400v Emergency AC lighting panels.	:	1x3-1/2C, 95 Sq.mm AL PVC/XLPE
III)	From Main Lighting Distribution Boards (MLDB) to 400V AC/220V DC Emergency Lighting Distribution Boards (DCELDB)	:	1x3-1/2C, 95 Sq.mm AL PVC/XLPE
Iv)	From Main Lighting Distribution Boards (MLDB) to 400V AC/220V DC Emergency Lighting Distribution Boards (DCELDB)	:	1x3-1/2C, 95 Sq.mm AL PVC/XLPE
v)	From PMCC/MCC/DB to 100A 3 phase receptacles	:	1x3-1/2C, 95 Sq.mm AL PVC/XLPE
vi)	From PMCC/MCC/DB to 63A 3 phase receptacles	:	1x4C, 35 Sq.mm AL PVC/XLPE
vii)	From SLP (Street Lighting Panel) to tower junction box	:	1x4C, 16 Sq.mm AL PVC/XLPE
viii)	From SLP to light pole junction box (for single phase)	:	1x2C, 16 Sq.mm AL PVC/XLPE
Ix)	From SLP to light pole junction box (for three phase)	:	1x4C, 16 Sq.mm AL PVC/XLPE

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B. WIRES

Wires shall generally be PVC insulated650V grade. Each wire shall be of following sizes:

I)	From lighting panels (LPs) to Junction Boxes	:	10sqmm AL (stranded) or 6 sqmm Cu (stranded)
II)	From junction boxes (JBs) to lighting fixtures	:	2.5sqmm Cu
III)	From junction boxes to flood light fixtures	:	2.5sqmm Cu
Iv)	From lighting panels to 24V AC supply modules (complete with 230/24V built-in transformer & 24V receptacle)	:	10sqmm AL (stranded) or 6 sqmm Cu (stranded)
v)	Point wiring of light/ceiling fan/exhaust fan/call bell	:	1.5sqmm Cu (stranded)
vi)	230V, 6A receptacle	:	1.5sqmm Cu (stranded)
vii)	From LP to 230V, 16/6A 1st receptacles	:	4sqmm Cu (stranded)
viii)	From 230V, 16/6A 1st receptacle to 230V 16/6A second receptacle	:	2.5sqmm Cu (stranded)
Ix)	From LP to 230V, 20/6A receptacles	:	4sqmm Cu (stranded)
x)	230V window/split AC starter unit upto 2 Ton capacity	:	4sqmm Cu (stranded)
xI)	Circuit wiring from LP to switchboard	:	2.5sqmm Cu (stranded)
xII)	From street light panel to lighting pole JB (If conduit used)	:	16sqmm AL (stranded) or 6 sqmm Cu (stranded)
xIII)	From street light pole junction box to street light fixture	:	2.5sqmm Cu (stranded)

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C. CONDUITS

a) Unless otherwise noted, in residential and commerical building, PVC conduit shall generally be used for concealed conduiting purpose both in masonry wall as well as in concrete portion. Two numbers 18 SWG GI fish wires shall be drawn inside each conduit while embedding in concrete portion. At both ends of each conduit a minimum 400mm length of fish wiers shall be ketp by cooling, for pulling of wires. All exposed conduits above false ceiling shall be Galvanised iron (GI) or Enameled iron (EI).

b) In plant area GI conduit shall be used at surface. Unless otherwise noted, in Non-Plant building rigid PVC conduit shall be used at surface.

c) Conduits shall generally be Galvanised iron (GI)/ Enameled iron (EI)/PVC of following minimun sizes:

	Wire Size	Conduit. Size					
		20MM	25MM	32MM	40MM	50MM	
I)	10 Sq.mm AL	–	2	5	7	8	Maximum no. of wires admissable for conduit
II)	6 Sq.mm Cu	2	3	7	–	–	
III)	4 Sq.mm Cu	3	5	10	–	–	
Iv)	2.5 Sq.mm CU	4	6	10	–	–	
v)	2.5 Sq.mm CU	4	6	10	–	–	

D. JUNCTION BOXES

	Conduit Size (MM)	Junction Box Size (MM)			
		4-WAY	3-WAY	STRAIGHT THROUGH	90°
I)	20 / 25	150x150x100	150x100x100	88 ø	88 ø
II)	32 / 40	254x200x127	254x200x127	150x150x100	–
III)	50	254x200x127	254x200x127	254x200x127	–

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14	
APPVD.	REVWD.	CHKD.	REV.	DATE	

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 08 | REV. A

A4_DD (9-96) [210x297]

23. All lighting panels/distribution boards, junction boxes, receptacles fixtures, conduits, etc. shal be grounded in compliance with the provision of I.E. rules and as detailed below :

I)	Lighting Panels	:	35 x 6 mm G.S. Flat
II)	Distribution Boards	:	50 x 6 mm G.S. Flat
III)	Power receptacles Junction Boxes etc.	:	12 SWG G.I. Wire
Iv)	Lighting fixtures, switches conduits, etc.	:	16 SWG G.I. Wire
v)	Street Light Poles and Towers for floodlighting	:	25 x 3 mm G.S. Flat

24. A continious ground conductor of 16 SWG GI.wire shall run along each exposed metallic conduit run and bonded to it every 600mm.

25. For a run of conduit partly or wholly embedded, PVC insulated stranded copper conductor wire, as ground conductor shall run through the conduit.

26. Typical details of lighting fixtures, other lightign system components and their mounting arrangement as shown herein are for general guidance only. The type no. of some make has been referred in the various drawings only to indicate desired appearance and construction features of the fixture. The contactor has to design the same fulfilling the requirement of the specification.

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HYDERABAD - TELANGANA - INDIA

					TITLE: ILLUMINATION SYSTEM NOTES & DETAILS
DS	DS	AD	A	24.09.14	PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA
APPVD.	REVWD.	CHKD.	REV.	DATE	

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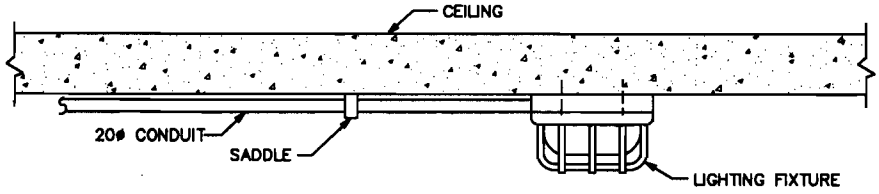
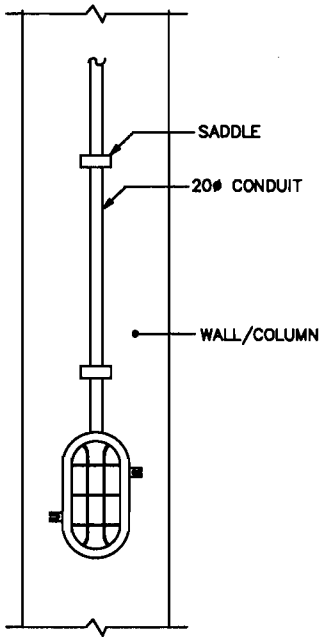
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 07 | REV. A

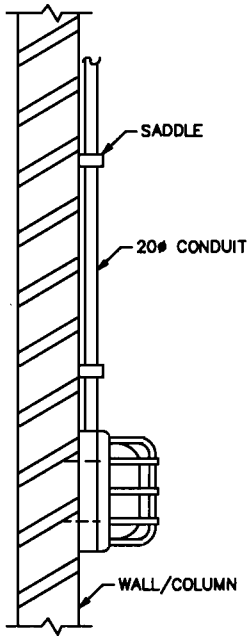
A4_DD (9-96) [210x297]



CEILING MOUNTING



VIEW – AA



WALL/COLUMN MOUNTING

VIEW – AA

BULKHEAD LUMINAIRE

BULKHEAD LUMINAIRE WITH 100W/60W GLS OR 9W CFL
[EQ. PHILIPS TYPE NXC 101(1xGLS 60W)/FXC 101(1xPL-S 9W)]
[EQ. BAJAJ TYPE BJDB100(1xGLS 100W)/BJBE19(9W CLF)]

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DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

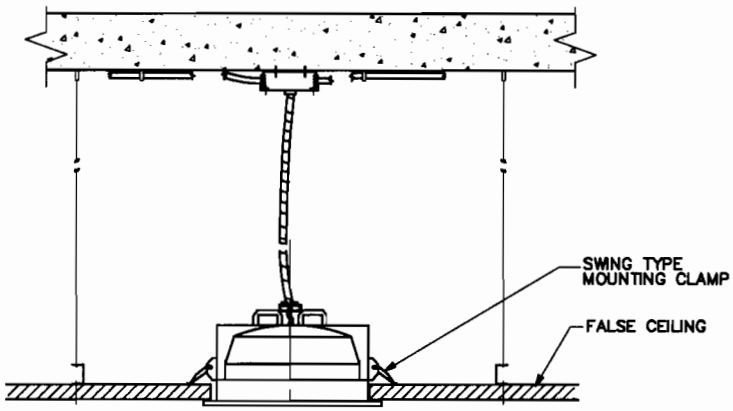
TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

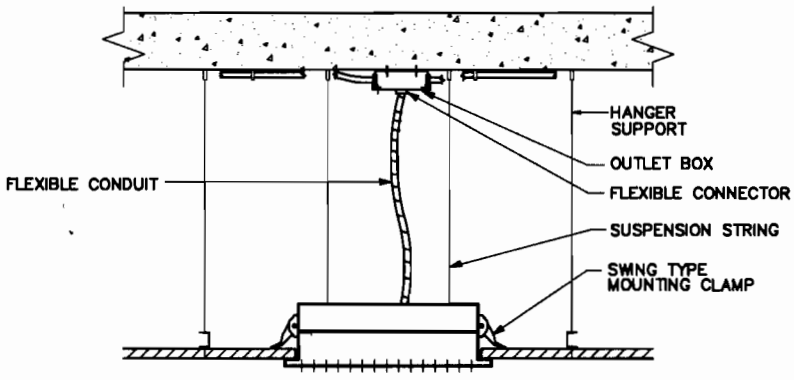
DWG. NO. 13A06-DWG-E-0800 | REV. A | SHT. 08

A4_DD (9-96) [210x297]



RECESS MOUNTED DOWNLIGHT

NOTE:-
RECESSED, DECORATIVE, SINGLE/TWIN LAMP HOROZONTAL MOUNTING CFL DOWN LIGHT
[EQ. BAJAJ TYPE BJDR110(CFL 1x10W), BJDR113(CFL 1x13W),BJDR118(CFL 1x18W), BJDR29(CFL 2x9W)]
[EQ. BAJAJ TYPE BJDR210LH(CFL 2x10W), BJDR213LH(CFL 2x13W), BJDR218LH(CFL 2x18W)]
[EQ. PHILIPS TYPE FBH120(PL-C 1X10W), FBH150/145(PL-C 1X13W, 1X18W, 2X13W, 2X18W)]



RECESS MOUNTED MIRROR OPTICS LUMINAIRE

RECESSED, DECORATIVE, MIRROR OPTICS LUMINAIRE
SUITABLE FOR 2X9W, 2X11W, 2X18W, 2X36W
& 3X36W PL-L/CFL-L LAMPS AND WITH
HIGH FREQUENCY ELECTRONIC GEAR.
[EQ. PHILIPS TYPE FBS SERIES]
[EQ. BAJAJ TYPE BMMR, BJMR & BJMMA SERIES]

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DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

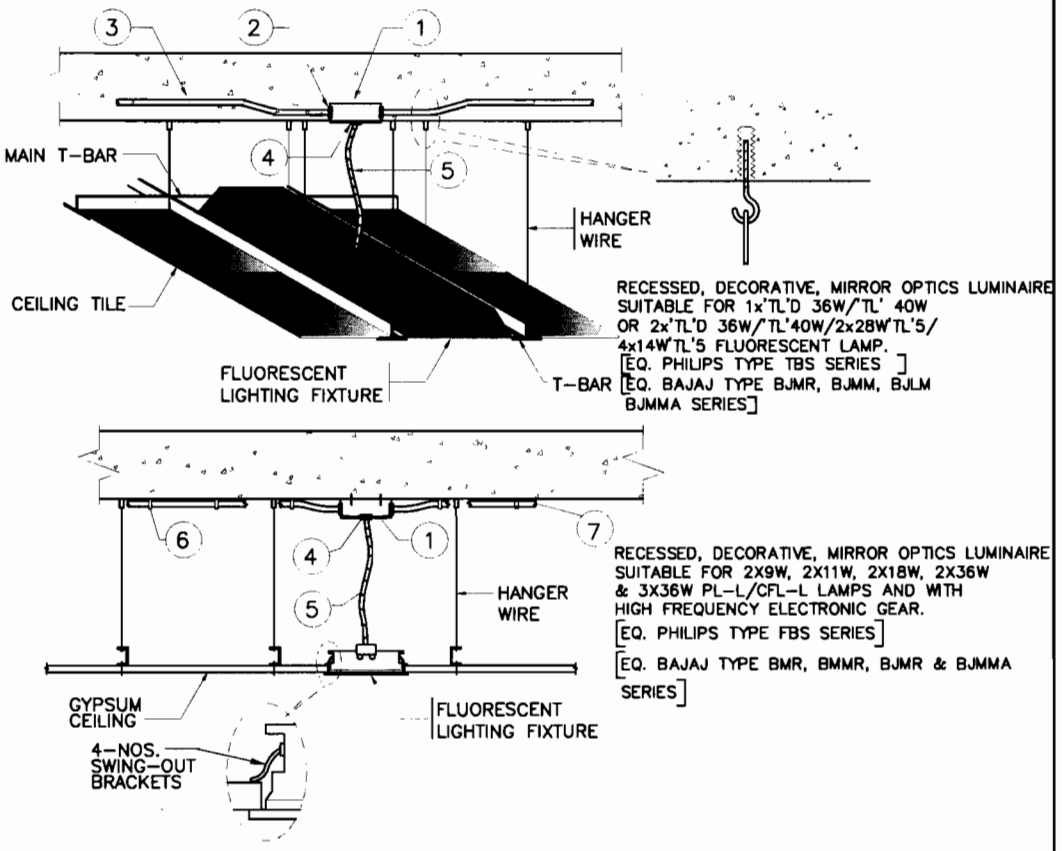
TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 | REV. A | SHT. 09

A4_DD (9-96) [210x297]



RECESS MOUNTED LUMINARIES

NO.	DESCRIPTION
1	OUTLET BOX
2	PVC CONNECTOR
3	HI-PVC CONDUIT
4	FLEXIBLE CONNECTOR
5	FLEXIBLE CONDUIT
6	SADDLE
7	ELECTRICAL METALIC CONDUCTOR

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HYDERABAD - TELANGANA - INDIA

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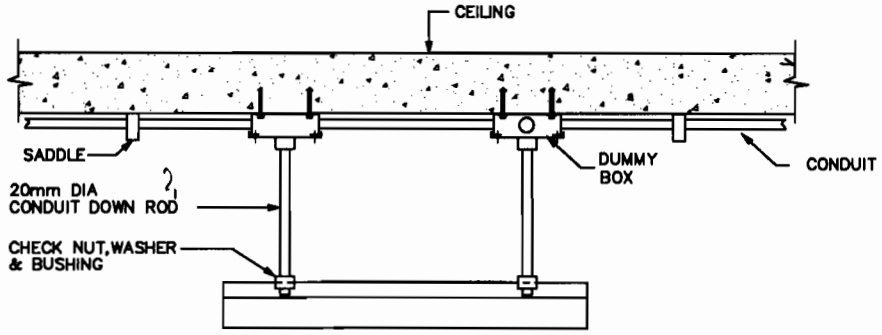
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

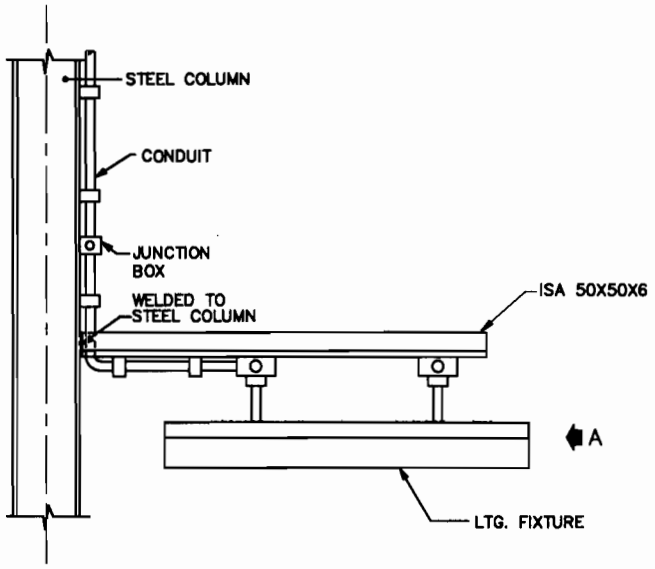
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 10 | REV. A

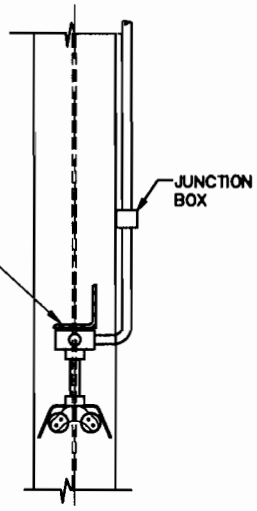
A4_DD (9-96) [210x297]



PENDANT/CEILING MOUNTING



CANTILEVER MOUNTING



VIEW-A

INDUSTRIAL REFLECTOR LUMINAIRE SUITABLE FOR 1x'TL'D 36W/'TL' 40W , 2x'TL'D 36W/'TL'40W , 1x'TL'5 28W OR 2x'TL'5 28W FLUORESCENT LAMP.

[EQ. PHILIPS TYPE TKC24/TMS122]

[EQ. BAJAJ TYPE BJIV/BTIA]

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HYDERABAD - TELANGANA - INDIA

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PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

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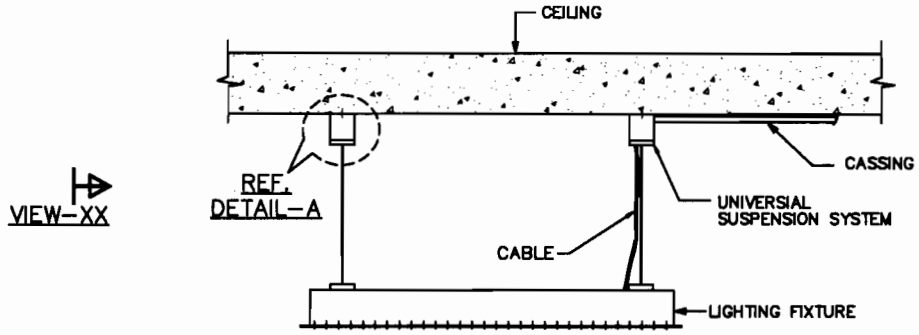
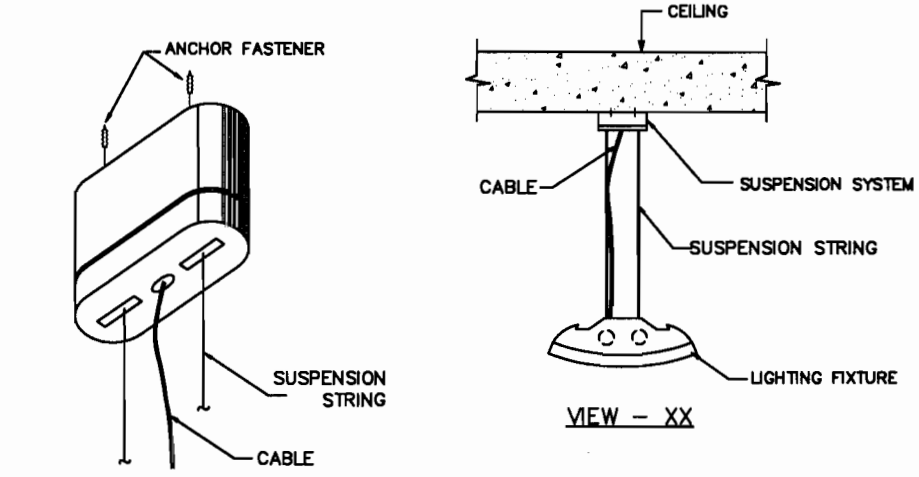
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 | SHT. 11 | REV. A

A4_DD (9-96) [210x297]





UNIVERSAL SUSPENSION SYSTEM
DETAIL-A

SUSPENDED LUMINIARIES

SUSPENDED MOUNTED FUNCTIONAL AND DECORATIVE MIRROR OPTICS LUMINAIRES
WITH 'TL'D/'TL-5' FLOURESCENT LAMP WITH 1X36W 'TL'D/2X36W 'TL'D OR 1X18W 'TL'-5/2X36W 'TL'-5
[EQ. PHILIPS TYPE TPS 498]

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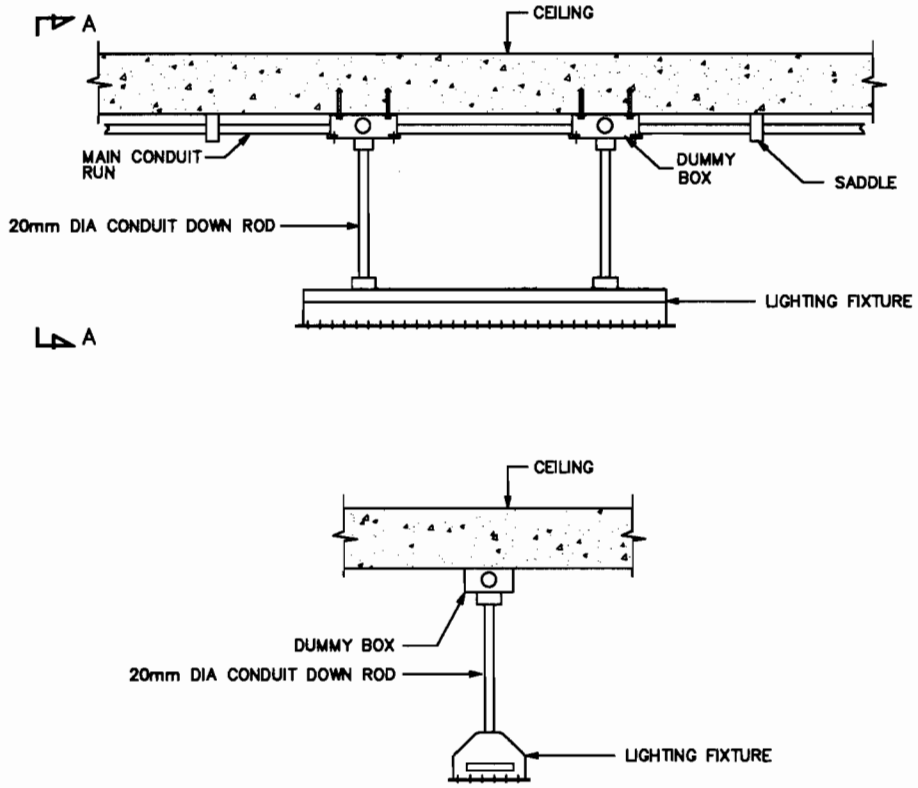
HYDERABAD - TELANGANA - INDIA

					TITLE: ILLUMINATION SYSTEM NOTES & DETAILS	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA . MUMBAI . CHENNAI . NEW DELHI	
DS	DS	AD	A	24.09.14	PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA	JOB NO. 13A06	SCALE : NIL
APPVD.	REVWD.	CHKD.	REV.	DATE		DWG. NO. 13A06-DWG-E-0800 SHT. 12	REV. A

A4_DD (9-96) [210x297]



VIEW – A–A

PENDANT/CEILING MOUNTING

WIDESPREAD MIRROR OPTICS LUMINAIRES WITH 'TL'D/'TL' FLOURESCENT LAMP WITH 1X36W 'TL'D/2X36W 'TL'D

[EQ. PHILIPS TYPE TCS 306]

[EQ. BAJAJ TYPE BTSM218/236 WEB2]

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HYDERABAD – TELANGANA – INDIA

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APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

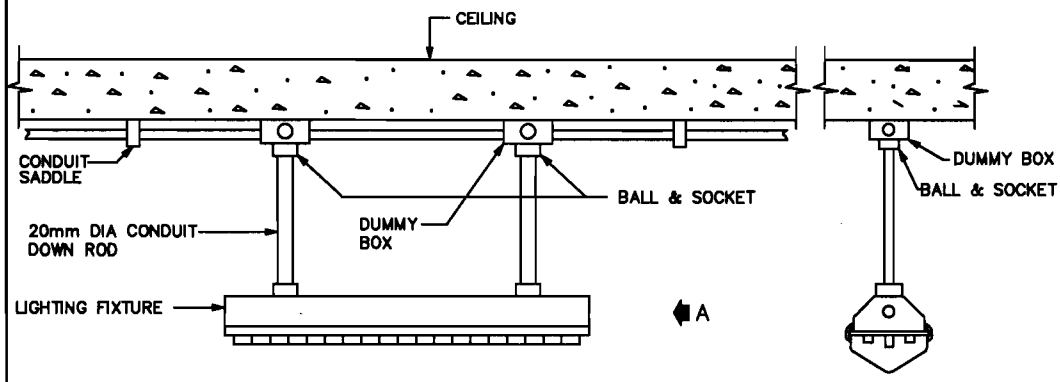
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 13 | REV. A

A4_DD (9-96) [210x297]



PENDANT/CEILING MOUNTING

VIEW–A

DUST AND JET WATER RESISTANT
FOR SINGLE AND TWIN TL–D AND T–5 WITH
1X36W 'TL'D/1X18W 'TL'D/2X36W 'TL'D/2X18W 'TL'D/
1X28W 'TL'5/2X28W'TL'5
[EQ. PHILIPS TYPE TCW 097]
[EQ. BAJAJ TYPE BJ236/240DP]

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PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 | SHT. 14 | REV. A

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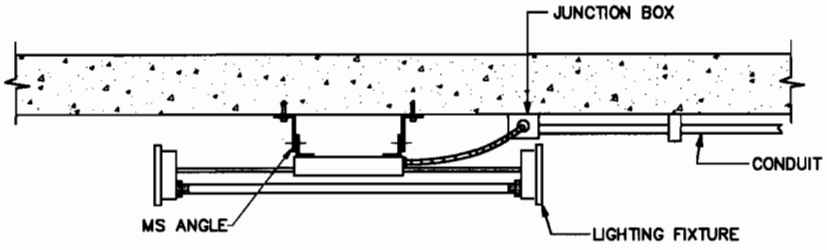
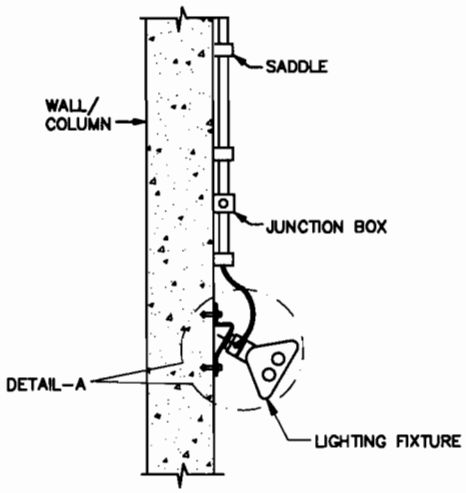
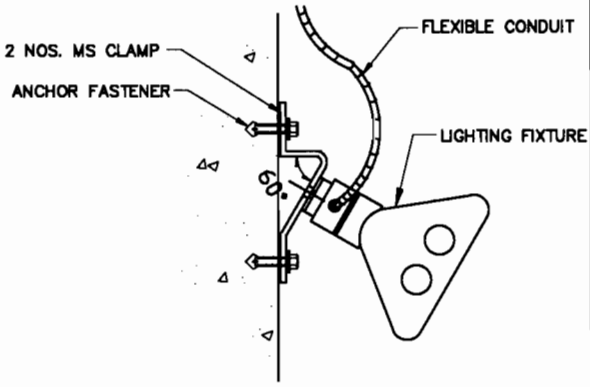


CEILING MOUNTING





DETAIL-A

WALL/COLUMN MOUNTING

CORROSION-RESISTANT INDUSTRIAL BATTEN FOR 'TL'/'TL'D FLOURESCENT LAMP WITH 2X36W 'TL'D/2X40W 'TL'

[EQ. PHILIPS TYPE TMX 95]

[EQ. BAJAJ TYPE BJ240VP]

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HYDERABAD - TELANGANA - INDIA

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TITLE: ILLUSTRATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 15 | REV. A

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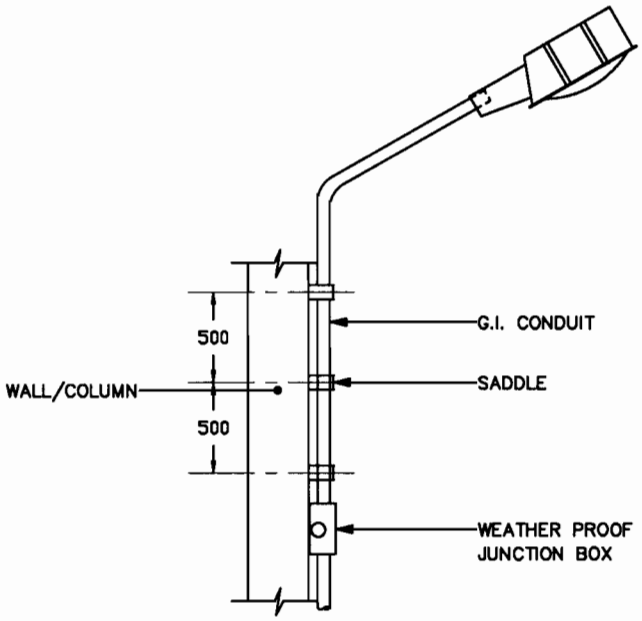

MOUNTED IN BUILDING WALL/COLUMN

ROAD LIGHTING LUMINAIRE WITH
18/36W TLD, 28/54 TL5,
SON 70/150/250/400W,
HPL-N 125/250W LAMP

[PHILIPS TYPE SRP/TRC/HGS/
HRP/SRX/SGP SERIES OR EQUAL]

[BAJAJ TYPE BJMIP SERIES OR EQUAL]

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
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TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06	SCALE : NIL	
DWG. NO. 13A06-DWG-E-0800	SHT. 16	REV. A

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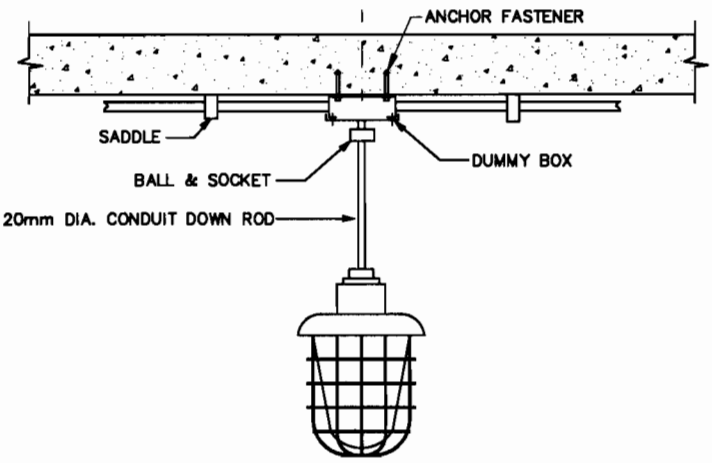
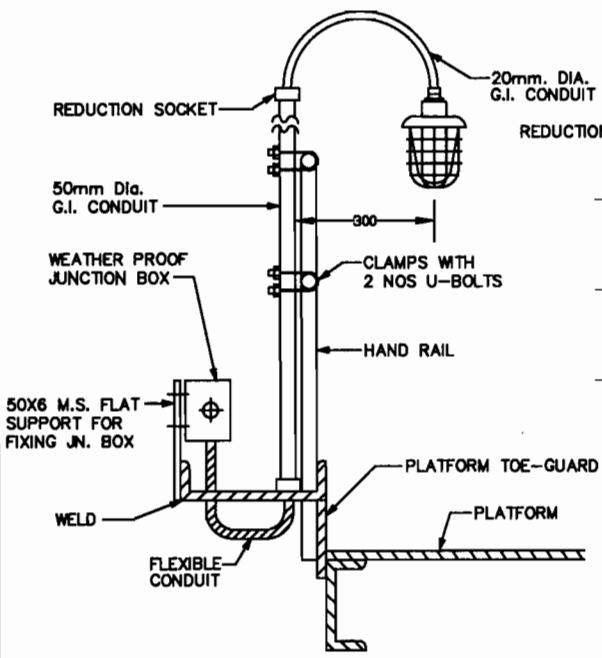
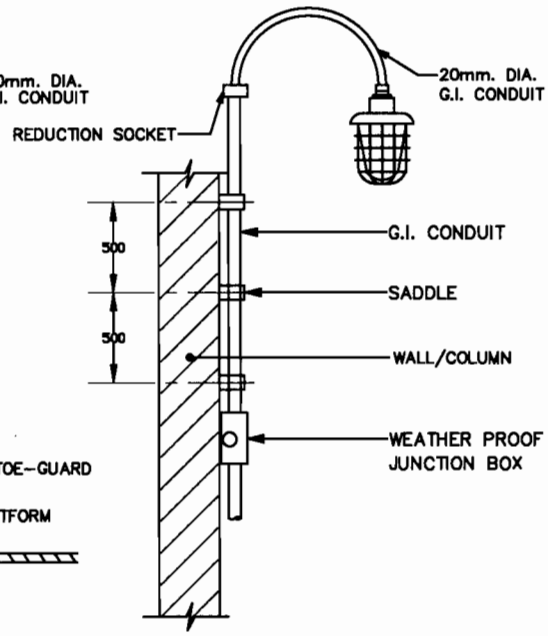


PENDANT/CEILING MOUNTING



PLATFORM MOUNTED



MOUNTED IN BUILDING WALL/COLUMN

INDOOR WELL GLASS INDUSTRIAL LUMINAIRE WITH NON INTEGRAL CG BOX

[EQ. PHILIPS TYPE NDC 21(1XGLS 500W, 1XHPL-N 250W, 1XSON 150W OR 250W]

[EQ. PHILIPS TYPE NDC 203(1XGLS 200W, 1XHPL-N 80W OR 125W, 1XSON 70(I) OR 70W(E), ML-N 160W]

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 17 | REV. A

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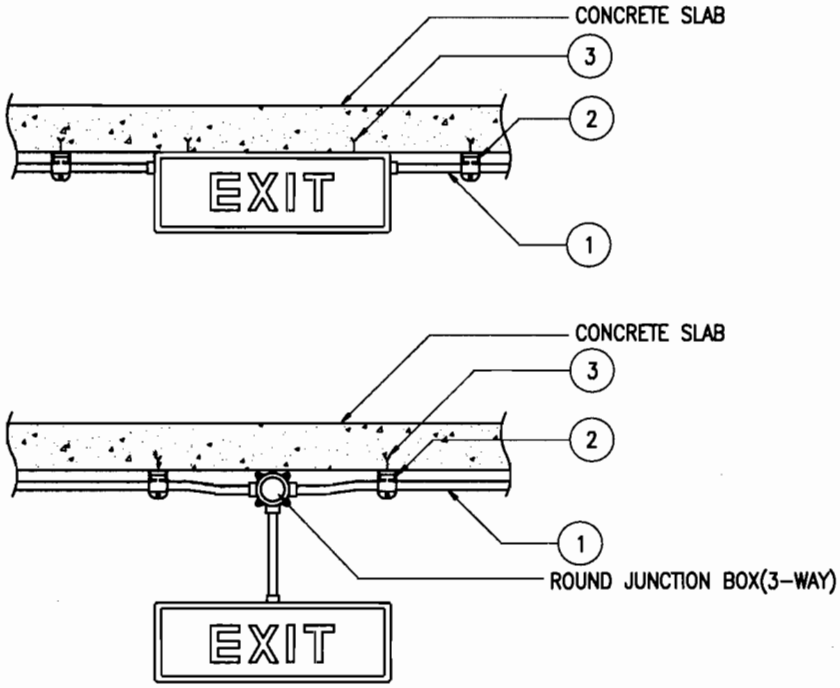

NO.	DESCRIPTION
1	H.D.G STEEL CONDUIT
2	UNISTRUT CHANNEL W/PIPE CLAMP
3	CON'C EXPANSION ANCHOR

EXIT LIGHT MOUNTING DETAIL

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HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

DS	DS	AD	A	24.09.14
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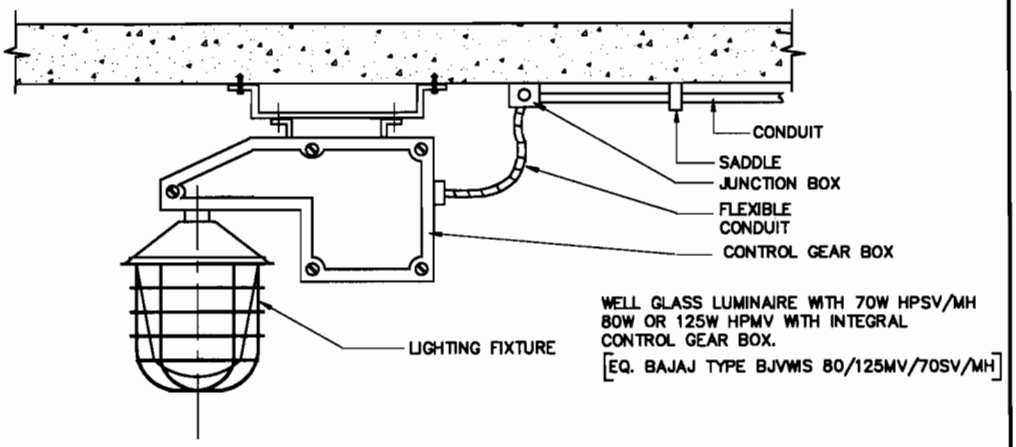
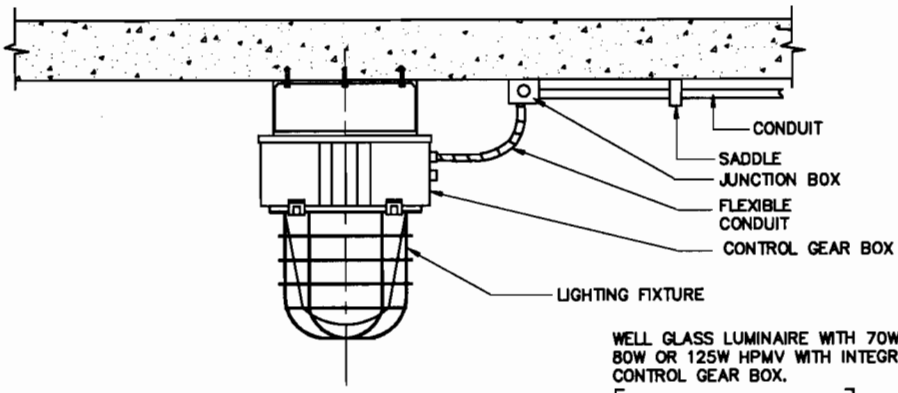
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 18 | REV. A

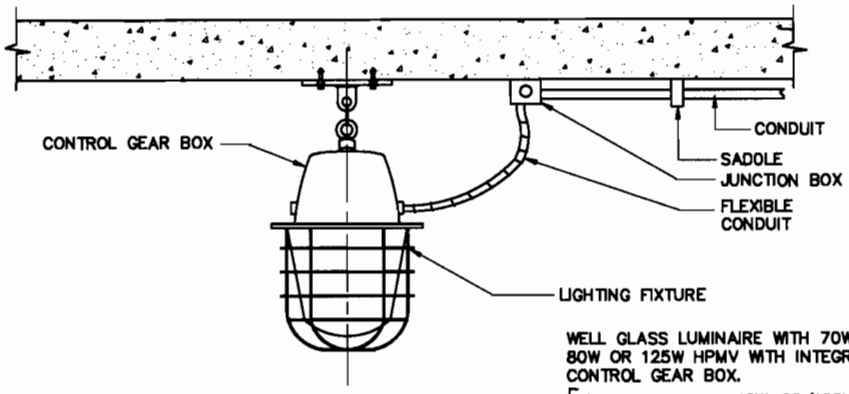
A4_DD (9-96) [210x297]



WELL GLASS LUMINAIRE WITH 70W HPSV/MH 80W OR 125W HPMV WITH INTEGRAL CONTROL GEAR BOX.
[EQ. BAJAJ TYPE BJVWIS 80/125MV/70SV/MH]



WELL GLASS LUMINAIRE WITH 70W HPSV/ 80W OR 125W HPMV WITH INTEGRAL CONTROL GEAR BOX.
[EQ. PHILIPS TYPE SDL 203]



WELL GLASS LUMINAIRE WITH 70W HPSV/ 80W OR 125W HPMV WITH INTEGRAL CONTROL GEAR BOX.
[EQ. BAJAJ TYPE BJISW-80/125MV(I) OR 70SV(I)]

INDUSTRIAL WELL GLASS CEILING MOUNTED LUMINAIRES

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 19 | REV. A

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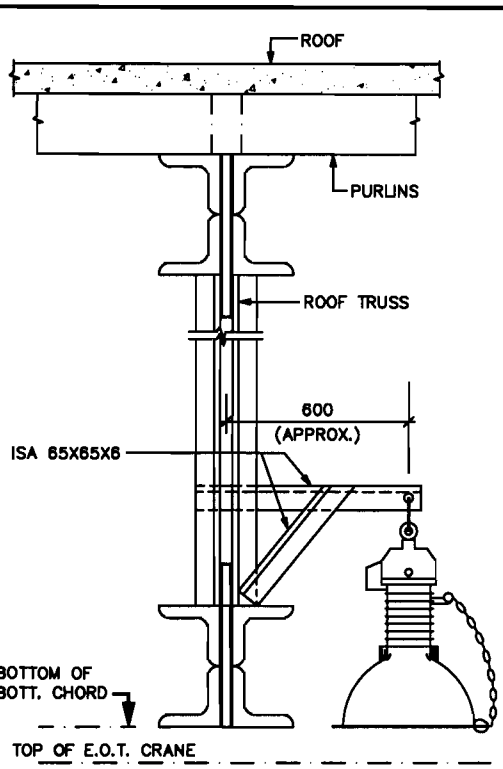
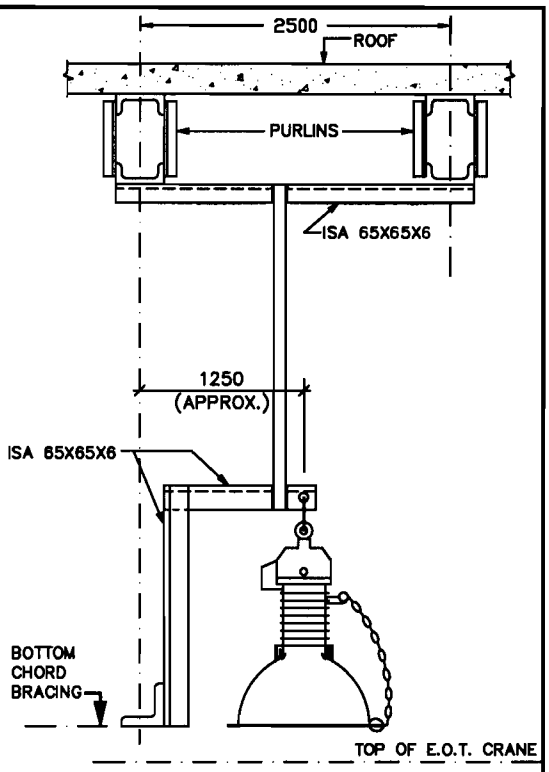
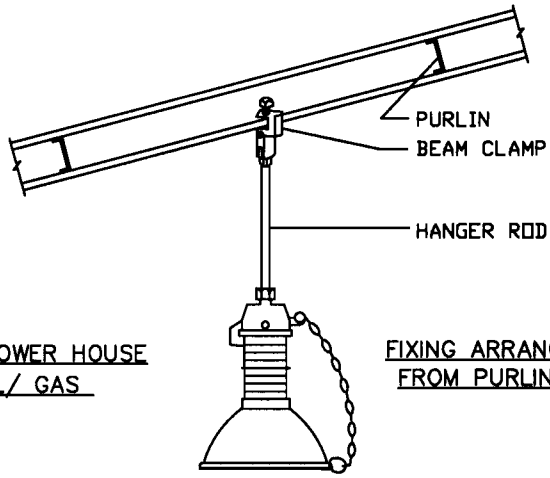


FIXING ARRANGEMENT
FROM ROOF TRUSS



FIXING ARRANGEMENT FROM
BOTTOM CHORD BRACING



TYP. FIXING ARRGT. IN POWER HOUSE
FROM ROOF OF T.G. HALL/ GAS
COMPRESSOR HALL

FIXING ARRANGEMENT
FROM PURLIN

HIGH PERFORMANCE HIGH BAY AND MEDIUM BAY LUMINAIRE
WITH HPSV LAMPS (150 TO 400W), HIGH PRESSURE MERCURY VAPOUR
AND METAL HALIDE LAMPS (250 TO 400W).
[EQ. PHILIPS TYPE HPK 225/HPK 205]
[EQ. BAJAJ TYPE BGEHB]

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

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TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

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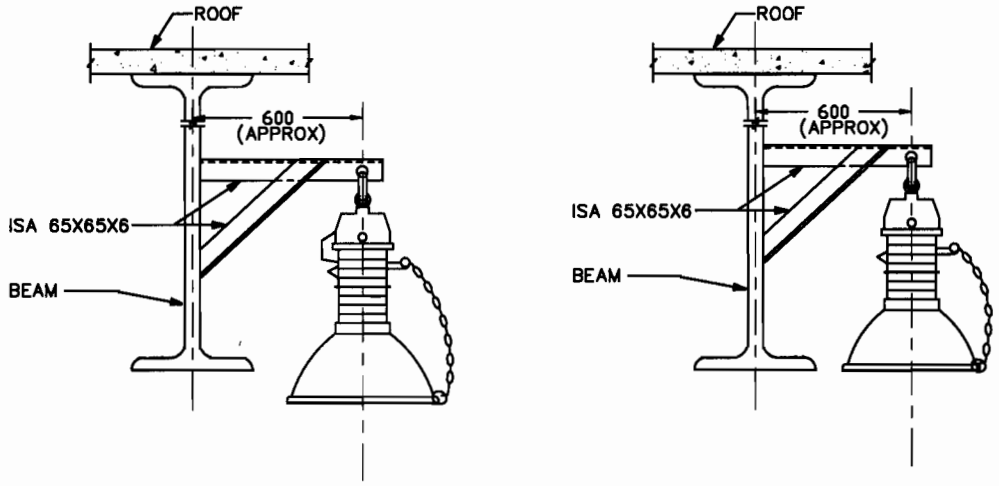

TYPICAL FIXING ARRGT. FROM BEAM

(IN AREA OTHER THAN POWER HOUSE T.G. HALL)

HIGH PERFORMANCE HIGH BAY AND MEDIUM BAY LUMINAIRE WITH HPSV LAMPS (150 TO 400W), HIGH PRESSURE MERCURY VAPOUR AND METAL HALIDE LAMPS (250 TO 400W).

[EQ. PHILIPS TYPE HPK 225/HPK-205]

[EQ. BAJAJ TYPE BGEHB]

NOTE:

BOTTOM OF FIXTURE ELEVATION SHALL BE FLUSH WITH OR BELOW BOTTOM OF BEAM ELEVATION DEPENDING ON THE BOTTOM OF FIXTURE ELEVATION AND THE ASSOCIATED BEAM SIZE, IN ANY CASE BOTTOM OF FIXTURE ELEVATION SHALL NOT BE ABOVE THE ASSOCITED BOTTOM OF BEAM ELEVATION.

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HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 | REV. A | SHT. 21

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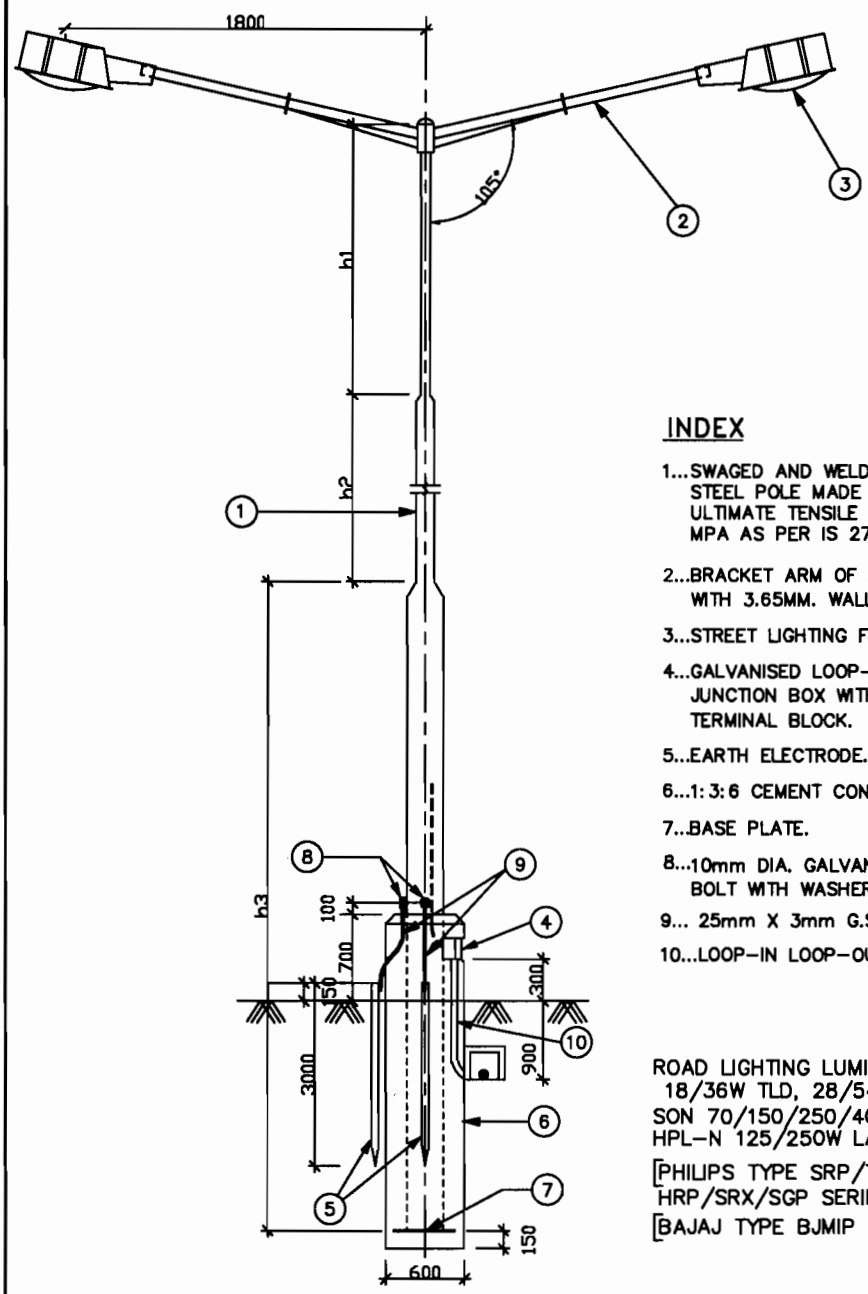

INDEX

1...SWAGED AND WELDED GALVANISED STEEL POLE MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPA AS PER IS 2713 PART–III.

2...BRACKET ARM OF 50MM. DIA. PIPE WITH 3.65MM. WALL THICKNESS.

3...STREET LIGHTING FIXTURE.

4...GALVANISED LOOP–IN LOOP–OUT JUNCTION BOX WITH SP MCB, TERMINAL BLOCK.

5...EARTH ELECTRODE.

6...1:3:6 CEMENT CONCRETE SQ. FOOTING.

7...BASE PLATE.

8...10mm DIA. GALVANISED M.S. EARTHING BOLT WITH WASHER.

9... 25mm X 3mm G.S. FLAT.

10...LOOP–IN LOOP–OUT GI PIPES.

ROAD LIGHTING LUMINAIRE WITH 18/36W TLD, 28/54 TL5, SON 70/150/250/400W, HPL–N 125/250W LAMP

[PHILIPS TYPE SRP/TRC/HGS/ HRP/SRX/SGP SERIES OR EQUAL]

[BAJAJ TYPE BJMIP SERIES OR EQUAL]

SWAGED AND WELDED POLE WITH DOUBLE ARM

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

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TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE–VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06–DWG–E–0800 SHT. 22 | REV. A

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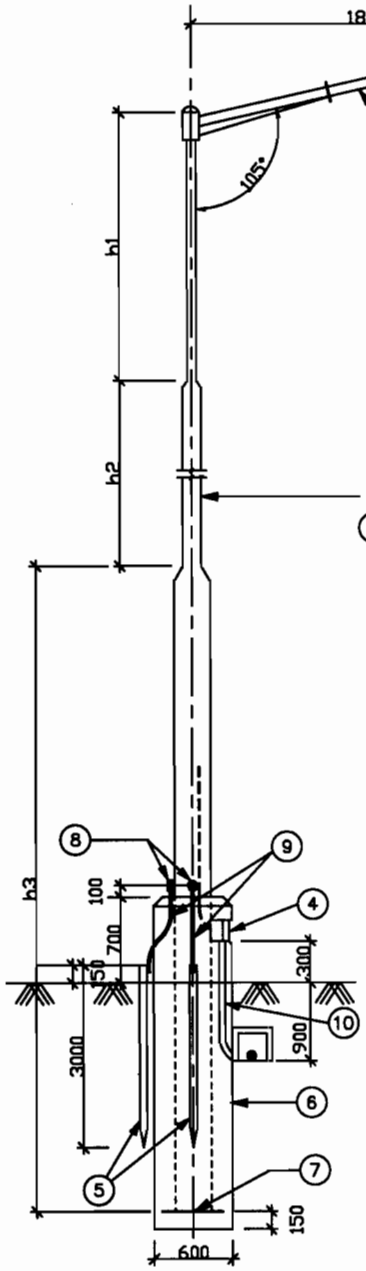

INDEX

1...SWAGED AND WELDED GALVANISED STEEL POLE MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPA AS PER IS 2713 PART–III.

2...BRACKET ARM OF 50MM. DIA. PIPE WITH 3.65MM. WALL THICKNESS.

3...STREET LIGHTING FIXTURE.

4...GALVANISED LOOP–IN LOOP–OUT JUNCTION BOX WITH SP MCB, TERMINAL BLOCK.

5...EARTH ELECTRODE.

6...1:3:6 CEMENT CONCRETE SQ. FOOTING.

7...BASE PLATE.

8...10mm DIA. GALVANISED M.S. EARTHING BOLT WITH WASHER.

9... 25mm X 3mm G.S. FLAT.

10...LOOP–IN LOOP–OUT GI PIPES.

ROAD LIGHTING LUMINAIRE WITH 18/36W TLD, 28/54 TL5, SON 70/150/250/400W, HPL–N 125/250W LAMP

[PHILIPS TYPE SRP/TRC/HGS/ HRP/SRX/SGP SERIES OR EQUAL]

[BAJAJ TYPE BJMIP SERIES OR EQUAL]

SWAGED AND WELDED POLE WITH SINGLE ARM

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

DS	DS	AD	A	24.08.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE–VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06–DWG–E–0800 SHT. 23 | REV. A

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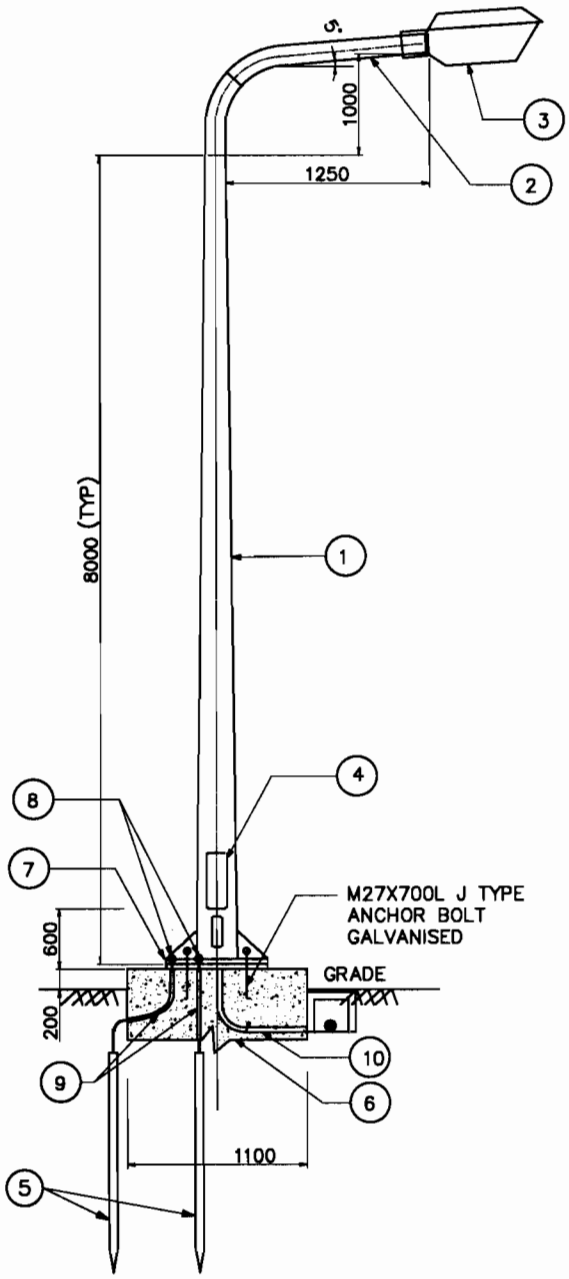

POLYGONAL SINGLE PIECE POLE

INDEX

1... SINGLE PIECE MS GALVANISED STRUCTURE CONTINUOUSLY TAPERED POLYGONAL CROSS SECTION LIGHT POLE AS PER BS 5649.

2... BRACKET ARM OF 50MM. DIA. PIPE WITH 3.65MM. WALL THICKNESS.

3... STREET LIGHTING FIXTURE.

4... 550 X 200 HINGED DOOR OPENING FOR SP MCB, TERMINAL BLOCK.

5... EARTH SPRIKE.

6... 1:3:6 CEMENT CONCRETE SQ. FOOTING.

7... 450 X 450 BASE PLATE.

8... 10mm DIA. GALVANISED M.S. EARTHING BOLT WITH WASHER.

9... 8 SWG GI WIRE THROUGH 25ø GI CONDUIT.

10... LOOP-IN LOOP-OUT GI PIPES.

ROAD LIGHTING LUMINAIRE WITH 18/36W TLD, 28/54 TL5, SON 70/150/250/400W, HPL-N 125/250W LAMP

[PHILIPS TYPE SRP/TRC/HGS/ HRP/SRX/SGP SERIES OR EQUAL]

[BAJAJ TYPE BJMIP SERIES OR EQUAL]

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
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JOB NO. 13A06 | SCALE : NIL

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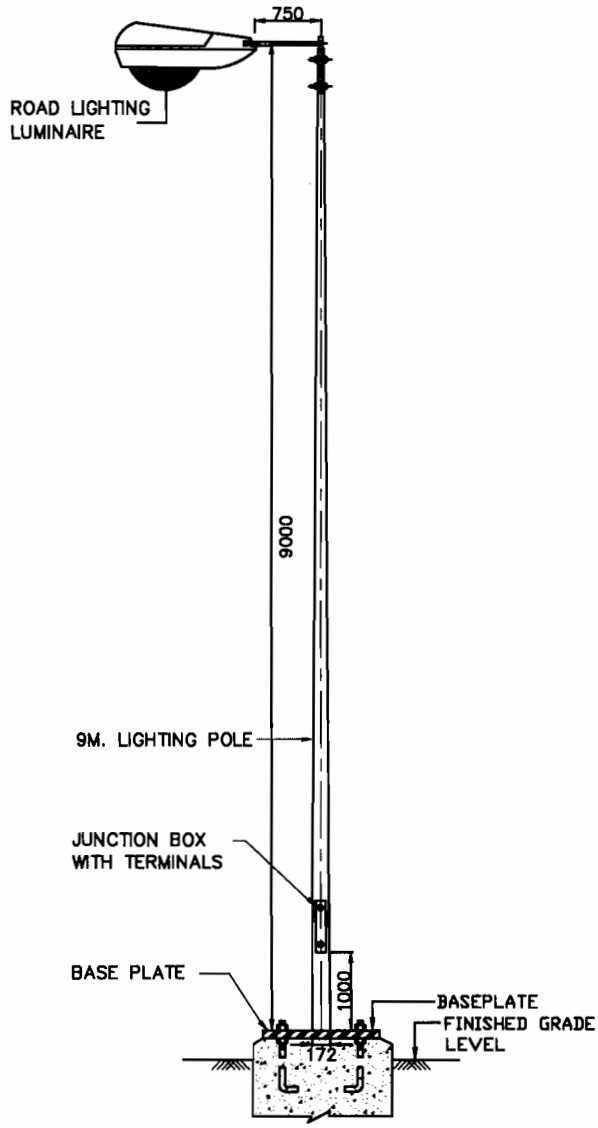

ROAD LIGHTING POLE

(POLE GROUNDING ARRANGEMENT SHALL BE IN LINE WITH SHEET NO 22)

ROAD LIGHTING LUMINAIRE WITH 18/36W TLD, 28/54 TL5,
SON 70/150/250/400W, HPL-N 125/250W LAMP
OR CFL 11W/18W/36W..
[PHILIPS TYPE SRP/TRC/HGS/FGS/HRP/FRP/SRX/SGP SERIES OR EQUAL]
[BAJAJ TYPE BJSLA/BJMIP SERIES OR EQUAL]

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
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TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
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JOB NO. 13A06 | SCALE : NIL

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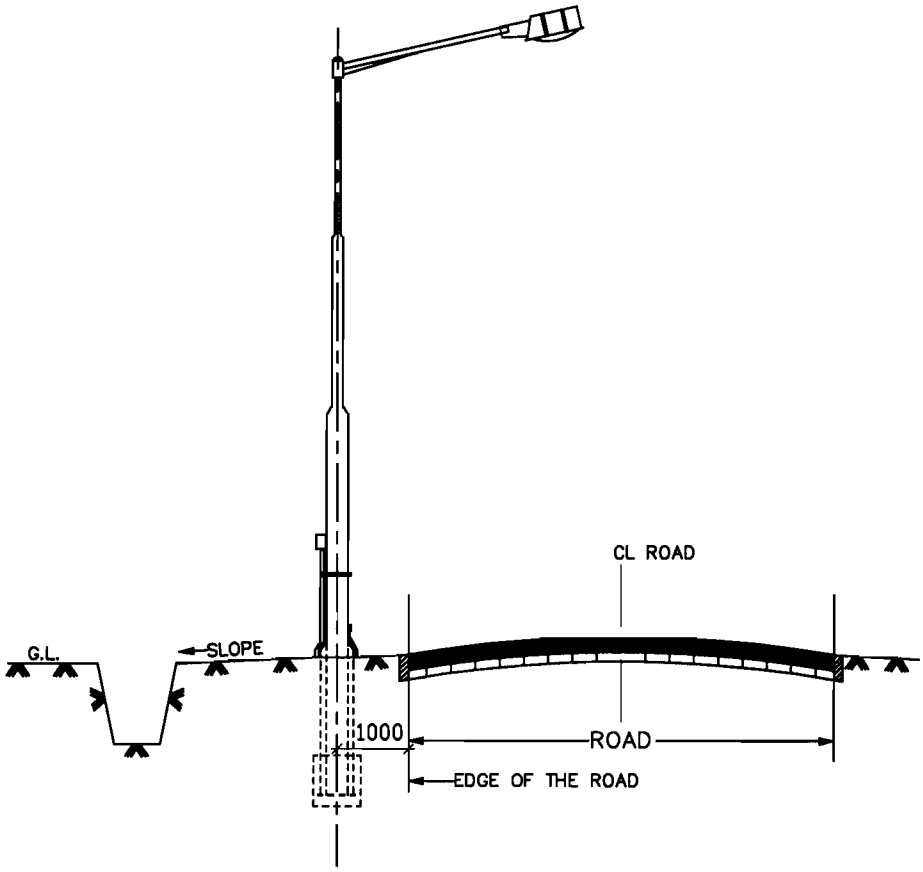

TYPICAL ARRANGEMENT OF ROAD LIGHT POLE

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

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APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

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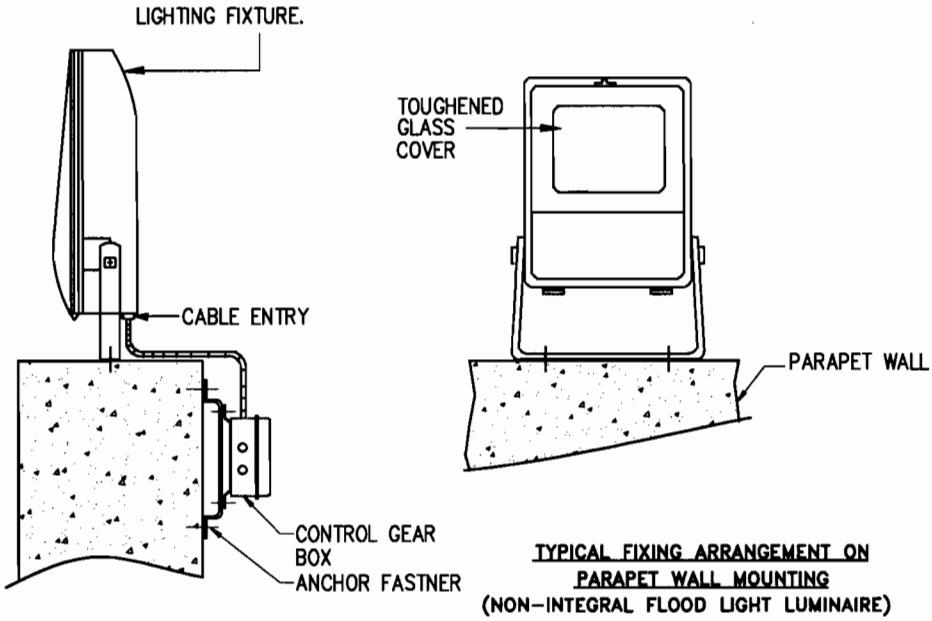
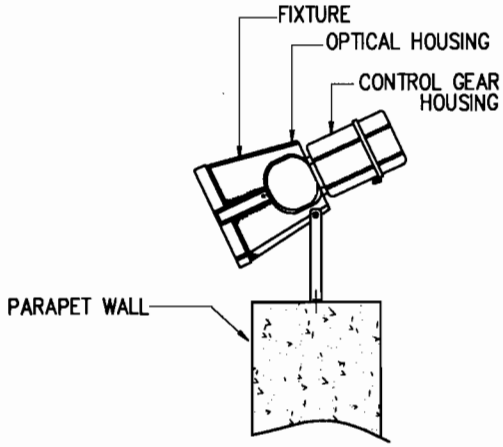


TYPICAL FIXING ARRANGEMENT ON PARAPET WALL MOUNTING
(NON-INTEGRAL FLOOD LIGHT LUMINAIRE)



TYPICAL FIXING ARRANGEMENT ON PARAPET WALL MOUNTING
(INTEGRAL FLOOD LIGHT LUMINAIRE)

FLOOD LIGHT LUMINAIRE WITH HPSV 150/250W/400W/1000W
OR HIGH PRESSURE METAL HALIDE 250W/400W/1000W,
OR TUNGSTEN HALOGEN 500W/1000W LAMP.
[EQ. PHILIPS TYPE SWF/MWF/SNF/SLF/RVP]
[EQ. BAJAJ TYPE BJQF/BJHF/BJEQF/BJEF/BJENF/BJHM/BGEMF/BGEMFS]

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

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PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 27 | REV. A

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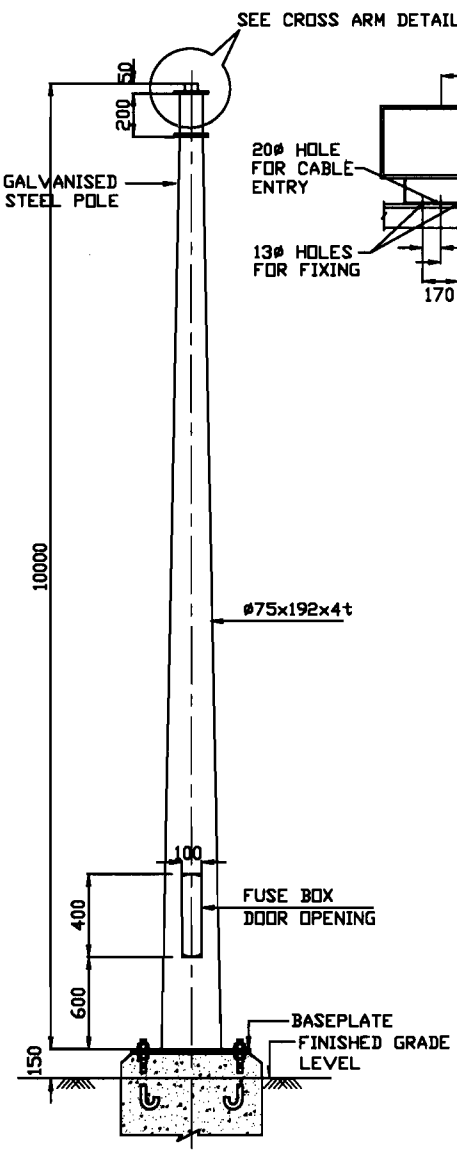
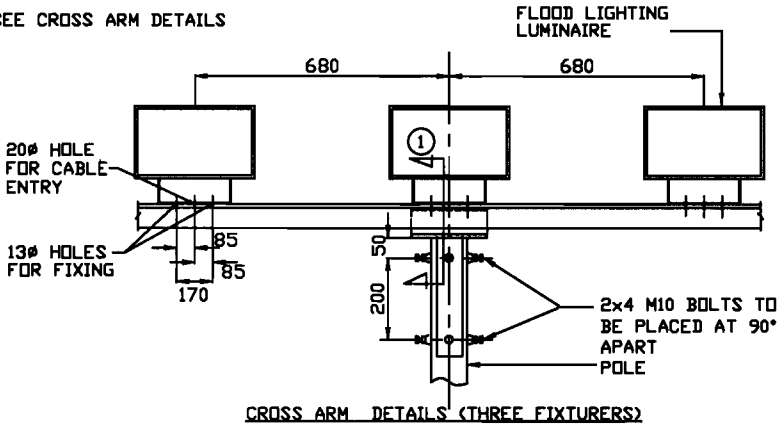
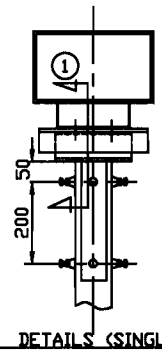


FLOOD LIGHT FIXTURE :
TYP. FIXING ARRGT. ON 10M CONICAL POLE WITH CROSS ARM

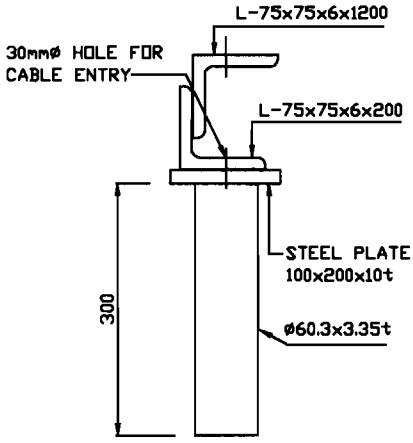
(POLE GROUNDING ARRANGEMENT SHALL BE IN LINE WITH SHEET NO. 23)



CROSS ARM DETAILS (THREE FIXTURERS)



CROSS ARM DETAILS (SINGLE FIXTURERS)



SECTION -(1)

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					TITLE: ILLUMINATION SYSTEM NOTES & DETAILS	TELANGANA STATE POWER GENERATION CORPORATION LIMITED HYDERABAD - TELANGANA - INDIA
						DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA . MUMBAI . CHENNAI . NEW DELHI
DS	DS	AD	A	24.09.14	PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA	JOB NO. 13A06 / SCALE : NIL
APPVD.	REVWD.	CHKD.	REV.	DATE		DWG. NO. 13A06-DWG-E-0800 SHT. 28 / REV. A

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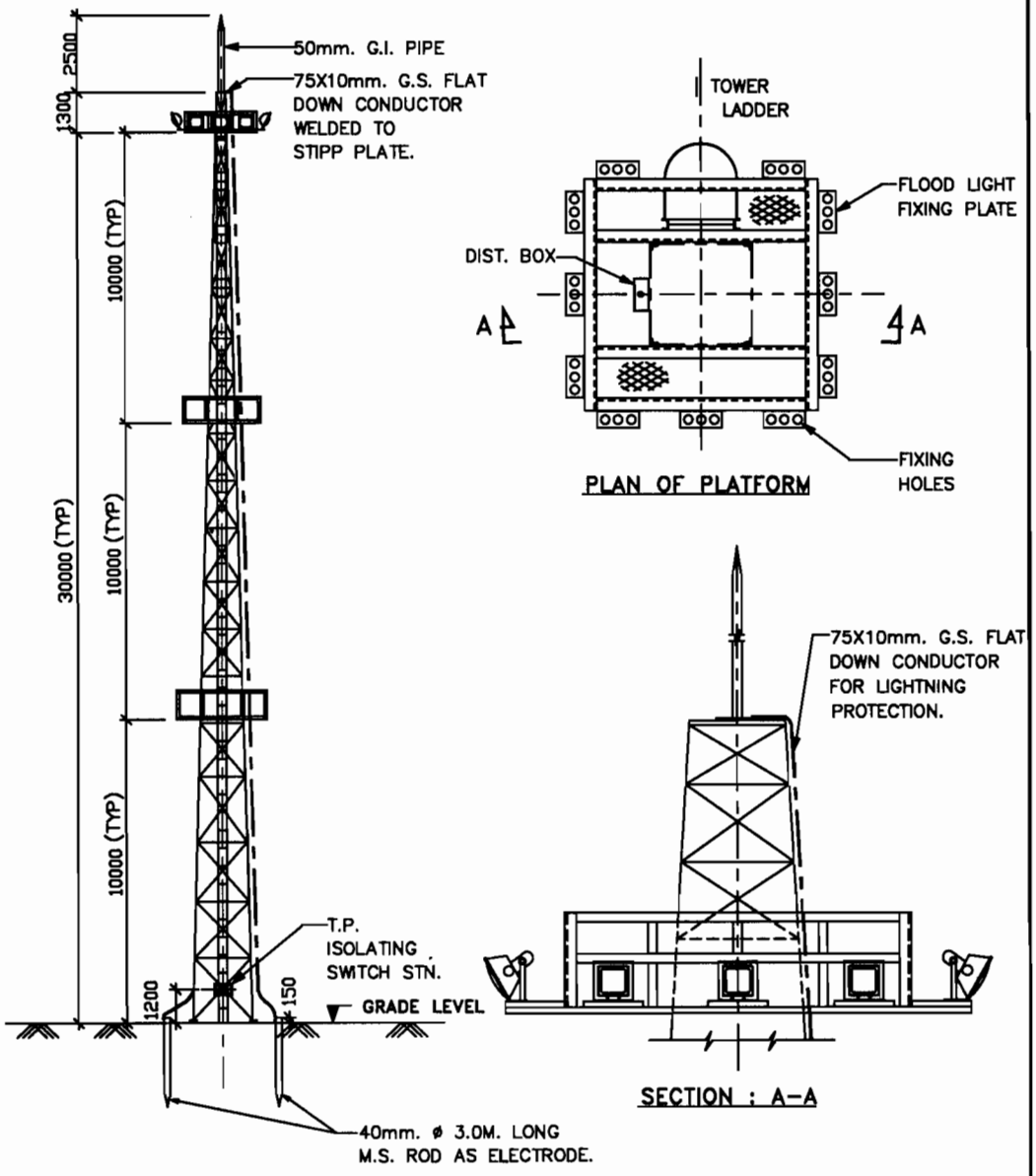

FLOOD LIGHT TOWER ELEVATION

NOTE :

Anticlimbing features shall be provided with the stair up to 1500mm above ground level.

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
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KOLKATA . MUMBAI . CHENNAI . NEW DELHI

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PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 29 | REV. A

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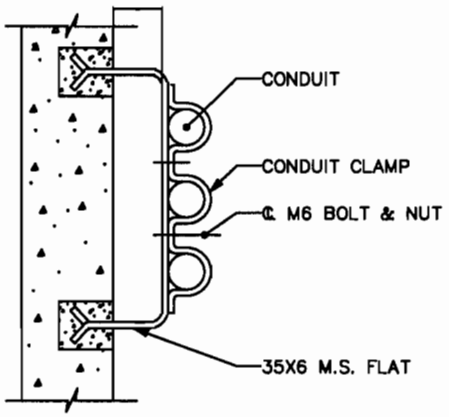
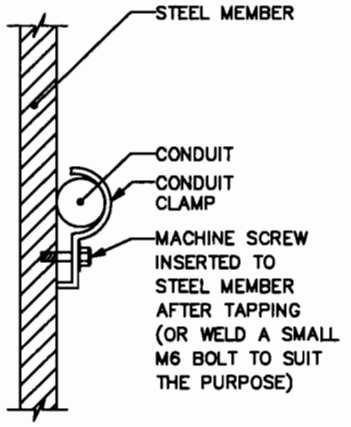
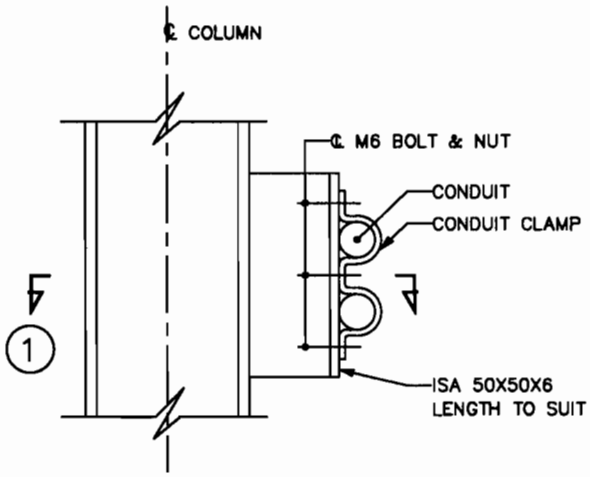


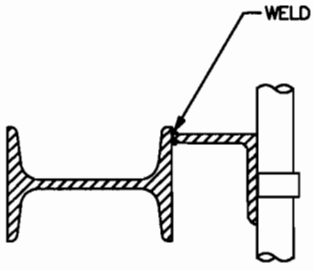
GROUP OF CONDUITS RUN
ON CONCRETE SURFACE



SINGLE CONDUIT RUN
ON STEEL MEMBER



ELEVATION



SECTION–1

GROUP OF CONDUIT RUN ON
STEEL MEMBER ARRANGEMENT–A

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

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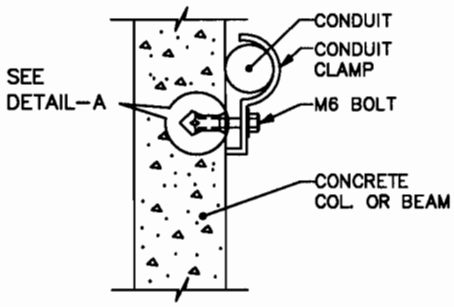
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

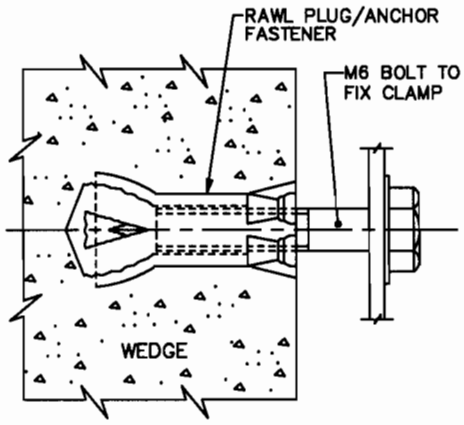
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06–DWG–E–0800 SHT. 30 | REV. A

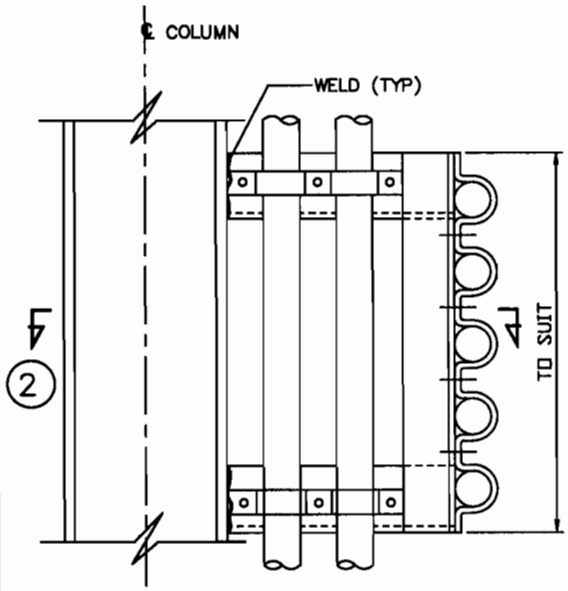
A4_DD (9–96) [210x297]



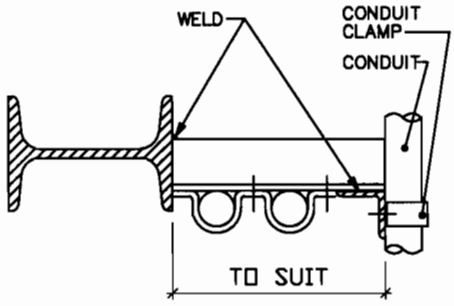
SINGLE CONDUIT RUN ON CONCRETE SURFACE



DETAIL–A



ELEVATION



SECTION–(2)

GROUP OF CONDUIT RUN ON STEEL MEMBER ARRANGEMENT–B

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

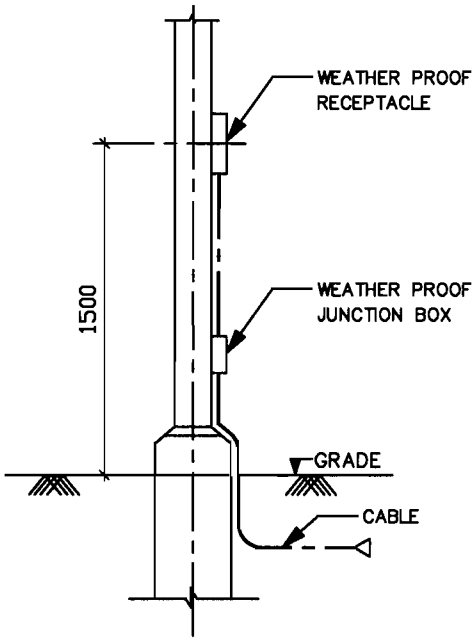
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE–VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

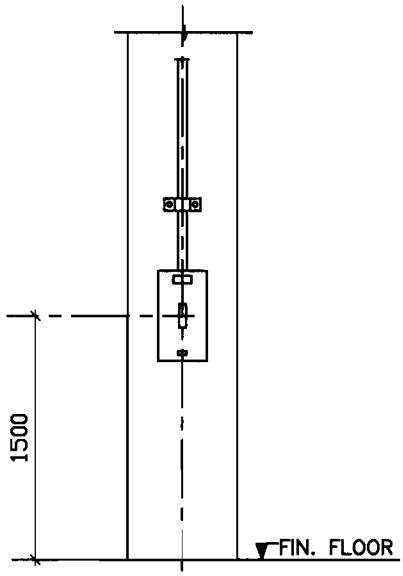
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06–DWG–E–0800 | SHT. 31 | REV. A

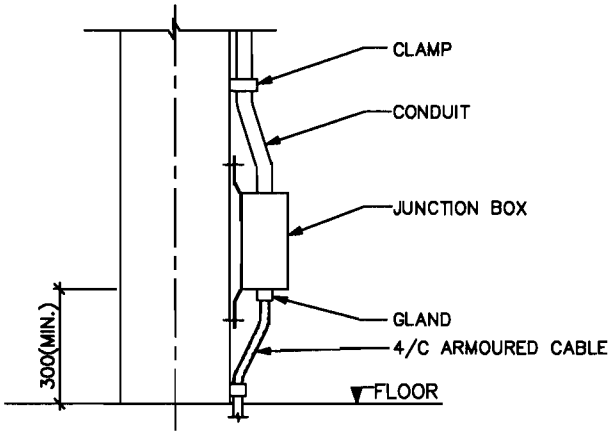
A4_DD (9–96) [210x297]



OUTDOOR RECEPTACLE



SWITCH ON COLUMN



JUNCTION BOX
MOUNTING (TYP.)

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HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

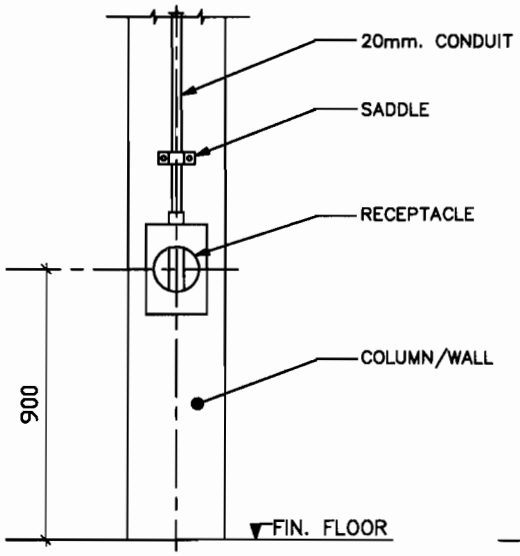
TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

JOB NO. 13A06 | SCALE : NIL

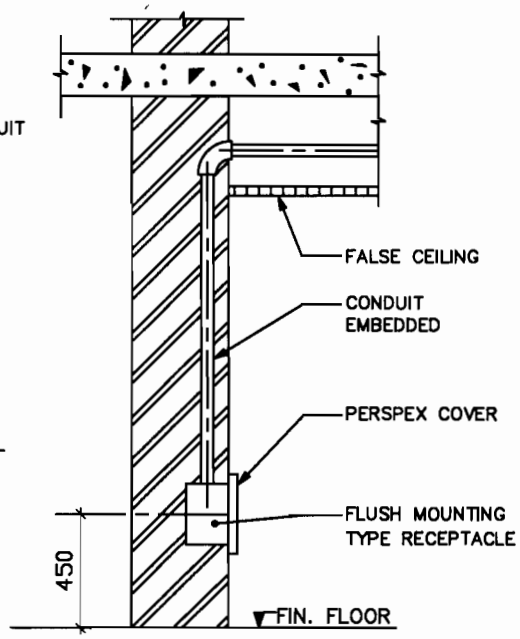
DWG. NO. 13A06-DWG-E-0800 | REV. A | SHT. 32

A4_DD (9-96) [210x297]



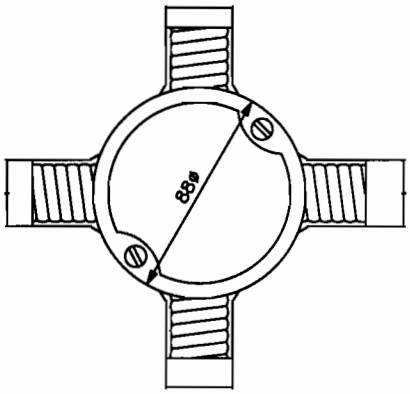
RECEPTACLE – TYPE 'RB'

(STRUTURE MOUNTING)



RECEPTACLE – TYPE 'RA'

(WALL MOUNTING)



JUNCTION BOX ROUND (TYP.)

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

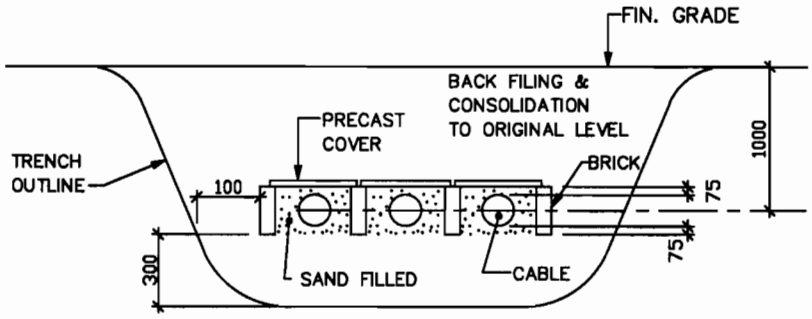
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 33 | REV. A

A4_DO (9-98) [210x297]



TYP. DETAIL FOR BURRIED CABLE

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

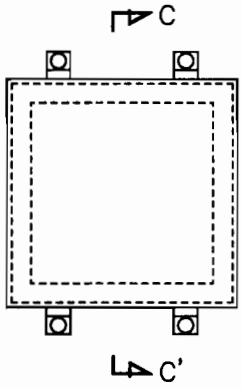
TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

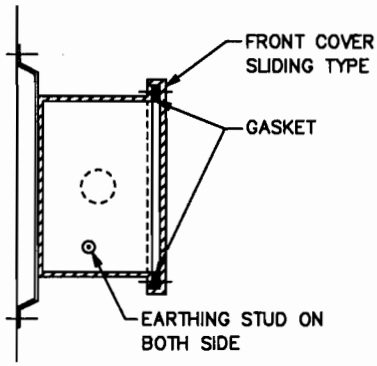
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 34 | REV. A

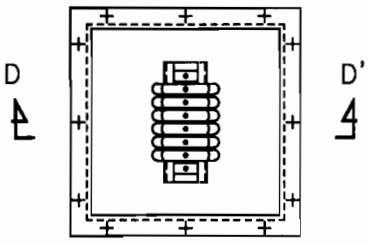
A4_DD (9-96) [210x297]



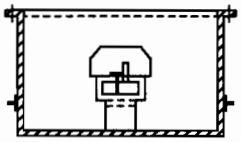
TYP. FIXING DETAIL
OF JUNCTION BOX



SECTION : C–C'



JUNCTION BOX (TYP.)
FRONT VIEW



SECTION : D–D'

FOR TENDERING ONLY

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE–VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

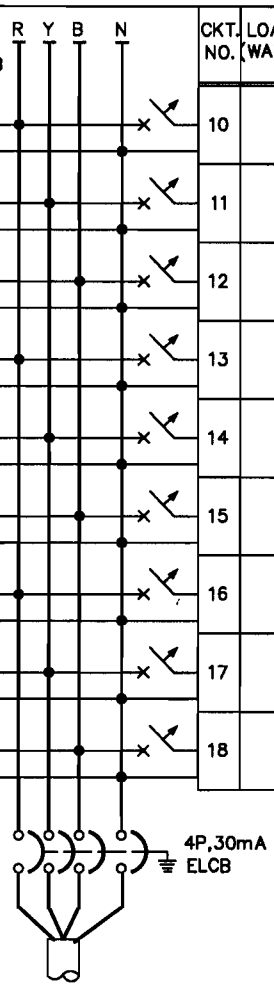
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06–DWG–E–0800 SHT. 35 | REV. A

A4_DD (9–96) [210x297]

LOCATION	NO.& TYPE OF FIXTURE	LOAD (WATT)	CKT. NO.		CKT. NO.	LOAD (WATT)	NO.& TYPE OF FIXTURE	LOCATION
			1		10			
			2		11			
			3		12			
			4		13			
			5		14			
			6		15			
			7		16			
			8		17			
			9		18			



3–LINE DIAGRAM : LIGHTING PANEL

NOTES:

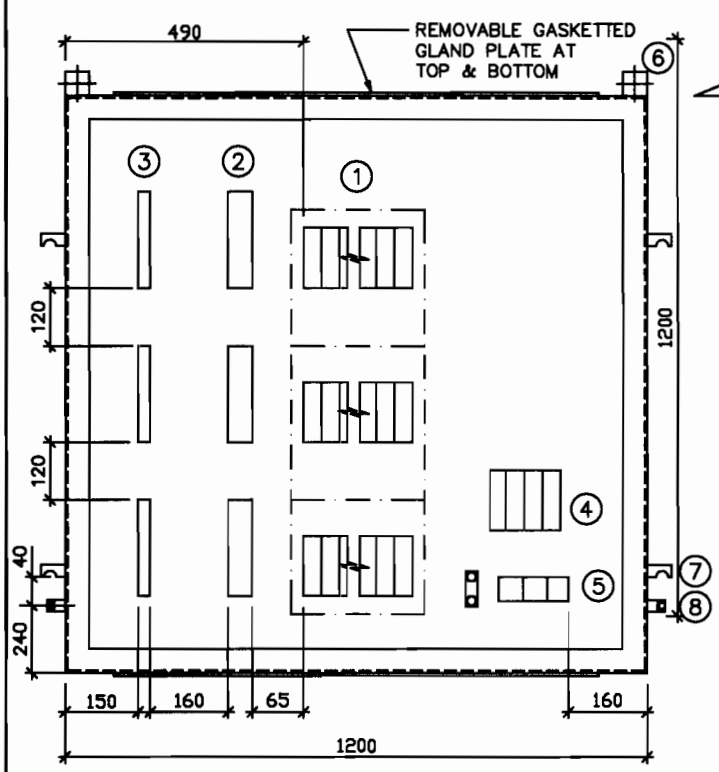
1. THE NUMBER OF OUTGOING FEEDERS SHALL BE DECIDED BASED ON REQUIREMENT.
2. THE MCB AND ELCB RATING SHALL BE SELECTED BASED ON APPLICATION.

FOR TENDERING ONLY

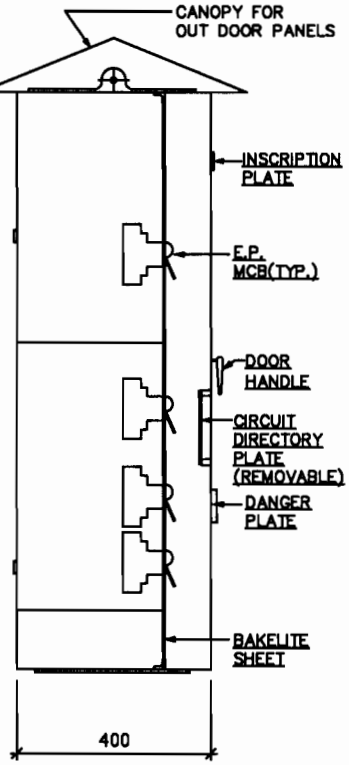
TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD – TELANGANA – INDIA

					TITLE: ILLUMINATION SYSTEM NOTES & DETAILS	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA . MUMBAI . CHENNAI . NEW DELHI	
						JOB NO. 13A06	SCALE : NIL
DS	DS	AD	A	24.09.14	PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE–VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA	DWG. NO. 13A06–DWG–E–0800 SHT. 38	REV. A
APP'VD.	REV'WD.	CHK'D.	REV.	DATE			

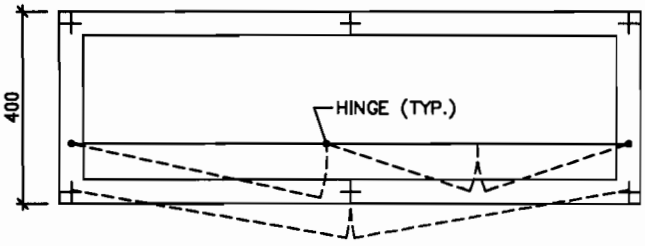
A4_DD (9–96) [210x297]



FRONT VIEW
(DOOR REMOVED)



SECTIONAL SIDE VIEW



FOUNDATION PLAN

LEGEND :

1. MINIATURE CKT. BKR.
2. PHASE TERMINALS STRIP
3. NEUTRAL BUS WITH NUT, BOLT & WASHER
4. ELCB
5. TERMINAL BLOCK
6. LIFTING LUG
7. FIXING LUG
8. EARTHING STUD WITH NUTS

GENERAL ARRANGEMENT : LIGHTING PANEL

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

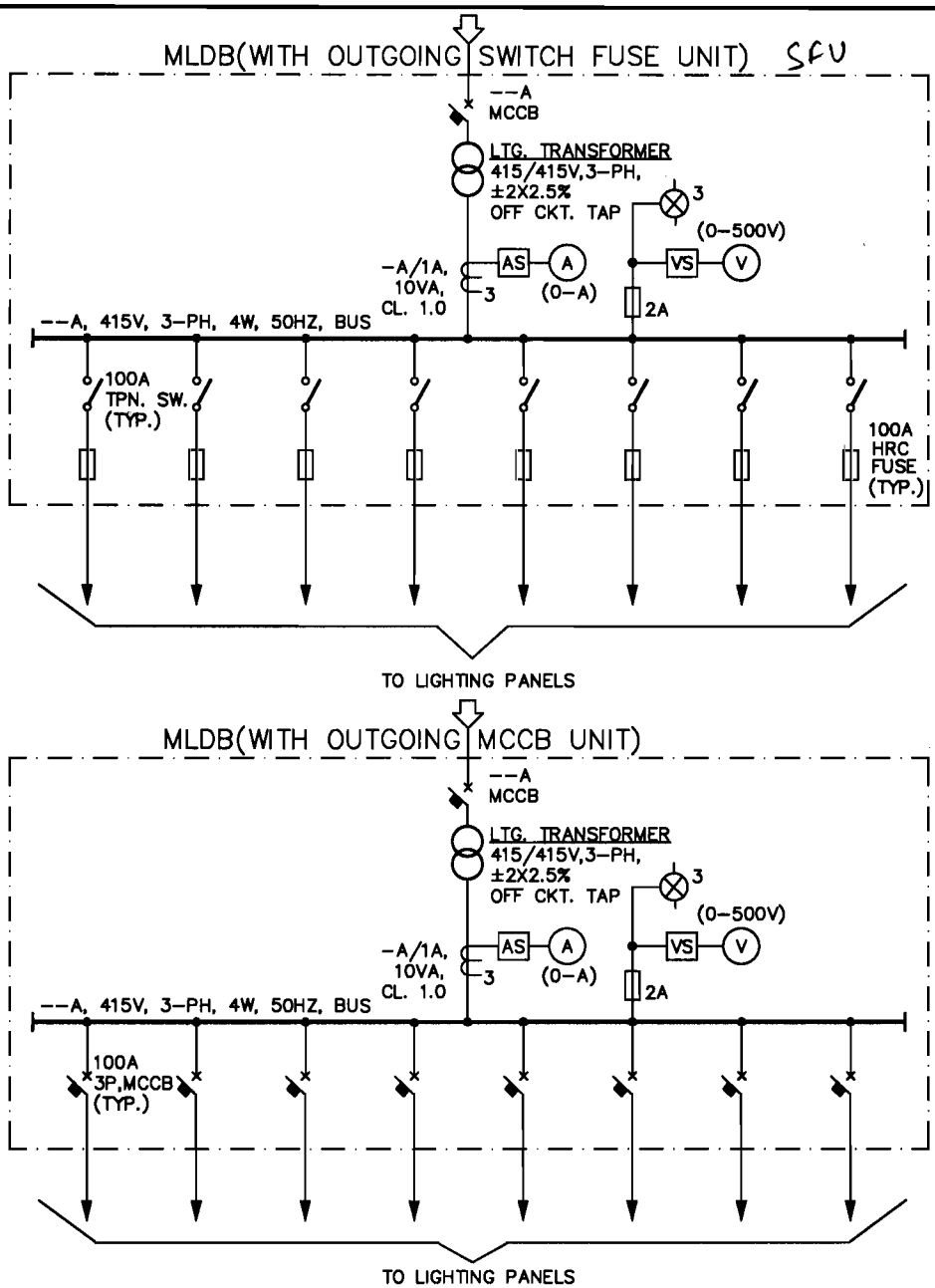
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 37 | REV. A

A4_DD (9-96) [210x297]



SLD : MAIN LIGHTING DISTRIBUTION BOARD(MLDB)

NOTE :-

TRANSFORMER RATING AND %Z SHALL BE SO SELECTED THAT THE FAULT LEVEL SHALL BE WITHIN AVAILABLE MCB OF LIGHTING PANELS.THE BUSBAR CONTINUOUS CURRENT RATING, CT RATIO,AMMETER RANGE ETC SHALL BE SELECTED ACCORDINGLY

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

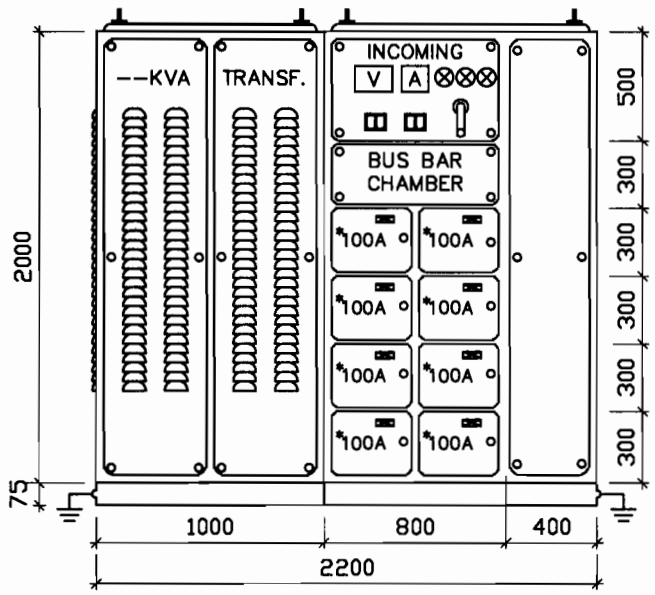
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

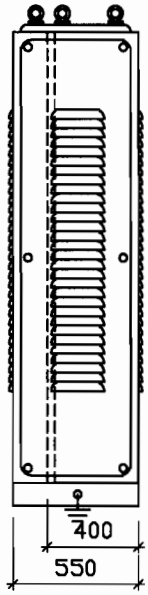
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 38 | REV. A

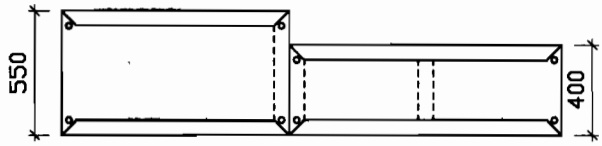
A4_DD (9-96) [210x297]



FRONT VIEW



SIDE VIEW



FOUNDATION PLAN

*TPN SWITCH FUSE/TP MCCB.

GENERAL ARRANGEMENT : MAIN LIGHTING DISTRIBUTION BOARD (MLDB)

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

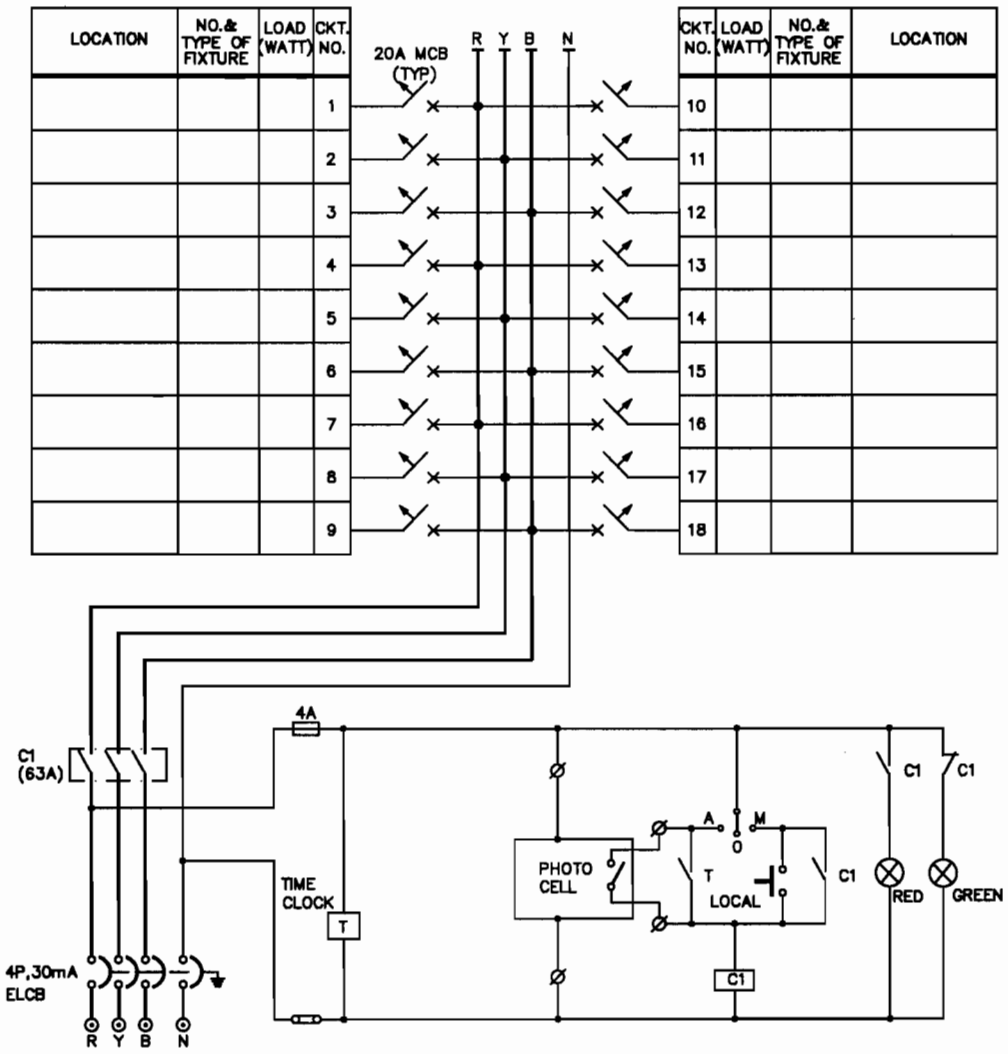
JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 39 | REV. A

A4_DD (9-96) [210x297]

LOCATION	NO.& TYPE OF FIXTURE	LOAD (WATT)	CKT. NO.
			1
			2
			3
			4
			5
			6
			7
			8
			9

CKT. NO.	LOAD (WATT)	NO.& TYPE OF FIXTURE	LOCATION
10			
11			
12			
13			
14			
15			
16			
17			
18			



NOTES :

1. FIXTURES ON STREET LIGHTING POLES SHALL BE FED FROM THE SLPs.
2. FIXTURES ON FLOOD LIGHTING TOWERS SHALL ALSO BE FED FROM THE SLPs VIA ISOLATING SWITCH IN FLP MOUNTED AT THE BASE OF FLOOD LIGHTING TOWER.
3. SP AND 3P MCB SHALL BE USED FOR SINGLE PHASE AND 3-PHASE DISTRIBUTION RESPECTIVELY.

SCHEMATIC : STREET LIGHT PANELS (SLP)

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

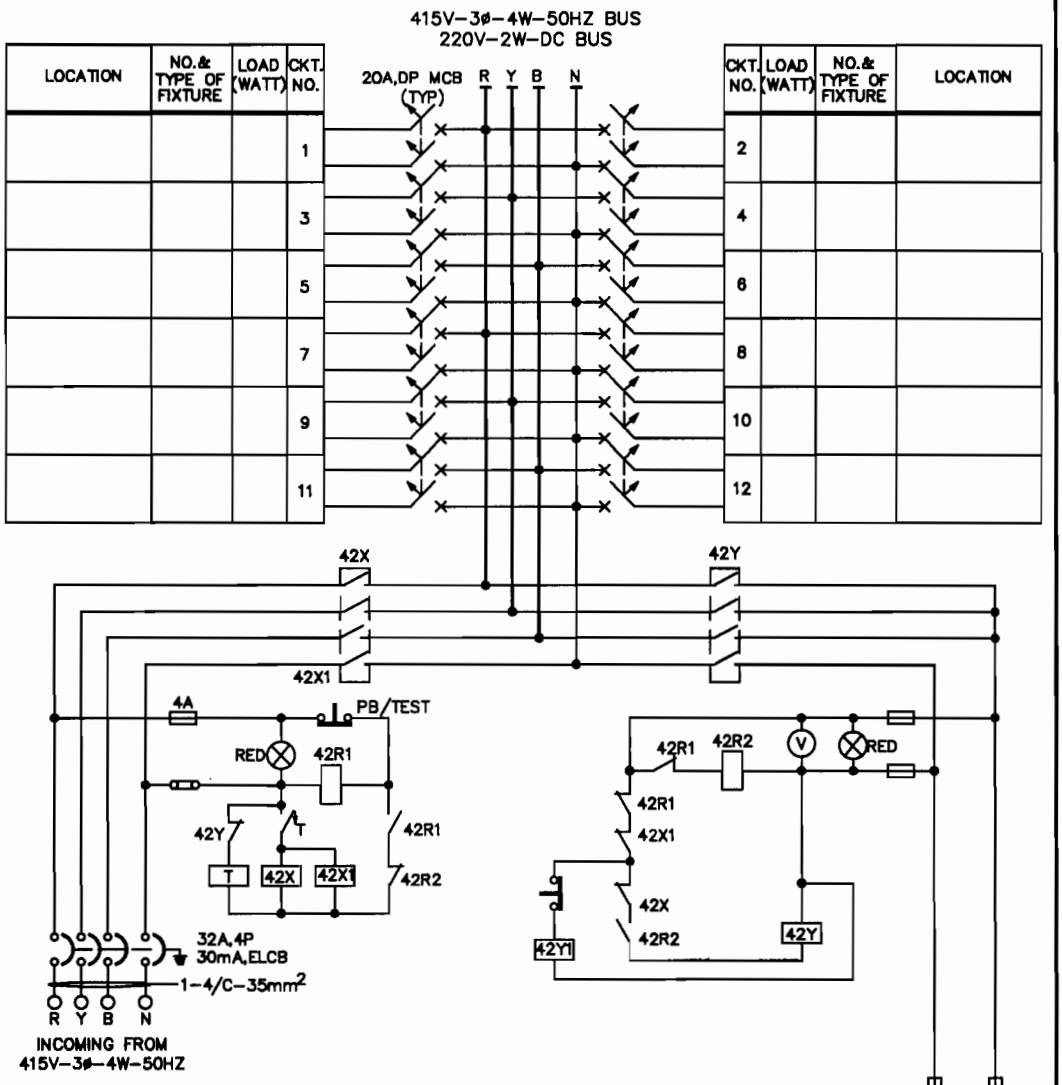
PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 40 | REV. A

A4_DD (9-96) [210x297]



LEGEND:-

42X & 42X1	:	AC. CONTACTOR 3-POLE, 32A
42Y	:	DC. CONTACTOR 4-POLE, 100A
42R1	:	AUX. CONTACTOR 240V AC.
42R2	:	AUX. CONTACTOR 220V DC
42Y1	:	AUX. CONTACTOR 220V DC.
T	:	TIMER

NOTES:-

1.. CKT. SHOWN HERE IS IN RESET AND DE-ENERGISED POSITION.

2.. ALL SWITCH FUSE UNITS AC AND DC. CONTACTORS, RELAYS, LAMPS, METERS SHOWN IN THIS DRG. SHALL BE FURNISHED WITH EMERGENCY LTG. BOARD.

3.. THE FAULT LEVEL SHALL BE WITHIN AVAILABLE MCB.

SCHEMATIC : EMERGENCY LTG. DIST. BOARD (3ø)

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TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

DS	DS	AD	A	24.09.14
APPVD.	REVWD.	CHKD.	REV.	DATE

TITLE: ILLUMINATION SYSTEM NOTES & DETAILS

PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA

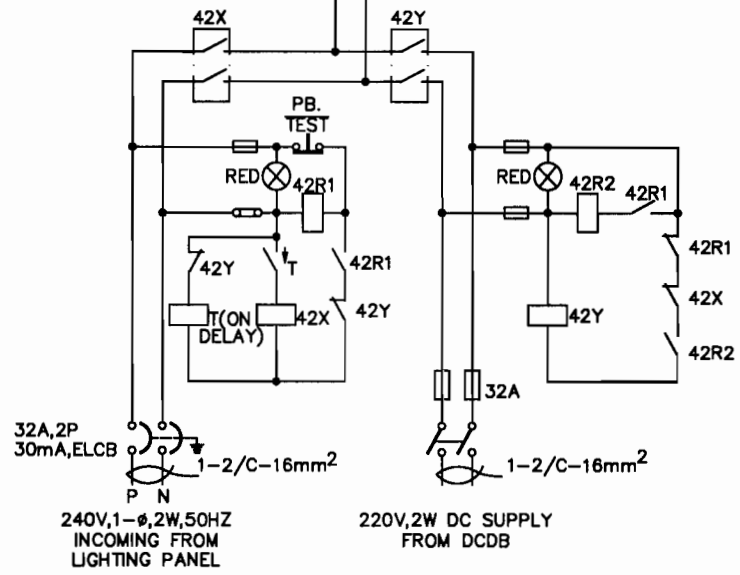
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA . MUMBAI . CHENNAI . NEW DELHI

JOB NO. 13A06 | SCALE : NIL

DWG. NO. 13A06-DWG-E-0800 SHT. 41 | REV. A

A4_DD (9-96) [210x297]

LOCATION	NO.& TYPE OF FIXTURE	LOAD (WATT)	CKT. NO.	220V,1-ø,2W,50HZ BUS 220V,2W,DC BUS	CKT. NO.	LOAD (WATT)	NO.& TYPE OF FIXTURE	LOCATION
			1	20A,DP MCB(TYP) P N	3			
			2		4			



LEGEND :-

42X : AC CONTACTOR, 2-POLE, 32A
42Y : DC CONTACTOR, 2-POLE, 32A
42R1: AUX. CONTACTOR 240V AC.
42R2: AUX. CONTACTOR 220V DC.
T : TIMER

NOTES :-

1. CKT. SHOWN HERE IS IN RESET AND DE-ENERGISED POSITION.
2. ALL SWITCH FUSE UNITS, AC AND DC CONTACTORS, RELAYS, LAMPS, METERS SHOWN IN THIS DRG. SHALL BE FURNISHED WITH EMERGENCY LTG. BOARD.
3. THE FAULT LEVEL SHALL BE WITHIN AVAILABLE MCB.

SCHEMATIC : EMERGENCY LTG. DIST. BOARD (1ø)

FOR TENDERING ONLY

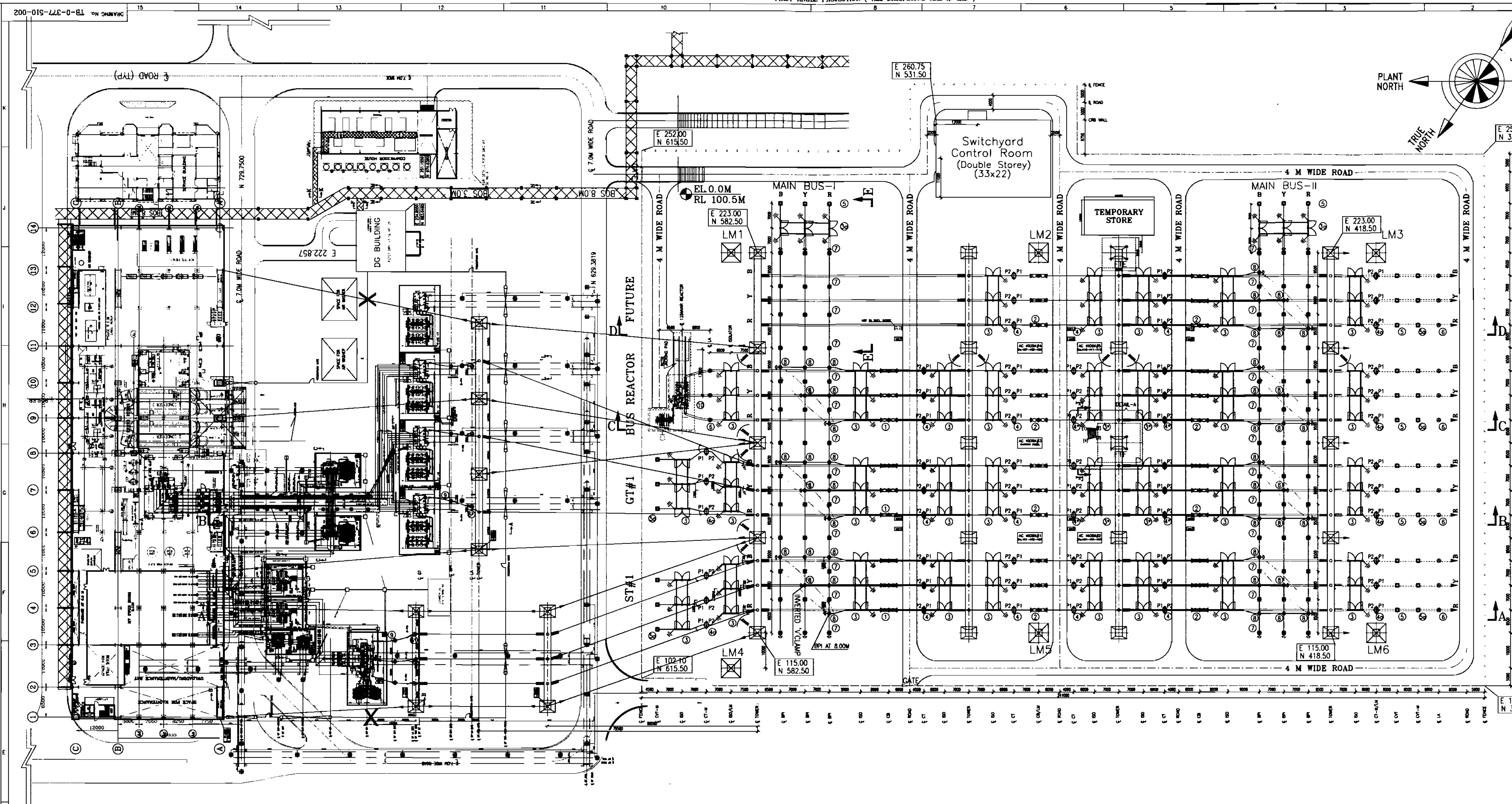
TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD - TELANGANA - INDIA

					TITLE: ILLUMINATION SYSTEM NOTES & DETAILS	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA . MUMBAI . CHENNAI . NEW DELHI	
					PROJECT: KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12 (1X800MW) KOTHAGUDEM, TELANGANA, INDIA	JOB NO. 13A06	SCALE : NIL
DS	DS	AD	A	24.09.14		DWG. NO. 13A06-DWG-E-0800 SHT. 42	REV. A
APPVD.	REVWD.	CHKD.	REV.	DATE			

A4_DD (9-96) [210x297]

ANNEXURE-3 (KOTHAGUDEM)

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)



SCHEDULE OF EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	QTY.
1	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITHOUT PIR		03
2	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITH PIR		08
3	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH ONE EARTH SWITCH		27
3*	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH ONE EARTH SWITCH (HIGH LEVEL)		04
3a	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH TWO EARTH SWITCH		02
4	400kV 3000A, 5-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER		30
4*	400kV 3000A, 5-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER (HIGH LEVEL)		12
4a	400kV 3000A, 2-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER (METERING)		18
5	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (3 SECONDARY)		18
5a	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (2 SECONDARY)		18
6	360kV, 20KA, 1-PH SURGE ARRESTER		15
6*	360kV, 20KA, 1-PH SURGE ARRESTER (HIGH LEVEL)		06
7	400KV, 8kN BUS POST INSULATOR (HIGH LEVEL - 12.5 m)		78
8	400KV, 8kN BUS POST INSULATOR (LOW LEVEL - 8.00 m)		[illegible]
9	400KV, 8kN BUS POST INSULATOR (MED. LEVEL - 10.5 m)		-
10	400KV, 125MVAR BUS REACTOR		-

SYSTEM PARAMETERS

DESCRIPTION	400kV
HIGHEST SYSTEM VOLTAGE (kV)	420
LIGHTNING IMPULSE WITHSTAND VOLTAGE (kVp)	1425
SWITCHING IMPULSE WITHSTAND VOLTAGE (Ph-E)(kVp)	1050
P.F. WITHSTAND VOLTAGE (kV rms)	630
SYSTEM FAULT LEVEL (kA for 1sec)	50
CREEPAGE DISTANCE (25mm/kV) (mm)	10500

CLEARANCE TABLE

PHASE TO PHASE (PP)	4200
PHASE TO EARTH (PE)	3500
SECTION CLEARANCE (SC)	6500
VERTICAL GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR/EQUIPMENT	2440
GROUND CLEARANCE (PLINTH TO CENTER OF TUBE)	8000

CONDUCTOR DETAIL

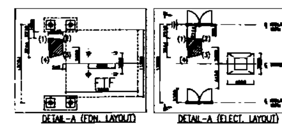
S.NO	DESCRIPTION	
1.	MAIN BUS	4.5"IPS (EH) AL TUBE "E-91E GRADE, SCHEDULE 80". OD=120mm ID=96mm
2.	EQUIPMENT INTERCONNECTION	4.5"IPS AL TUBE/QUAD/TWIN MOOSE/BERSIMIS ACSR
3.	JUMPER /DROPPERS	QUAD/TWIN MOOSE/BERSIMIS ACSR
4.	SHIELD WIRE	(7/8 SWG) GALVANISED STEEL (12mm DIA)

LEGEND TABLE

——	PRESENT BHEL SCOPE
	CUSTOMER SCOPE
× ×	FENCE
	TENSION STRING INSULATOR (2X25 DISCS)
	SUSPENSION STRING INSULATOR (1X25 DISCS)
	COLUMN WITHOUT PEAK
	COLUMN WITH PEAK
	CORONA END BELL
	INDICATES CONNECTION TO MAIN BUS
	LIGHTNING MAST

NOTES:-

1. ALL CONNECTIONS MARKED WITH ACSR CONDUCTOR ARE WITH "MOOSE"/"BERSIMIS". CONNECTIONS MARKED WITH AL. TUBE ARE WITH 4.5" IPS.
2. SWITCHYARD SHALL BE PROVIDED WITH 20MM & 40MM GRAVEL (75MM EACH LAYER).
3. LA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE/ ANY EQUIPMENT KEPT NEAR LIGHTNING ARRESTERS.
4. CB, BPI, ISOLATOR, LA, CVT & CT STRUCTURE SHALL BE LATTICE TYPE.
5. TERMINATION OF LINE CONDUCTORS ON THE SWITCHYARD GANTRY INCLUDING INSULATOR STRINGS FOR SAME IS NOT IN SCOPE OF CONTRACT AND THEREFORE SHOWN IN DOTTED. CUSTOMER TO PROVIDE CONDUCTOR DETAILS.
6. LM QUANTITY AND LOCATION IS TENTATIVE. IT SHALL BE FINALIZED AFTER DSLP CALCULATION.
7. THE TOP OF THE BOLT OF LA/POST INSULATOR (COMING NEAR GENERATOR/STATION TRANSFORMER YARD) FOUNDATION SHALL BE LOWER BY 15MM THAN THE TOP OF RAIL, THIS IS TO FACILITATE THE REMOVAL OF LA STRUCTURE DURING TRANSFORMER TO BE TAKEN OUT FOR REPAIR/REPLACEMENT.
8. LOCATION OF AC KIOSKs & MKs ARE TENTATIVE AND SHALL BE AS PER CABLE TRENCH LAYOUT.
9. INPUTS OF EXISTING "MUTYALAMMA" TEMPLE RECEIVED FROM TSGENCO VIDE LETTER REF NO. CE/O&M/KTPS(1x800MW)/F.16/D.No 757/16, DT. 06.01.16.
   a. CO-ORDINATES:-
      (1) N-488.090, E-173.286 (2) N-485.660, E-173.054
      (3) N-485.642, E-170.590 (4) N-487.853, E-170.042
   b. HEIGHT = 4000mm FROM FGL.



REFERENCE NO.	DESCRIPTION
TB 3 377 510 001	SINGLE LINE DIAGRAM FOR 400kV SWITCHYARD
PE-DG-410-100-M001-0P	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION
W.O.No. 84005
STATUS OF DRAWING
DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD, HYDERBAD, TELANGANA, 1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12

NAME OF CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS, KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	NAME	SIGN.	DATE
DRAWN	PR	Sd/-	20.02.15
CHECKED	PR	Sd/-	20.02.15
APPROVED	AS	Sd/-	20.02.15

SCALE 1:430

TITLE: 400 kV SWITCHYARD PLAN

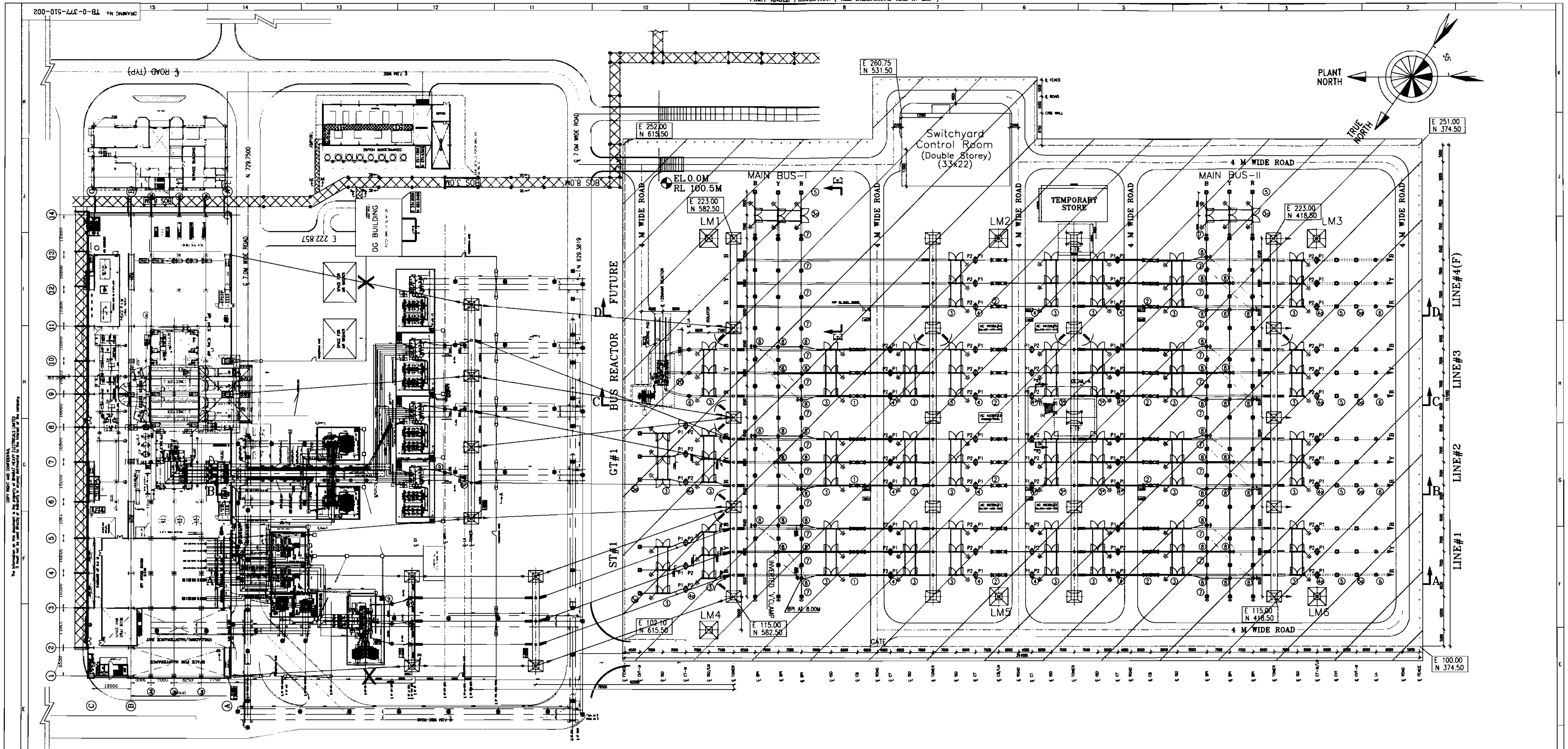
DRAWING NO. TB-0-377-510-002 REV. 05

SHEET No. 1 NEXT SHEET 2

REV.	DATE	ALTERED / CHECKED / APPROVED	
05	18.06.16	APPROVED AS	DRAWING REVISED TO INCORPORATE 125MVAR REACTOR & METERING CT, CVT (OTHER BAY) DETAILS AS PER TSGENCO REQUIREMENT (ADDITIONAL SCOPE).
04	05.03.16	APPROVED AS Sd/-	DRAWING REVISED IN LINE WITH LATEST PEM PLOT PLAN & TO INCORPORATE "MUTYALAMMA" TEMPLE DETAILS.
03	09.10.15	APPROVED AS Sd/-	DRAWING REVISED IN CUSTOMER COMMENTS.
02	20.05.15	APPROVED AS Sd/-	DRAWING REVISED IN LINE DCPL LETT. REF. NO. 13A08/DCH/-5/0241 DATED: 19.05.15.
01	16.05.15	APPROVED AS Sd/-	DRAWING REVISED IN LINE DCPL LETT. REF. NO. 13A08/DCH/-5/0082 DATED: 19.03.15.

COMPUTER DWG. PATH NAME / REF. DRG. NO. / SIGN. & DATE / INVENTORY No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)



SCHEDULE OF EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	QTY.
1	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITHOUT PIR		03
2	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITH PIR		08
3	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH ONE EARTH SWITCH		27
3*	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH ONE EARTH SWITCH (HIGH LEVEL)		04
3a	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH TWO EARTH SWITCH		02
4	400kV 3000A, 5-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER		30
4*	400kV 3000A, 5-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER (HIGH LEVEL)		12
4a	400kV 3000A, 2-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER (METERING)		18
5	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (3 SECONDARY)		18
5a	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (2 SECONDARY)		18
6	360kV, 20KA, 1-PH SURGE ARRESTER		15
6*	360kV, 20KA, 1-PH SURGE ARRESTER (HIGH LEVEL)		06
7	400KV, 8kN BUS POST INSULATOR (HIGH LEVEL - 12.5 m)		78
8	400KV, 8kN BUS POST INSULATOR (LOW LEVEL - 8.00 m)		[illegible]
9	400KV, 8kN BUS POST INSULATOR (MED. LEVEL - 10.5 m)		[illegible]
10	400KV, 125MVAR BUS REACTOR		[illegible]

SYSTEM PARAMETERS

DESCRIPTION	400kV
HIGHEST SYSTEM VOLTAGE (kV)	420
LIGHTNING IMPULSE WITHSTAND VOLTAGE (kVp)	1425
SWITCHING IMPULSE WITHSTAND VOLTAGE (Ph-E)(kVp)	1050
P.I. WITHSTAND VOLTAGE (kV rms)	630
SYSTEM FAULT LEVEL (kA for 1sec)	50
CREEPAGE DISTANCE (25mm/kV) (mm)	10500

CLEARANCE TABLE

PHASE TO PHASE (PP)	4200
PHASE TO EARTH (PE)	3500
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GROUND CLEARANCE (PLINTH TO CENTER OF TUBE)	8000

CONDUCTOR DETAIL

S.NO	DESCRIPTION	
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2.	EQUIPMENT INTERCONNECTION	4.5"IPS AL. TUBE/QUAD/TWIN MOOSE/BERSIMIS ACSR
3.	JUMPER /DROPPERS	QUAD/TWIN MOOSE/BERSIMIS ACSR
4.	SHIELD WIRE	(7/8 SWG) GALVANISED STEEL (12mm DIA)

LEGEND TABLE

	PRESENT BHEL SCOPE
	CUSTOMER SCOPE
X X	FENCE
	TENSION STRING INSULATOR (2X25 DISCS)
	SUSPENSION STRING INSULATOR (1X25 DISCS)
	COLUMN WITHOUT PEAK
	COLUMN WITH PEAK
	CORONA END BELL
	INDICATES CONNECTION TO MAIN BUS
	LIGHTNING MAST

NOTES:-

1. ALL CONNECTIONS MARKED WITH ACSR CONDUCTOR ARE WITH "MOOSE"/"BERSIMIS". CONNECTIONS MARKED WITH AL. TUBE ARE WITH 4.5" IPS.
2. SWITCHYARD SHALL BE PROVIDED WITH 20MM & 40MM GRAVEL (75MM EACH LAYER).
3. LA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE/ ANY EQUIPMENT KEPT NEAR LIGHTNING ARRESTERS.
4. CB, BPI, ISOLATOR, LA, CVT & CT STRUCTURE SHALL BE LATTICE TYPE.
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6. LM QUANTITY AND LOCATION IS TENTATIVE. IT SHALL BE FINALIZED AFTER DSLP CALCULATION.
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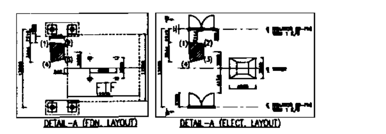
8. LOCATION OF AC KIOSKs & MKs ARE TENTATIVE AND SHALL BE AS PER CABLE TRENCH LAYOUT.
9. INPUTS OF EXISTING "MUTYALAMMA" TEMPLE RECEIVED FROM TSGENCO VIDE LETTER REF NO. CE/O&M/KTPS(1x800MW)/F.16/D.No 757/16, DT. 06.01.16.
   a. CO-ORDINATES:-
   (1) N-488.090, E-173.286 (2) N-485.660, E-173.054
   (3) N-485.642, E-170.590 (4) N-487.853, E-170.042
   b. HEIGHT = 4000mm FROM FGL.



DETAIL-A (FDN. LAYOUT) DETAIL-A (ELECT. LAYOUT)

AREA FOR ILLUMINATION.

REFERENCE NO.	DESCRIPTION
TB 3 377 510 001	SINGLE LINE DIAGRAM FOR 400kV SWITCHYARD
PE-DG-410-100-M001-OP	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION W.O.No. 84005

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD HYDERBAD, TELANGANA 1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12

NAME OF CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता./SIGN.	दि./DATE
	PR	Sd/-	20.02.15
	PR	Sd/-	20.02.15
	AS	Sd/-	20.02.15

REV. 01 DATE 18.05.15 ALTERED PR Sd/- CHECKED PR Sd/- APPROVED AS Sd/- DRAWING REVISED IN LINE DCPL LETT. REF. NO. 13A06/DCH/-5/0062 DATED: 18.01.15.

REV. 05 DATE 18.08.16

अनुपात / SCALE 1:430

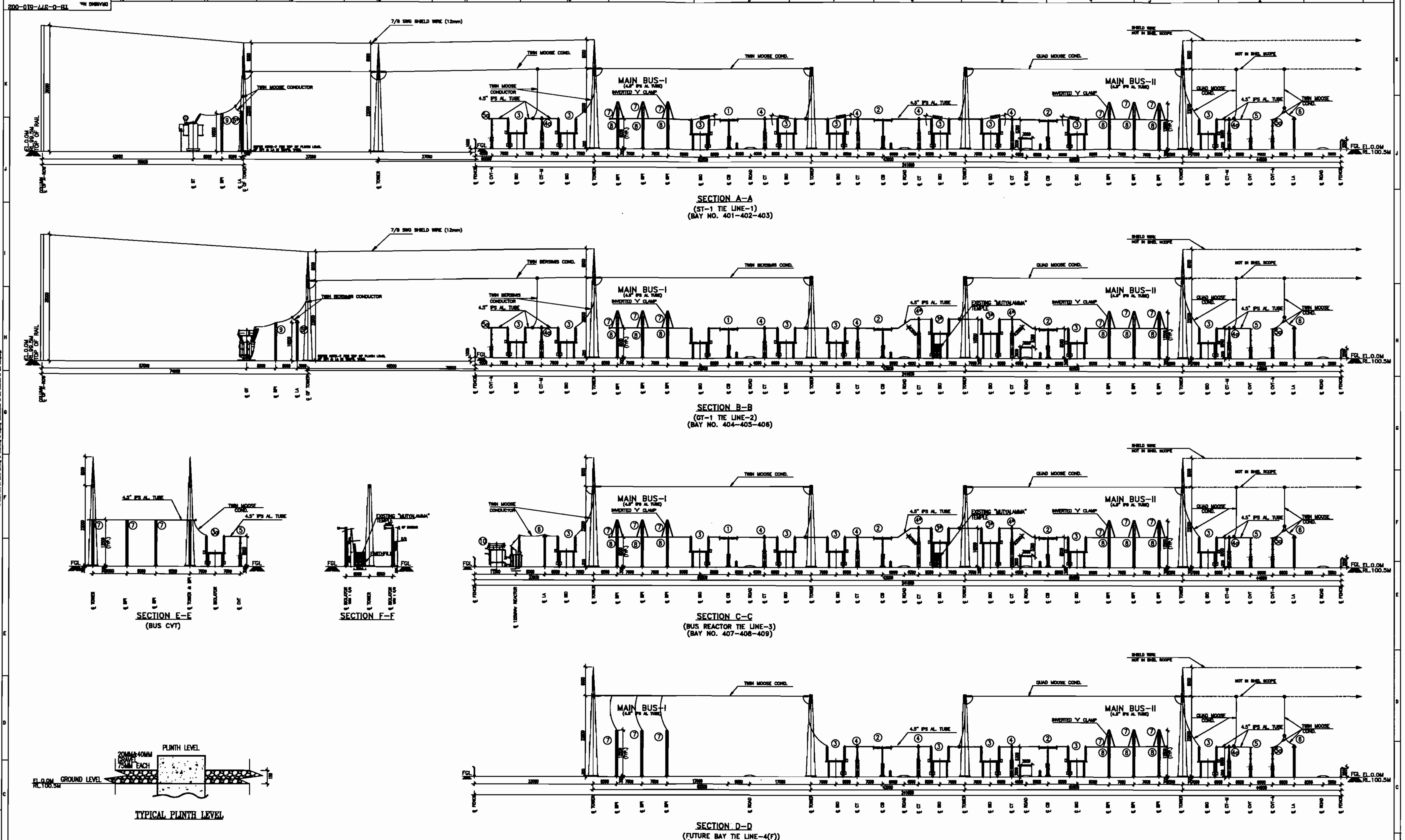
शीर्षक/TITLE 400 kV SWITCHYARD PLAN

ड्रॉ.सं./DRAWING NO. TB-0-377-510-002 संशो./REV. 05

पृष्ठ सं./SHEET No. 1 अगला पृष्ठ/NEXT SHEET 2

INVENTORY No. SIGN. & DATE REF. DRG. No. COMPUTER DWG. PATH NAME

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)



REFERENCE NO.	DESCRIPTION
TB 0 377 510 002	LAYOUT PLAN FOR 400kV SWITCHYARD
TB 3 377 510 001	SINGLE LINE DIAGRAM FOR 400kV SWITCHYARD
PE-DG-410-100-M001-GP	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION
W.O.No. 84005

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD
HYDERABAD, TELANGANA

NAME OF CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

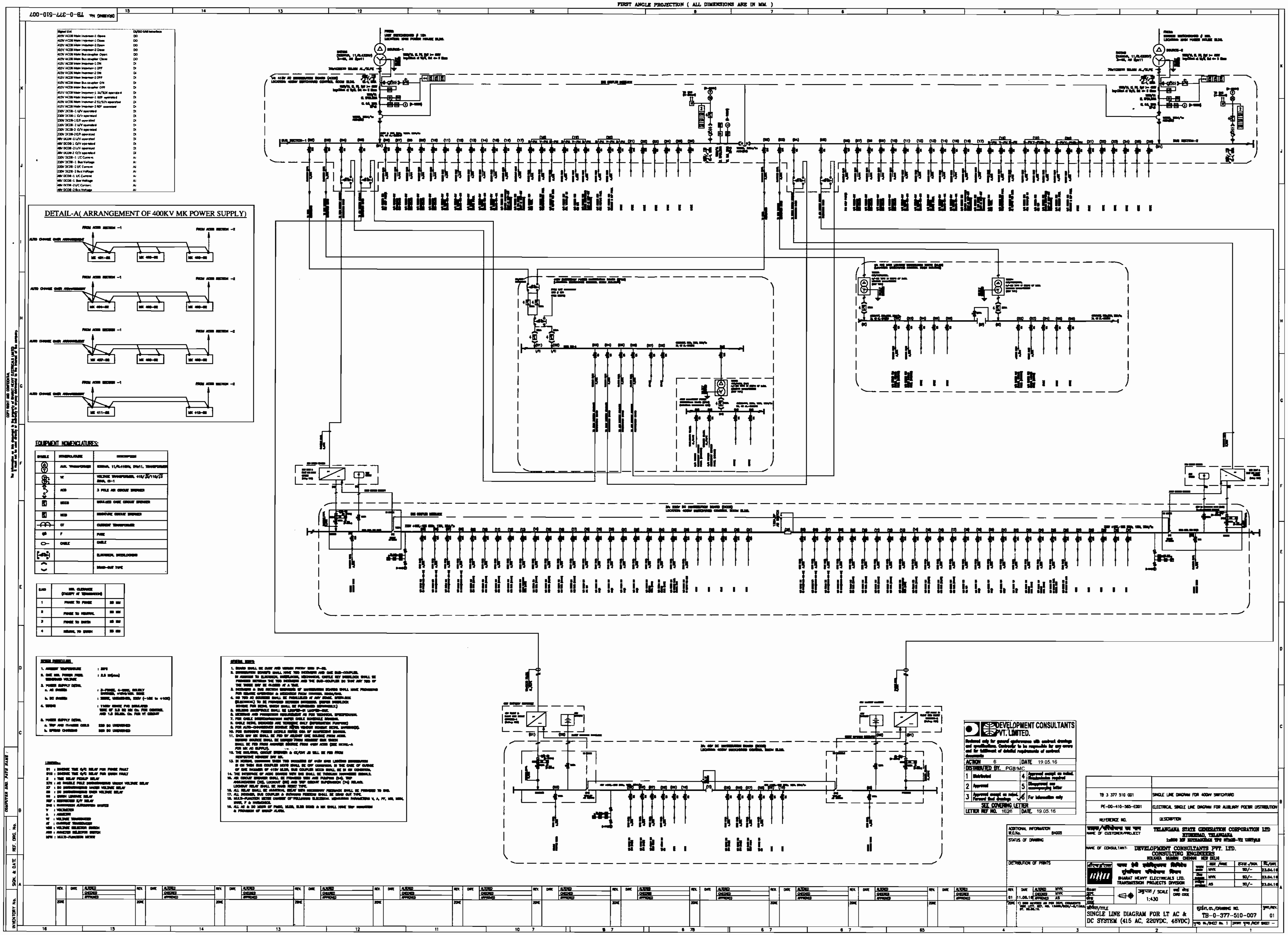
	NAME	SIGN.	DATE
	PR	Sd/-	
	PR	Sd/-	
	AS	Sd/-	

SCALE 1:430

TITLE: SECTIONAL ELEVATION OF 400 kV SWITCHYARD

DRAWING NO. TB-0-377-510-002 REV. 05

SHEET No. 2


FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)
DRAWING No. TB-0-377-510-007
DETAIL-A(ARRANGEMENT OF 400KV MK POWER SUPPLY)
EQUIPMENT NOMENCLATURES:
DEVELOPMENT CONSULTANTS PVT. LIMITED.
ACTION 6
DATE 19.05.16
DISTRIBUTED BY. PGB/MC
SEE COVERING LETTER
LETTER REF NO. 1626
DATE. 19.05.16
TB 3 377 510 001
SINGLE LINE DIAGRAM FOR 400KV SWITCHYARD
PE-DG-410-565-E001
ELECTRICAL SINGLE LINE DIAGRAM FOR AUXILIARY POWER DISTRIBUTION
REFERENCE NO.
DESCRIPTION
ADDITIONAL INFORMATION
W.O.No. 84005
STATUS OF DRAWING
DISTRIBUTION OF PRINTS
NAME OF CUSTOMER/PROJECT
TELANGANA STATE GENERATION CORPORATION LTD
HYDERABAD, TELANGANA
NAME OF CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION
MVK SD/- 23.04.16
MVK SD/- 23.04.16
AS SD/- 23.04.16
REV. 01 DATE 11.08.16 ALTERED MVK CHECKED MVK APPROVED AS
SCALE 1:430
TITLE
SINGLE LINE DIAGRAM FOR LT AC & DC SYSTEM (415 AC, 220VDC, 48VDC)
DRAWING NO. TB-0-377-510-007
REV. 01
SHEET No. 1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

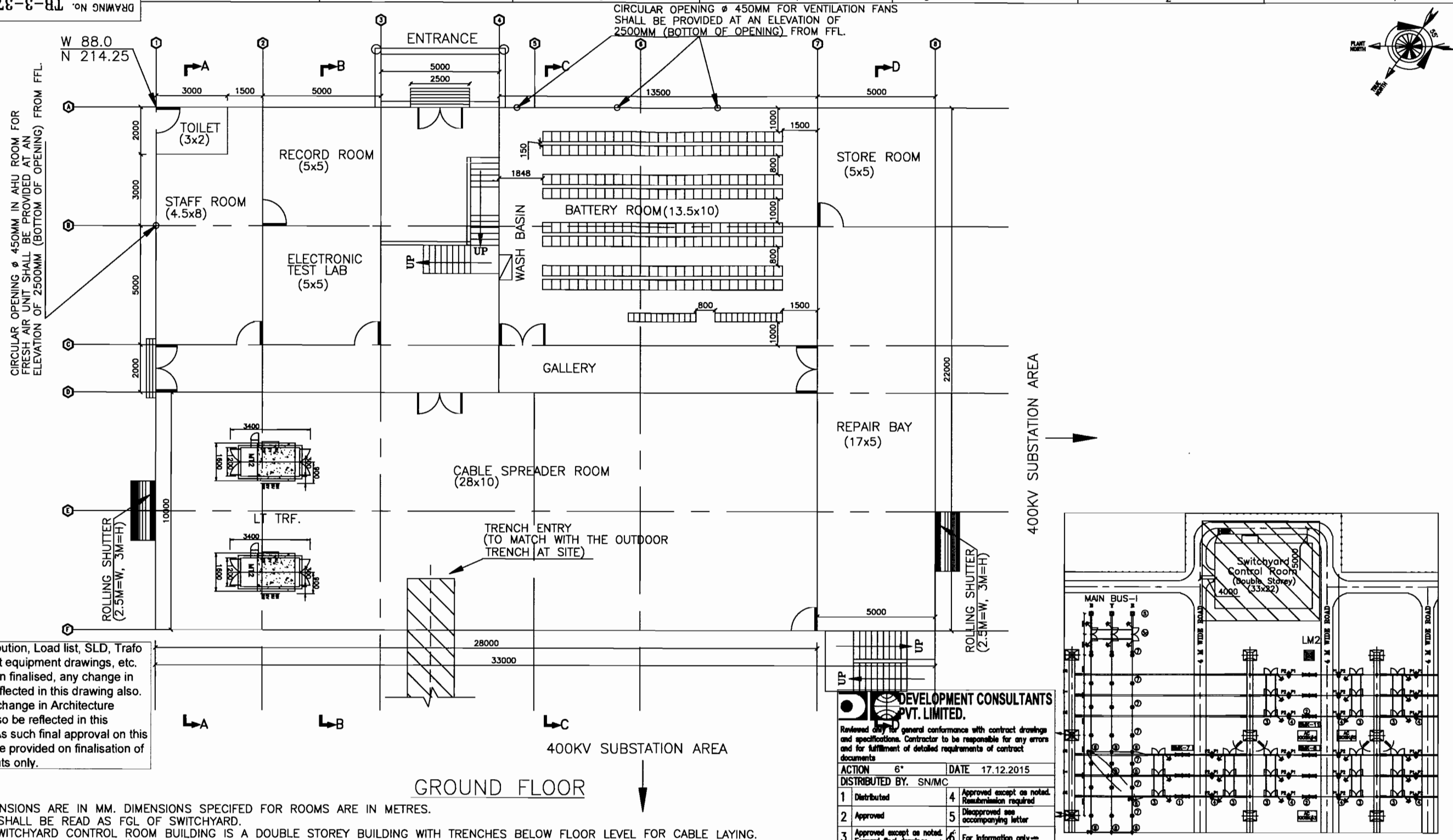
DRAWING No. TB-3-377-316-008

COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.



400KV SUBSTATION AREA

KEY PLAN

1. As LT Distribution, Load list, SLD, Trafo Sizing, different equipment drawings, etc. are not yet been finalised, any change in those will be reflected in this drawing also. Moreover any change in Architecture Drawing will also be reflected in this drawing also. As such final approval on this drawing shall be provided on finalisation of these documents only.

GROUND FLOOR

NOTES:–

1. ALL DIMENSIONS ARE IN MM. DIMENSIONS SPECIFED FOR ROOMS ARE IN METRES.
2. +0.00M SHALL BE READ AS FGL OF SWITCHYARD.
2. 400KV SWITCHYARD CONTROL ROOM BUILDING IS A DOUBLE STOREY BUILDING WITH TRENCHES BELOW FLOOR LEVEL FOR CABLE LAYING.
3. CONTROL ROOM, OFFICE ROOM'S & CONFERENCE ROOM ON FIRST FLOOR SHALL BE AIR–CONDITIONED WITH FALSE CEILING. OTHER PARTS OF BUILDING SHALL BE NON AIR–CONDITIONED & WITH NO FALSE CEILING.
4. DIMENSIONS AND ARRANGEMENT OF PANELS INSIDE CONTROL ROOM BUILDING ARE INDICATIVE AND SHALL BE FINALISED DURING DETAILED ENGINEERING.
5. ACDB ROOM, BATTERY ROOM, PANTRY AND TOILETS SHALL BE PROVIDED WITH EXHAUST AIR FANS.
6. ALL ROOM EXCEPT AHU ROOM SHALL BE PROVIDED WITH WINDOW.
7. ALL THE DIMENSIONS OF THE ROOMS ARE WALL CENTRE TO CENTRE DIMENSIONS.
8. SEPARATE DRAWING SHALL BE SUBMITED FOR DETAILED ARCHITECTURE AND TRENCH LAYOUT OF CONTROL ROOM BUILDING.
9. PROTECTION/BAY CONTROL PANELS WILL BE LOCATED IN OUTDOOR SWITCHYARD AC KIOSK.
10. ALUMINIUM GLAZED WINDOW SHALL BE PROVIDED IN CONTROL ROOM TO HAVE A CLEAR VIEW OF SWITCHYARD EQUIPMENTS.
11. PROTECTIVE GRILL SHALL BE PROVIDED FOR ALL THE GLASS WINDOWS FACING SWITCHYARD.
12. BATTERY ROOM DOOR SHALL BE PVC TYPE. SWITCHGEAR ROOM DOOR SHALL BE FIRE–PROOF TYPE.

DEVELOPMENT CONSULTANTS PVT. LIMITED.

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

ACTION 6*		DATE 17.12.2015	
DISTRIBUTED BY. SN/MC			
1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved see accompanying letter
3	Approved except as noted. Forward final drawings	6	For information only
SEE COVERING LETTER			
LETTER REF NO. 0942		DATE. 17.12.2015	

REV.	DATE	ALTERED / CHECKED / APPROVED	ZONE	
03	23.11.15	ALTERED MVK; CHECKED MVK; APPROVED AS	ZONE	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.
02	11.10.15	ALTERED MVK SD/–; CHECKED MVK SD/–; APPROVED AS SD/–	ZONE	1) REVISED AS PER CUSTOMER COMMENTS.
01	21.08.15	ALTERED MVK SD/–; CHECKED MVK SD/–; APPROVED AS SD/–	ZONE	1) REVISED AS PER CUSTOMER COMMENTS.

ADDITIONAL INFORMATION
W.O.No. 84005

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम TSGENCO
NAME OF CUSTOMER/PROJECT 400KV SWITCHYARD AT 1x800 MW KOTHAGUDEM TPS

CONSULTANT:– DEVELOPMENT CONSULTANTS PVT. LTD.

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
चैक्ड CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

विभाग DEPT. TBEM; कोड CODE 422; अनुपात / SCALE; कार्ड कोड CARD CODE

शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT

ड्राईंग क्र./DRAWING NO. TB-3-377-316-008

पुनः/REV. 03

पृष्ठ क्र./SHEET No. 1 अगला पृष्ठ/NEXT SHEET 2

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

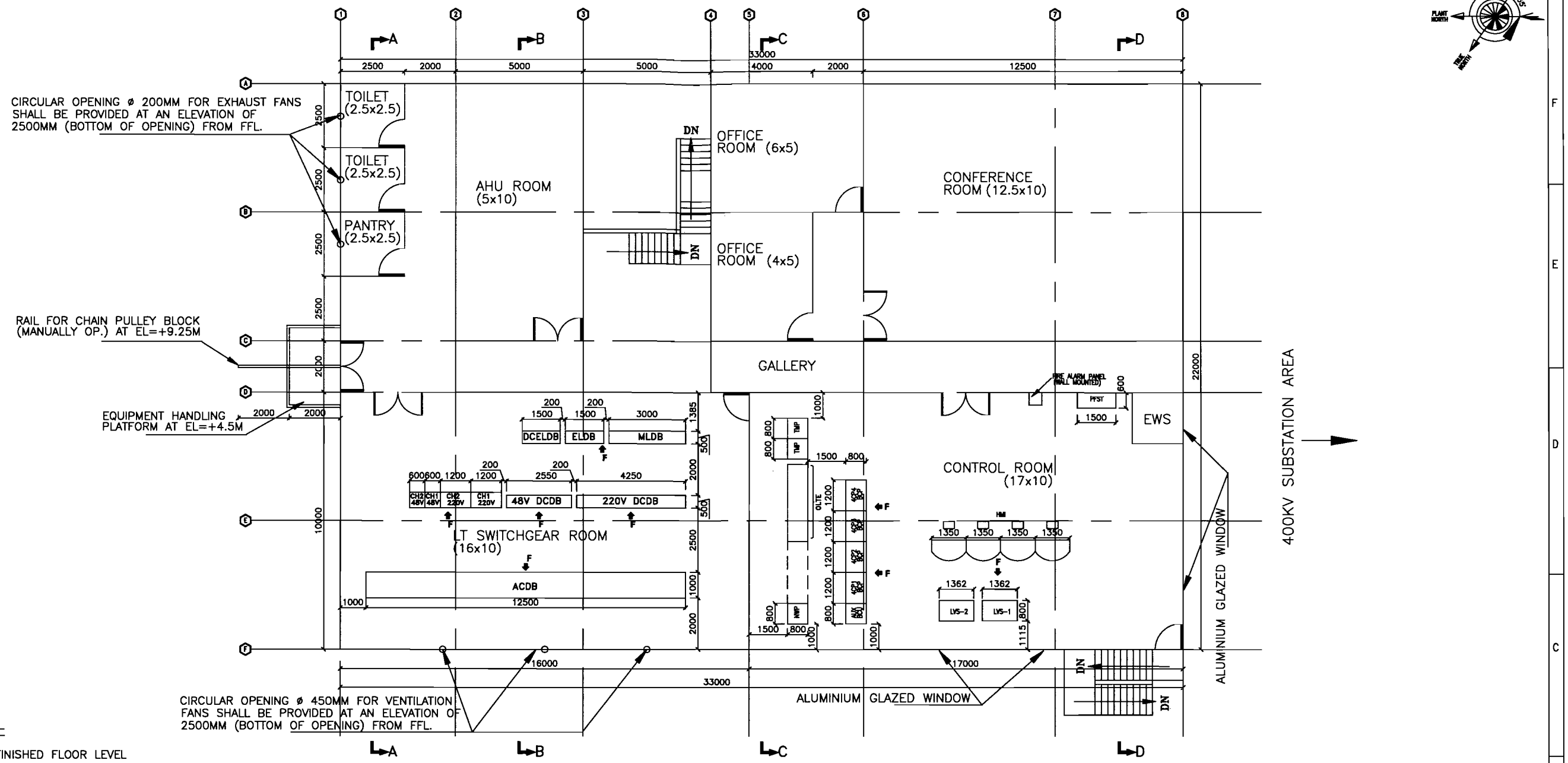
DRAWING No. TB-3-377-316-008

COMPUTER DRG. PATH NAME :

REF. DRG. No.

SIGN. & DATE

INVENTORY No.



LEGEND–

FFL = FINISHED FLOOR LEVEL
FGL = FINISHED GROUND LEVEL
ACDB = AC DISTRIBUTION BOARD
DCDB = DC DISTRIBUTION BOARD
MLDB = MAIN LIGHTING DISTRIBUTION BOARD
ELDB = EMERGENCY LIGHTING DISTRIBUTION BOARD
CH = CHARGER
AHU = AIR HANDLING UNIT
TMP = TARIFF METERING PANEL
BCP = BACK UP CONTROL PANEL
HMI = HUMAN MACHINE INTERFACE (MAIN OWS, BACKUP OWS, METERING WORK STATION)
LVS = LARGE VIDEO SCREEN
PFST = PRINTER CUM FILE STORAGE TABLE
AUX = AUXILIARY PANEL
NWP = NETWORKING PANEL
OLTE= OVERHEAD LINE TELECOMMUNICATION EQUIPMENT
EWS = ENGINEERING WORK STATION

FIRST FLOOR

REV.	DATE	
		ALTERED
		CHECKED
		APPROVED
ZONE		

REV.	DATE		
03	23.11.15	ALTERED	MVK
		CHECKED	MVK
		APPROVED	AS
ZONE	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.		

REV.	DATE		
02	11.10.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

REV.	DATE		
01	21.08.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

ADDITIONAL INFORMATION
W.O.No. 84005

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT: TSGENCO
400KV SWITCHYARD AT 1x800 MW KOTHAGUDEM TPS

CONSULTANT:– DEVELOPMENT CONSULTANTS PVT. LTD.

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
चैक्ड CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

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

शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT

ड्राईग.क्र./DRAWING NO. TB-3-377-316-008
पुनः/REV. 03

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

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

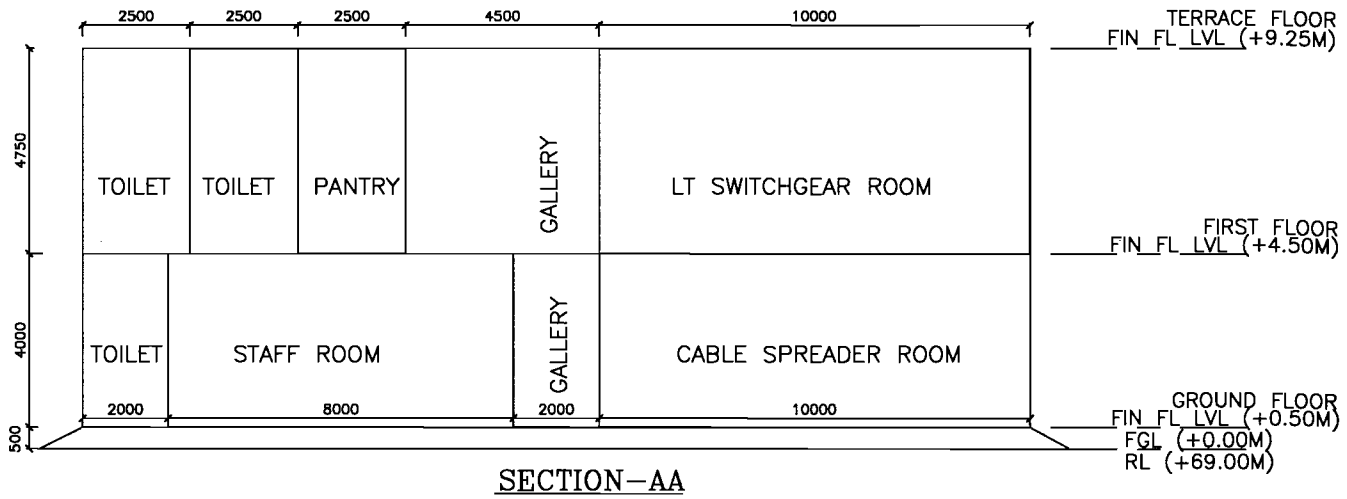
DRAWING No. TB-3-377-316-008

COMPUTER DRG. PATH NAME :

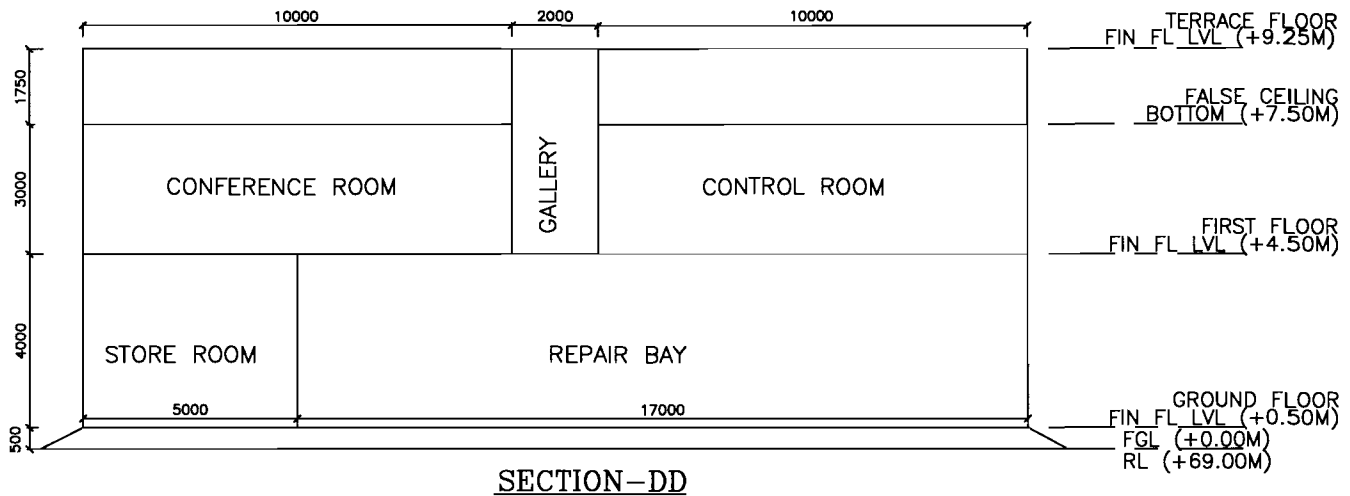
REF. DRG. No.

SIGN. & DATE

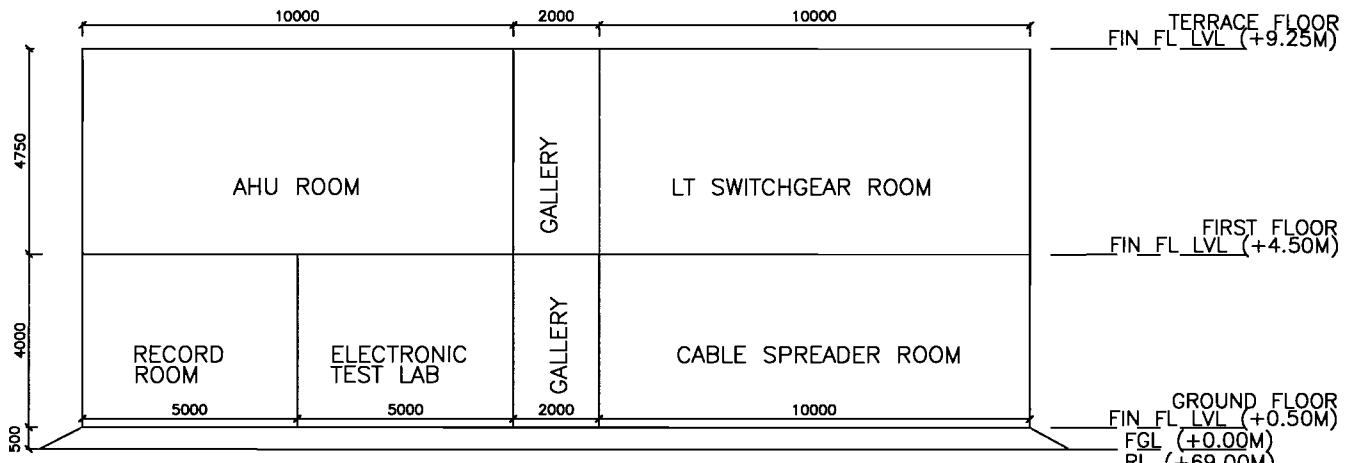
INVENTORY No.



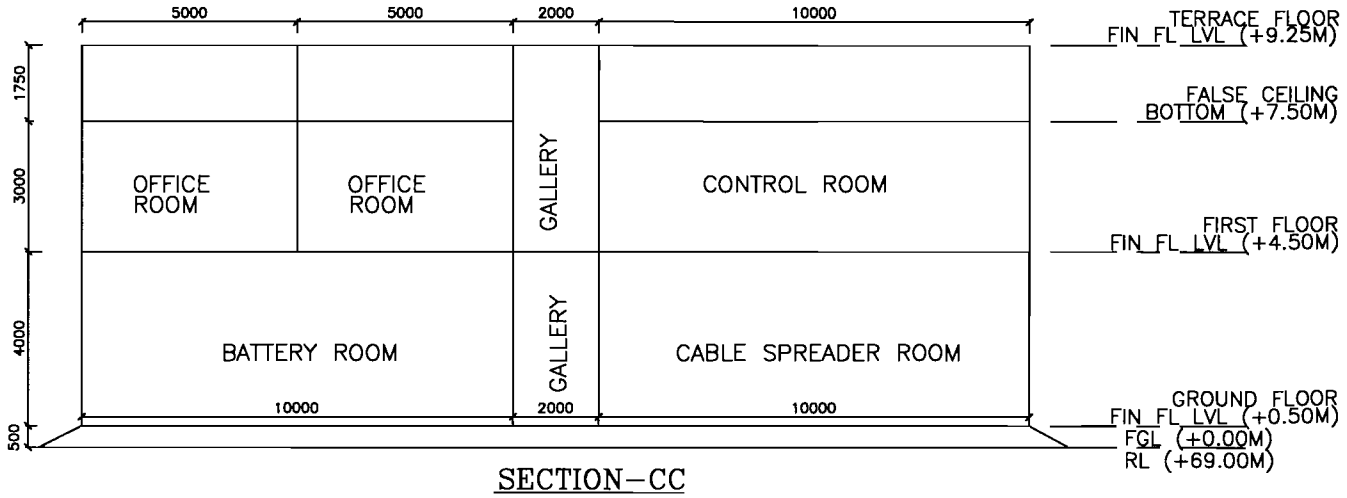
SECTION–AA



SECTION–DD



SECTION–BB



SECTION–CC

REV.	DATE		REV.	DATE		REV.	DATE		REV.	DATE	
		ALTERED			ALTERED MVK			ALTERED MVK SD/–			ALTERED MVK SD/–
		CHECKED			CHECKED MVK			CHECKED MVK SD/–			CHECKED MVK SD/–
		APPROVED			APPROVED AS			APPROVED AS SD/–			APPROVED AS SD/–
ZONE			03	23.11.15	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.	02	11.10.15	1) REVISED AS PER CUSTOMER COMMENTS.	01	21.08.15	1) REVISED AS PER CUSTOMER COMMENTS.

ADDITIONAL INFORMATION
W.O.No. 84005

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT: TSGENCO
400KV SWITCHYARD AT 1x800 MW KOTHAGUDEM TPS

CONSULTANT:– DEVELOPMENT CONSULTANTS PVT. LTD.

BHEL भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
जाँचा CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

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

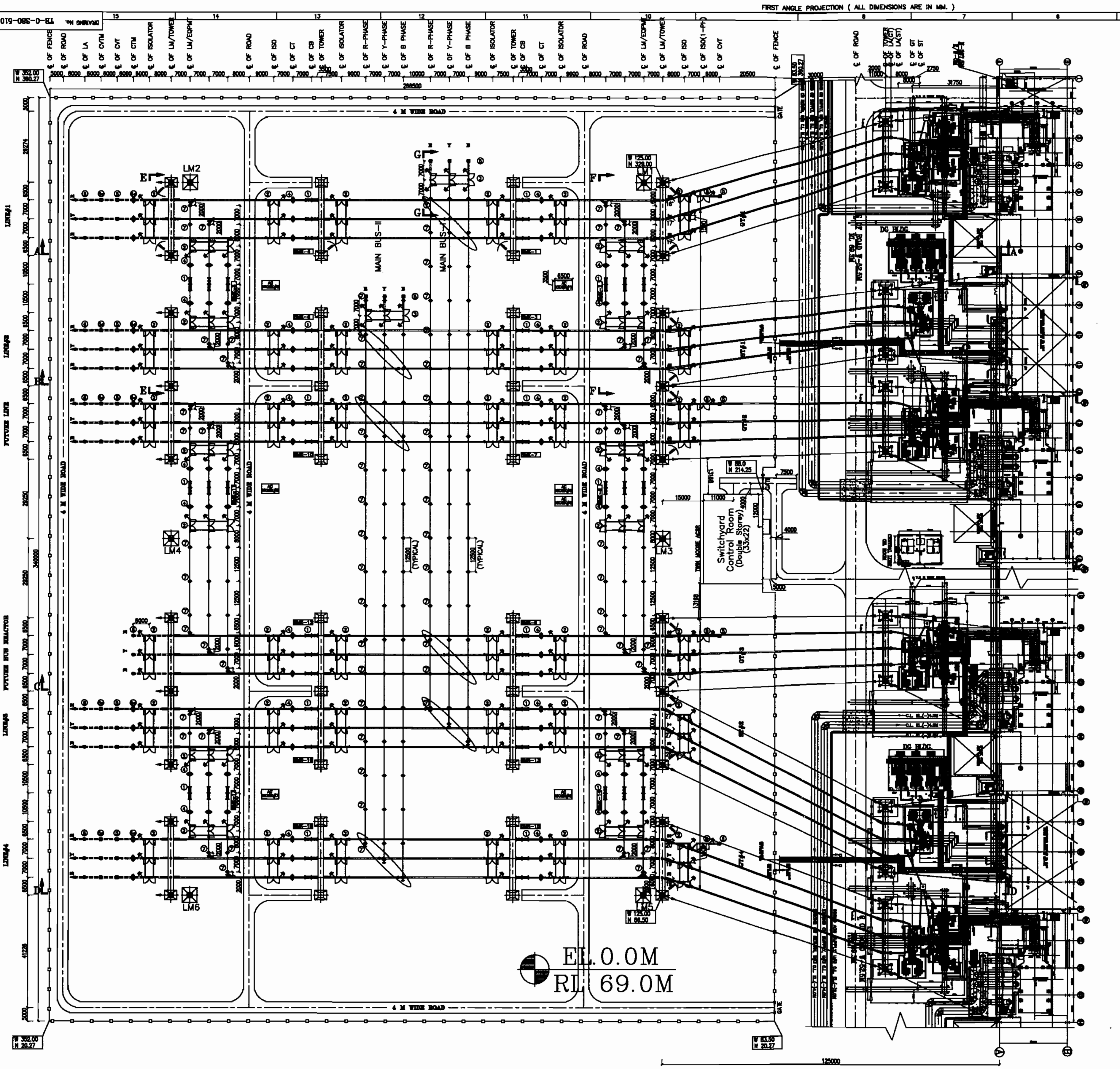
शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD
CONTROL ROOM BUILDING LAYOUT

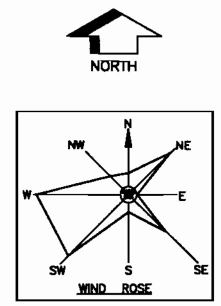
ड्राईग.क्र./DRAWING NO. TB-3-377-316-008
पुनः/REV. 03
पृष्ठ क्र./SHEET No. 3
अगला पृष्ठ/NEXT SHEET –

ANNEXURE-3

(BHADRADRI)

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)





SCHEDULE OF EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	QTY.
1	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITHOUT PIR		18
2	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH ONE EARTH SWITCH		48
3	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH TWO EARTH SWITCH		02
4	400KV 3000A, 5-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER		72
4a	400KV 3000A, 2-CORE, 50kA FOR 3 SEC 1PH. CURRENT TRANSFORMER (METERING)		15
5	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (3 SECONDARY)		25
5a	400kV, 4400pf, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (2 SECONDARY)		15
6	360kV, 20KA, 1-PH SURGE ARRESTER		36
7	400KV, 8kN BUS POST INSULATOR (SOLID CORE PORCELAIN TYPE)		156
8	400KV, 3150A, 50KA FOR 3 SEC, 1PH HCB ISOLATOR WITH ONE EARTH SWITCH		04

SYSTEM PARAMETERS

DESCRIPTION	400kV
HIGHEST SYSTEM VOLTAGE (kV)	420
RATED FREQUENCY	50hz, +3% to -5%
LIGHTNING IMPULSE WITHSTAND VOLTAGE (kVp)	1425
SWITCHING IMPULSE WITHSTAND VOLTAGE (kVp)	1050
P.F. WITHSTAND VOLTAGE (kV rms)	630
SYSTEM FAULT LEVEL (kA for 1sec)	50
CREEPAGE DISTANCE (25mm/kV) (mm)	10500
SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED

CLEARANCE TABLE

PHASE TO PHASE (PP)	4200
PHASE TO EARTH (PE)	3500
SECTION CLEARANCE (SC)	6500
VERTICAL GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR/EQUIPMENT	2440
GROUND CLEARANCE (PLINTH TO CENTER OF TUBE)	8000

CONDUCTOR DETAIL

S.NO.	DESCRIPTION	
1.	MAIN BUS	4.5"IPS (EH) AL TUBE OD=120mm ID=98mm
2.	EQUIPMENT INTERCONNECTION	4.5"IPS AL TUBE/QUAD/TWIN MOOSE ACSR
3.	JUMPER /DROPPERS	QUAD/TWIN MOOSE ACSR
4.	SHIELD WIRE	(7/8 SWG) GALVANISED STEEL (12mm DIA)

LEGEND TABLE

	PRESENT BHEL SCOPE
	CUSTOMER SCOPE
	FENCE
	TENSION STRING INSULATOR (2X25 DISCS)
	SUSPENSION STRING INSULATOR (1X25 DISCS)
	COLUMN WITHOUT PEAK
	COLUMN WITH PEAK
	CORONA END BELL
	INDICATES CONNECTION TO MAIN BUS
	LIGHTNING MAST

NOTES:-

1. ALL CONNECTIONS MARKED WITH ACSR CONDUCTOR ARE WITH "MOOSE". CONNECTIONS MARKED WITH AL. TUBE ARE WITH 4.5" IPS.
2. SWITCHYARD SHALL BE PROVIDED WITH GRAVELS. THE THICKNESS OF GRAVEL SHALL BE 150MM. GRAVEL SPREAD DRG TO BE ISSUED SEPARATELY.
3. LA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE/ANY EQUIPMENT KEPT NEAR LIGHTNING ARRESTERS.
4. BPI, ISOLATOR, LA, CVT, CB & CT STRUCTURE SHALL BE LATTICE TYPE.
5. TERMINATION OF OUTGOING LINE CONDUCTORS ON THE SWITCHYARD GANTRY INCLUDING INSULATOR STRINGS FOR SAME IS NOT IN SCOPE OF CONTRACT AND THEREFORE SHOWN IN DOTTED. CUSTOMER TO PROVIDE CONDUCTOR DETAILS.
6. LM QUANTITY AND LOCATION IS TENTATIVE. IT SHALL BE FINALIZED AFTER DSLP CALCULATION.
7. THE TOP OF THE BOLT OF LA / POST INSULATOR (COMING NEAR GENERATOR/STATION TRANSFORMER YARD) FOUNDATION SHALL BE LOWER BY 15MM THAN THE TOP OF RAIL, THIS IS TO FACILITATE THE REMOVAL OF LA STRUCTURE DURING TRANSFORMER TO BE TAKEN OUT FOR REPAIR/ REPLACEMENT.
8. REACTOR ALONGWITH FOUNDATION IS NOT IN BHEL SCOPE OF WORK.
9. LOCATION OF AC KIOSKs & MKs ARE TENTATIVE AND SHALL BE AS PER CABLE TRENCH LAYOUT.

REFERENCE NO.	DESCRIPTION
TB 3 380 510 001	SINGLE LINE DIAGRAM FOR 400kV SWITCHYARD
PE-DG-410-100-M001-0P	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION
W.O.No. 84010

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD
HYDERABAD, TELANGANA
4x270 MW BHADRADRI TPS

NAME OF CONSULTANT: DESEIN PRIVATE LIMITED

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

REV. 01 — DATE 28.05.15 — DRAWING REVISED AS PER CUSTOMER LETTER REF: HYD/BHEL(TPD)/020 DATED: 30/04/15.

SCALE 1:550

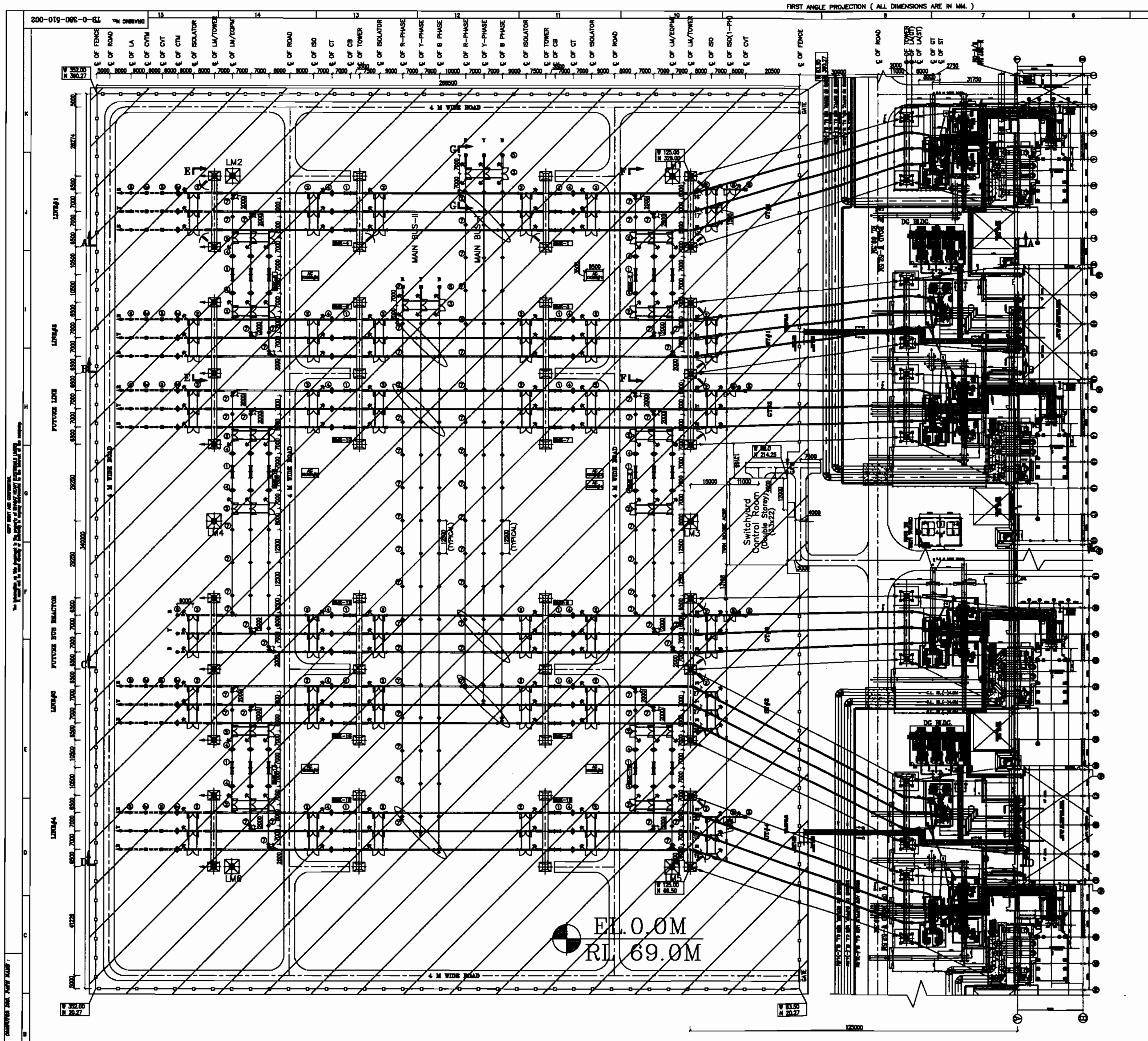
TITLE: 400 kV SWITCHYARD PLAN

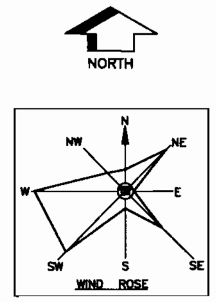
DRAWING NO. TB-0-380-510-002 — REV. 05

SHEET No. 1 — NEXT SHEET 2

DRAWING No. TB-0-380-510-002

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)





SCHEDULE OF EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	QTY.
1	400KV, 3150A, 50KA FOR 3 SEC, 3PH, SF6 CIRCUIT BREAKER WITHOUT PIR		18
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3	400KV, 3150A, 50KA FOR 3 SEC, 3PH HCB ISOLATOR WITH TWO EARTH SWITCH		02
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7	400KV, 8kN BUS POST INSULATOR (SOLID CORE PORCELAIN TYPE)		156
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SYSTEM PARAMETERS

DESCRIPTION	400kV
HIGHEST SYSTEM VOLTAGE (kV)	420
RATED FREQUENCY	50Hz, +3% to -5%
LIGHTNING IMPULSE WITHSTAND VOLTAGE (kVp)	1425
SWITCHING IMPULSE WITHSTAND VOLTAGE (kVp)	1050
P.f. WITHSTAND VOLTAGE (kV rms)	630
SYSTEM FAULT LEVEL (kA for 1sec)	50
CREEPAGE DISTANCE (25mm/kV) (mm)	10500
SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED

CLEARANCE TABLE

PHASE TO PHASE (PP)	4200
PHASE TO EARTH (PE)	3500
SECTION CLEARANCE (SC)	6500
VERTICAL GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR/EQUIPMENT	2440
GROUND CLEARANCE (PLINTH TO CENTER OF TUBE)	8000

CONDUCTOR DETAIL

S.NO.	DESCRIPTION	
1.	MAIN BUS	4.5"IPS (EH) AL TUBE OD=120mm ID=98mm
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3.	JUMPER /DROPPERS	QUAD/TWIN MOOSE ACSR
4.	SHIELD WIRE	(7/8 SWG) GALVANISED STEEL (12mm DIA)

LEGEND TABLE

	PRESENT BHEL SCOPE
	CUSTOMER SCOPE
	FENCE
	TENSION STRING INSULATOR (2X25 DISCS)
	SUSPENSION STRING INSULATOR (1X25 DISCS)
	COLUMN WITHOUT PEAK
	COLUMN WITH PEAK
	CORONA END BELL
	INDICATES CONNECTION TO MAIN BUS
	LIGHTNING MAST

NOTES:-

1. ALL CONNECTIONS MARKED WITH ACSR CONDUCTOR ARE WITH "MOOSE". CONNECTIONS MARKED WITH AL. TUBE ARE WITH 4.5" IPS.
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8. REACTOR ALONGWITH FOUNDATION IS NOT IN BHEL SCOPE OF WORK.
9. LOCATION OF AC KIOSKs & MKs ARE TENTATIVE AND SHALL BE AS PER CABLE TRENCH LAYOUT.

AREA FOR ILLUMINATION.

REFERENCE NO.	DESCRIPTION
TB 3 380 510 001	SINGLE LINE DIAGRAM FOR 400kV SWITCHYARD
PE-DG-410-100-M001-0P	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION
W.O.No. 84010
STATUS OF DRAWING
DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD HYDERABAD, TELANGANA 4x270 MW BHADRADRI TPS

NAME OF CONSULTANT: DESEIN PRIVATE LIMITED

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

SCALE 1:500

TITLE: 400 kV SWITCHYARD PLAN

DRAWING NO. TB-0-380-510-002 REV. 05

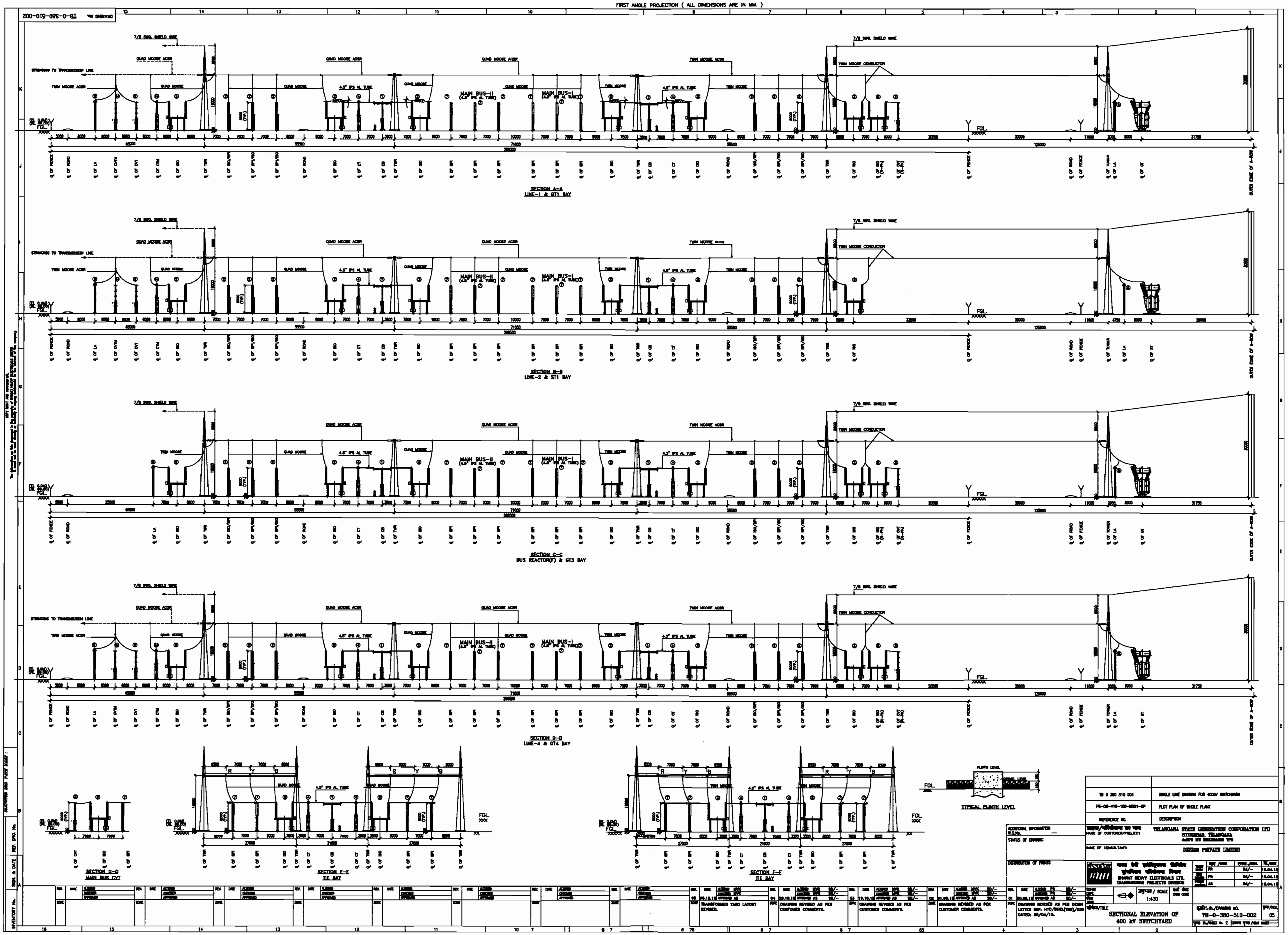
SHEET No. 1 NEXT SHEET 2

ZONE 01: DRAWING REVISED AS PER REVIEW LETTER REF: ... DATED: 30/04/18.

DRAWING No. TB-0-380-510-002

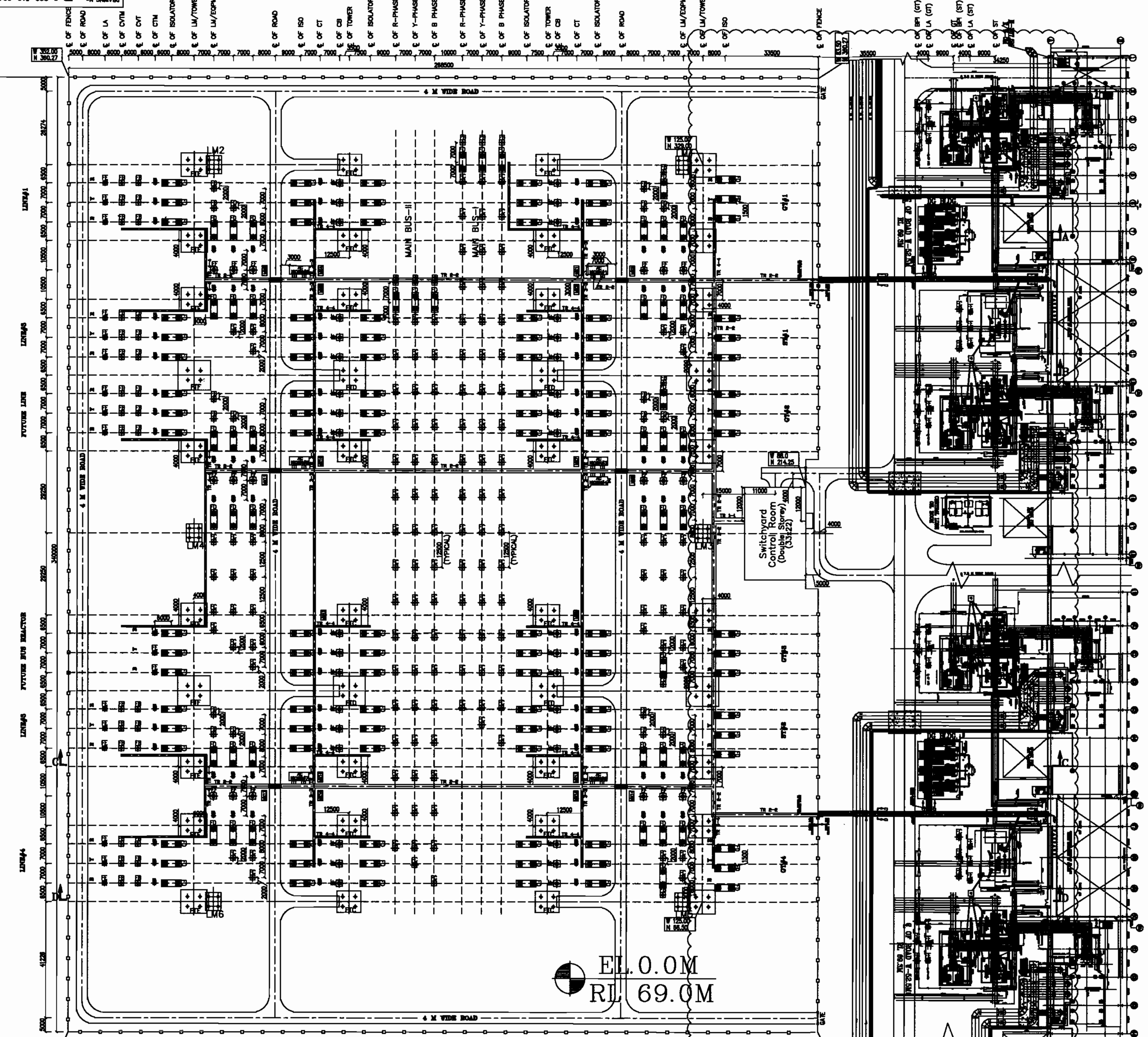
COMPUTER DWG. FILE NAME :

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

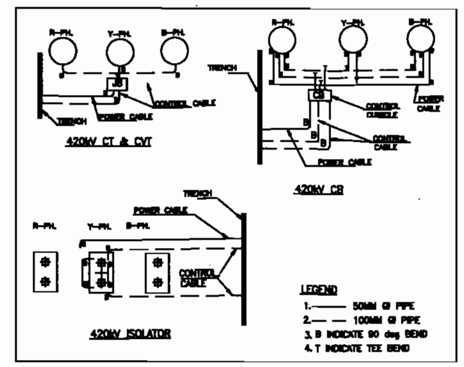


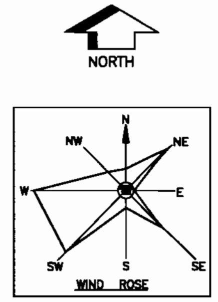
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)
SECTION A-A
LINE-1 & GT1 BAY
SECTION B-B
LINE-2 & ST1 BAY
SECTION C-C
BUS REACTOR(F) & GT3 BAY
SECTION D-D
LINE-4 & GT4 BAY
SECTION G-G
MAIN BUS CVT
SECTION E-E
TIE BAY
SECTION F-F
TIE BAY
TYPICAL PLINTH LEVEL
7/8 SWG. SHIELD WIRE
TWIN MOOSE CONDUCTOR
TWIN MOOSE ACSR
QUAD MOOSE ACSR
QUAD MOOSE
TWIN MOOSE
4.5" IPS AL TUBE
MAIN BUS-I (4.5" IPS AL TUBE)
MAIN BUS-II (4.5" IPS AL TUBE)
STRINGING TO TRANSMISSION LINE
FGL
OUTER EDGE OF A-ROW
TB 3 380 510 001
SINGLE LINE DIAGRAM FOR 400KV SWITCHYARD
PE-DG-410-100-M001-DP
PLOT PLAN OF WHOLE PLANT
REFERENCE NO.
DESCRIPTION
TELANGANA STATE GENERATION CORPORATION LTD
HYDERABAD, TELANGANA
DESIGN PRIVATE LIMITED
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION
SCALE 1:430
SECTIONAL ELEVATION OF
400 kV SWITCHYARD
DRAWING NO.
TB-0-380-510-002
REV. 05
DRAWING REVISED AS PER DESIGN LETTER REF: HYD/BHEL(TBG)/020 DATED: 30/04/15.
DRAWING REVISED AS PER CUSTOMER COMMENTS.
TRANSFORMER YARD LAYOUT REVISED.
COPY RIGHT AND CONFIDENTIAL
INVENTORY No.
SIGN. & DATE
REF. DRG. No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)



GI PIPE DETAILS OF 420 kV EQUIPMENTS



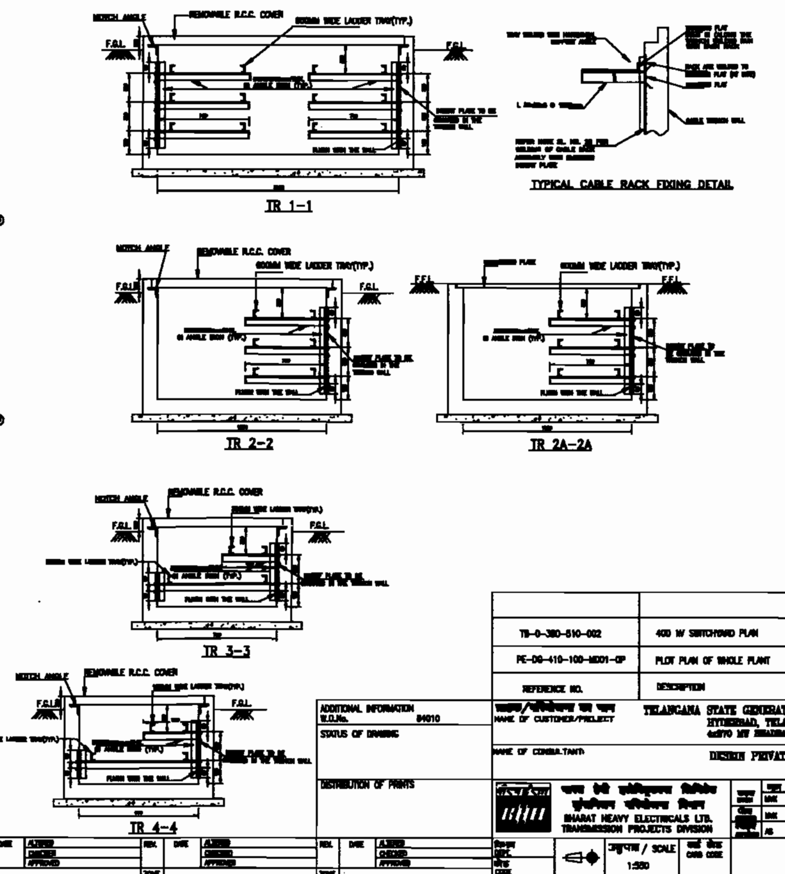


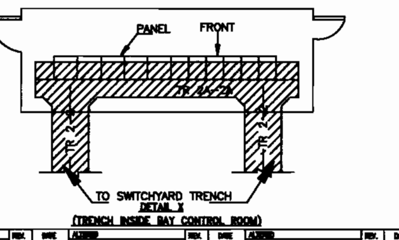
NOTES :-

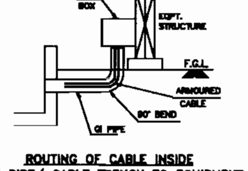
1. ALL DIMENSIONS ARE IN mm.
2. THE LOCATION OF CABLE TRENCHES MARKED IN THIS DWG MAY BE SLIGHTLY MODIFIED TO SUIT SITE CONDITIONS.
3. OPENINGS FOR TAKING OUT GI PIPES TO EQUIPMENTS SHALL BE PROVIDED IN CABLE TRENCHES. OPENING OF SIZE SUITABLE TO DIA. 50/100 PIPE SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.
4. MK – INDICATES MARSHALLING KIOSK.
5. MK SHALL BE PLACED IN THE LOCATION SHOWN. EXACT COORDINATES TO BE SUITABLY DECIDED AT SITE.
6. 1.1kV CABLE SHALL BE PLACED IN MULTI LAYER ON 2.5M LONG GI TRAY SUPPORTED ON RACK (GI ANGLE).
7. CABLE SUPPORT SHALL BE PROVIDED AT EVERY 1500mm INTERVAL.
8. INSERTS MUST BE EMBEDDED AT EVERY 1500mm INTERVAL FOR FIXING CABLE SUPPORT.
9. AUXILIARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS.
10. FIBER OPTIC CABLE BETWEEN AC KIOSK AND CONTROL ROOM SHALL BE LAID IN 50mm DIA GI PIPE AND SAME SHALL BE ROUTED THROUGH BOTTOM OF CABLE TRENCH. 50mm DIA GI PIPE USED FOR FIBER OPTICS CABLES SHALL BE SUITABLY CLAMPED TO AVOID MOVEMENT.
11. CABLES FOR LIGHTING PURPOSE SHALL BE LAID IN GI PIPE/ TRENCH. SEPARATE DRAWING SHALL BE SUBMITTED FOR LIGHTING SYSTEM.
12. LOCATION OF CABLE TRENCHES INSIDE CONTROL ROOM SHALL BE SHOWN IN SEPARATE DRAWING.
13. EARTH CONDUCTOR 50X8 GS FLAT TO BE WELDED IN VERTICAL ON THE CABLE SUPPORT BEFORE INSTALLATION OF CABLES.
14. CABLES CROSSING ROAD SHALL BE LAID IN PIPE CULVERT (FOR QUANTITY OF PIPE REFER TABLE-1).
15. FOR POWER & CONTROL CABLES, SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING CRITERIA.
16. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
17. GI PIPES SHALL BE SECURELY FIXED AT BOTH ENDS.
18. AFTER LAYING THE CABLES THE ENDS OF GI PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.
19. CONTROL CABLES & POWER CABLES MUST BE LAID IN SEPARATE GI PIPES.
20. CABLE TRENCH SHALL BE PROVIDED ON MARSHALLING BOX SIDE OF EQUIPMENT.
21. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS:
   - TO BE USED AS CIVIL INPUT FOR CABLE TRENCHES.
   - FOR ERECTION OF CABLE RACKS AT SITE.
   - FOR CABLE LAYING AND ROUTING AT SITE.
22. CONTROL CABLE SHALL BE LAID IN MULTILAYERS IN EACH TRAY.
23. THE CABLE OF CT /CVT BETWEEN SECONDARY TERMINAL BOX AND JUNCTION BOX SHALL BE LAID IN 100/50MM GI PIPE.
24. INDICATE PIPE CULVERT.
25. LONGITUDINAL SLOPE IN CABLE TRENCH SHALL BE TYPICALLY 1:500.
26. THE CABLE RACK ASSEMBLY SHALL BE WELDED TO EMBEDED INSERT PLATE AS MENTIONED BELOW. "6mm WELD 50mm LONG ON BOTH SIDES OF VERTICAL FLAT AT TOP AND BOTTOM AND NEAR EVERY INTERMEDIATE HORIZONTAL CABLE SUPPORT ANGLE, IT MEANT THAT IF CABLE RACK ASSEMBLY HAS THREE TIERS THEN IT SHALL BE WELDED TO FIVE LOCATION AT BOTH SIDE".
27. SUMP AND DRAINAGE SHALL BE SHOWN IN SEPARATE CIVIL DRAWING.
28. RACK ASSEMBLIES FOR CABLE TRENCHES SHALL BE PROVIDED ON THE FACE OF TRENCH WALL MARKED 4 THUS.
29. CABLES SHALL BE ROUTED THROUGH SHORTEST ROUTE AS POSSIBLE.
30. REFER DETAIL X FOR TRENCH INSIDE BAY AC KIOSK.

TABLE-1

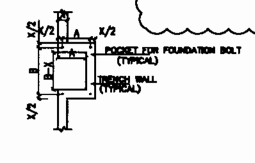
QUANTITY OF RCC PIPE FOR ROAD CROSSING	
TRENCH TYPE	300MM OD
TR-2	06 NO.







ROUTING OF CABLE INSIDE GI PIPE/ CABLE TRENCH TO EQUIPMENT



MK FIXING DETAIL ON TRENCH
A & B DIMENSIONS ARE AS PER MK DRAWING.
X-TRENCH WALL THICKNESS.

REFERENCE NO.	DESCRIPTION
TB-0-380-510-002	400 kV SWITCHYARD PLAN
PE-DG-410-100-M001-GP	PLOT PLAN OF WHOLE PLANT

ADDITIONAL INFORMATION W.O.No. 84010
STATUS OF DRAWING
DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT: TELANGANA STATE GENERATION CORPORATION LTD HYDERABAD, TELANGANA 4x270 MW BHADRADRI TPS

NAME OF CONSULTANT: DESEIN PRIVATE LIMITED

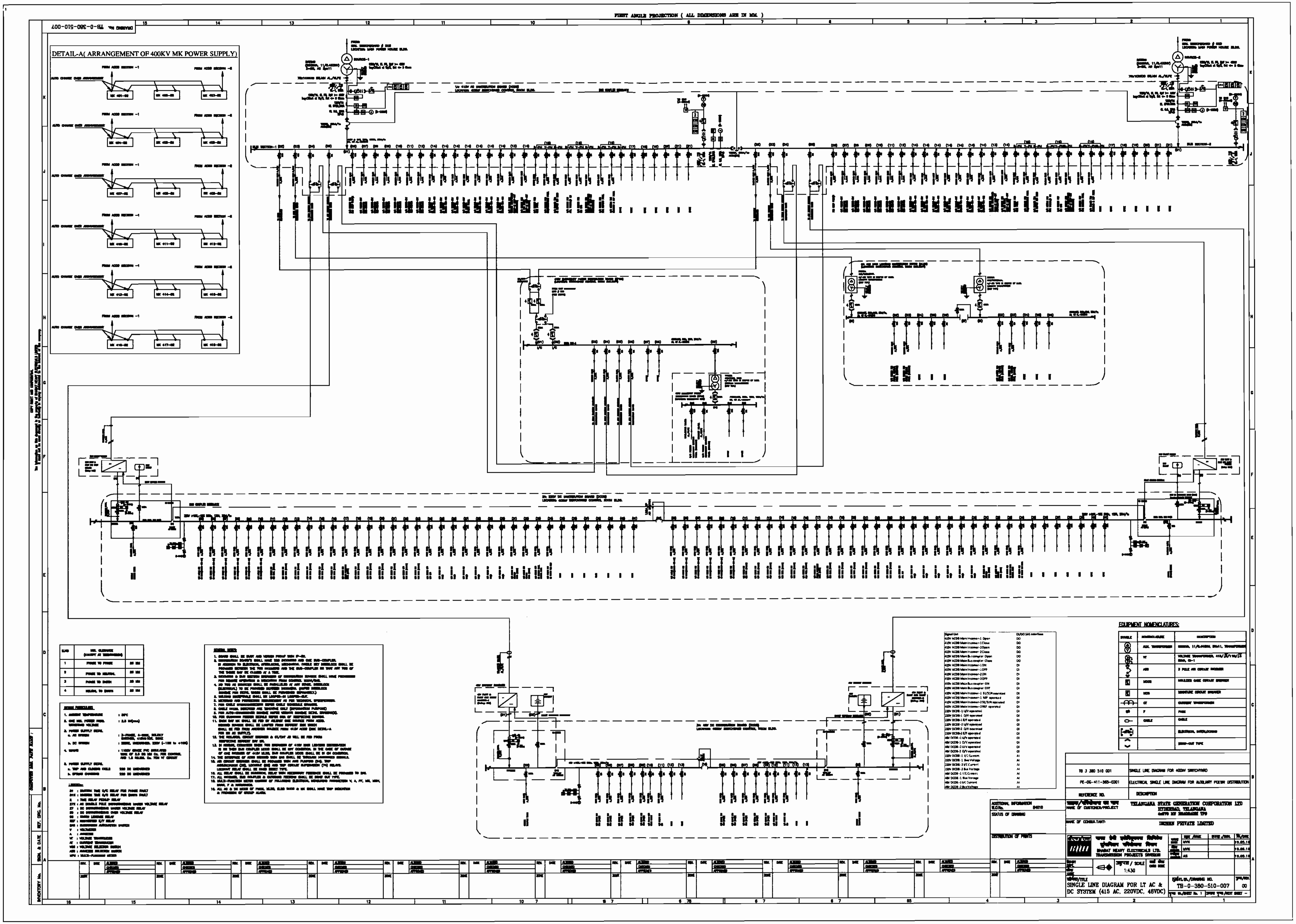
BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

SCALE 1:500

TITLE: CABLE TRENCH LAYOUT FOR 400 kV SWITCHYARD

DRAWING NO. TB-0-380-510-004 REV 00

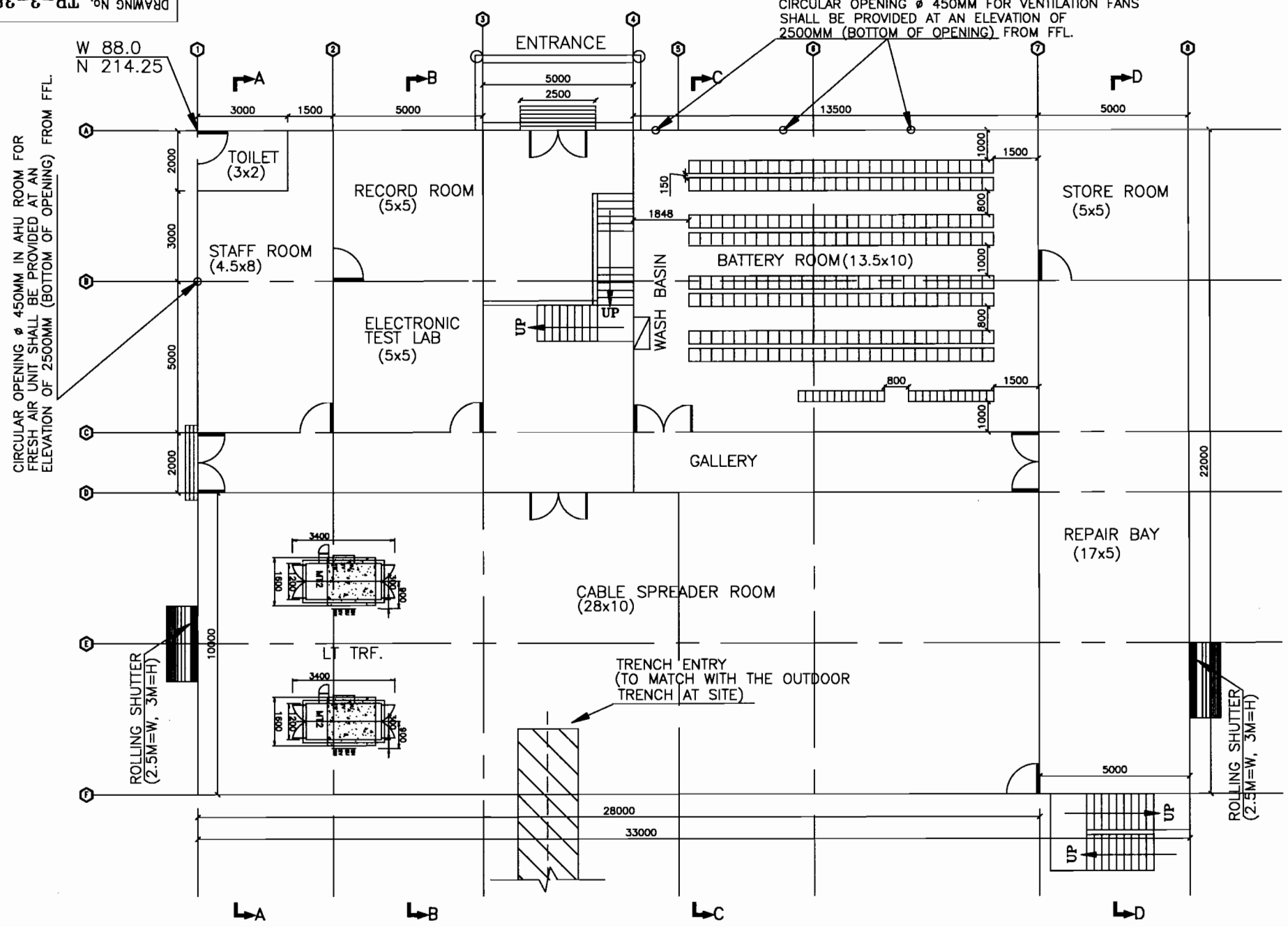
INVENTORY No. | SIGN. & DATE | REF. DRG. No. | COMPUTER DRG. FILE NAME :

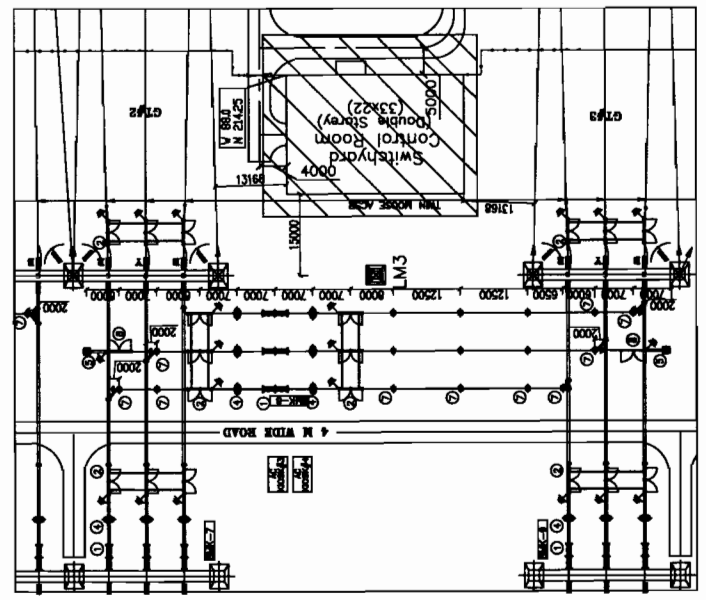


FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)
DRAWING No. TB-0-380-510-007
DETAIL-A(ARRANGEMENT OF 400KV MK POWER SUPPLY)
EQUIPMENT NOMENCLATURES:
TB 3 380 510 001
SINGLE LINE DIAGRAM FOR 400KV SWITCHYARD
PE-DG-411-565-E001
ELECTRICAL SINGLE LINE DIAGRAM FOR AUXILIARY POWER DISTRIBUTION
REFERENCE NO.
DESCRIPTION
NAME OF CUSTOMER/PROJECT
TELANGANA STATE GENERATION CORPORATION LTD
HYDERABAD, TELANGANA
NAME OF CONSULTANT
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION
MVK
MVK
AS
SCALE
1:430
TITLE
SINGLE LINE DIAGRAM FOR LT AC & DC SYSTEM (415 AC, 220VDC, 48VDC)
DRAWING NO.
TB-0-380-510-007
REV.
00
SHEET No. 1
NEXT SHEET -

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-3-380-316-008





KEY PLAN

GROUND FLOOR

NOTES:–

1. ALL DIMENSIONS ARE IN MM. DIMENSIONS SPECIFED FOR ROOMS ARE IN METRES.
2. +0.00M SHALL BE READ AS FGL OF SWITCHYARD.
2. 400KV SWITCHYARD CONTROL ROOM BUILDING IS A DOUBLE STOREY BUILDING WITH TRENCHES BELOW FLOOR LEVEL FOR CABLE LAYING.
3. CONTROL ROOM, OFFICE ROOM'S & CONFERENCE ROOM ON FIRST FLOOR SHALL BE AIR–CONDITIONED WITH FALSE CEILING. OTHER PARTS OF BUILDING SHALL BE NON AIR–CONDITIONED & WITH NO FALSE CEILING.
4. DIMENSIONS AND ARRANGEMENT OF PANELS INSIDE CONTROL ROOM BUILDING ARE INDICATIVE AND SHALL BE FINALISED DURING DETAILED ENGINEERING.
5. ACDB ROOM, BATTERY ROOM, PANTRY AND TOILETS SHALL BE PROVIDED WITH EXHAUST AIR FANS.
6. ALL ROOM EXCEPT AHU ROOM SHALL BE PROVIDED WITH WINDOW.
7. ALL THE DIMENSIONS OF THE ROOMS ARE WALL CENTRE TO CENTRE DIMENSIONS.
8. SEPARATE DRAWING SHALL BE SUBMITED FOR DETAILED ARCHITECTURE AND TRENCH LAYOUT OF CONTROL ROOM BUILDING.
9. PROTECTION/BAY CONTROL PANELS WILL BE LOCATED IN OUTDOOR SWITCHYARD AC KIOSK.
10. ALUMINIUM GLAZED WINDOW SHALL BE PROVIDED IN CONTROL ROOM TO HAVE A CLEAR VIEW OF SWITCHYARD EQUIPMENTS.
11. PROTECTIVE GRILL SHALL BE PROVIDED FOR ALL THE GLASS WINDOWS FACING SWITCHYARD.
12. BATTERY ROOM DOOR SHALL BE PVC TYPE. SWITCHGEAR ROOM DOOR SHALL BE FIRE–PROOF TYPE.

REV.	DATE		
		ALTERED	
		CHECKED	
		APPROVED	
ZONE			

REV.	DATE		
03	23.11.15	ALTERED	MVK
		CHECKED	MVK
		APPROVED	AS
ZONE	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.		

REV.	DATE		
02	11.10.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

REV.	DATE		
01	21.08.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

ADDITIONAL INFORMATION
W.O.No. 84010

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT: TSGENCO
400KV SWITCHYARD AT 4x270 MW BHADRADRI TPS

CONSULTANT:– DESEIN PRIVATE LIMITED

BHEL भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
जाँचा CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

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

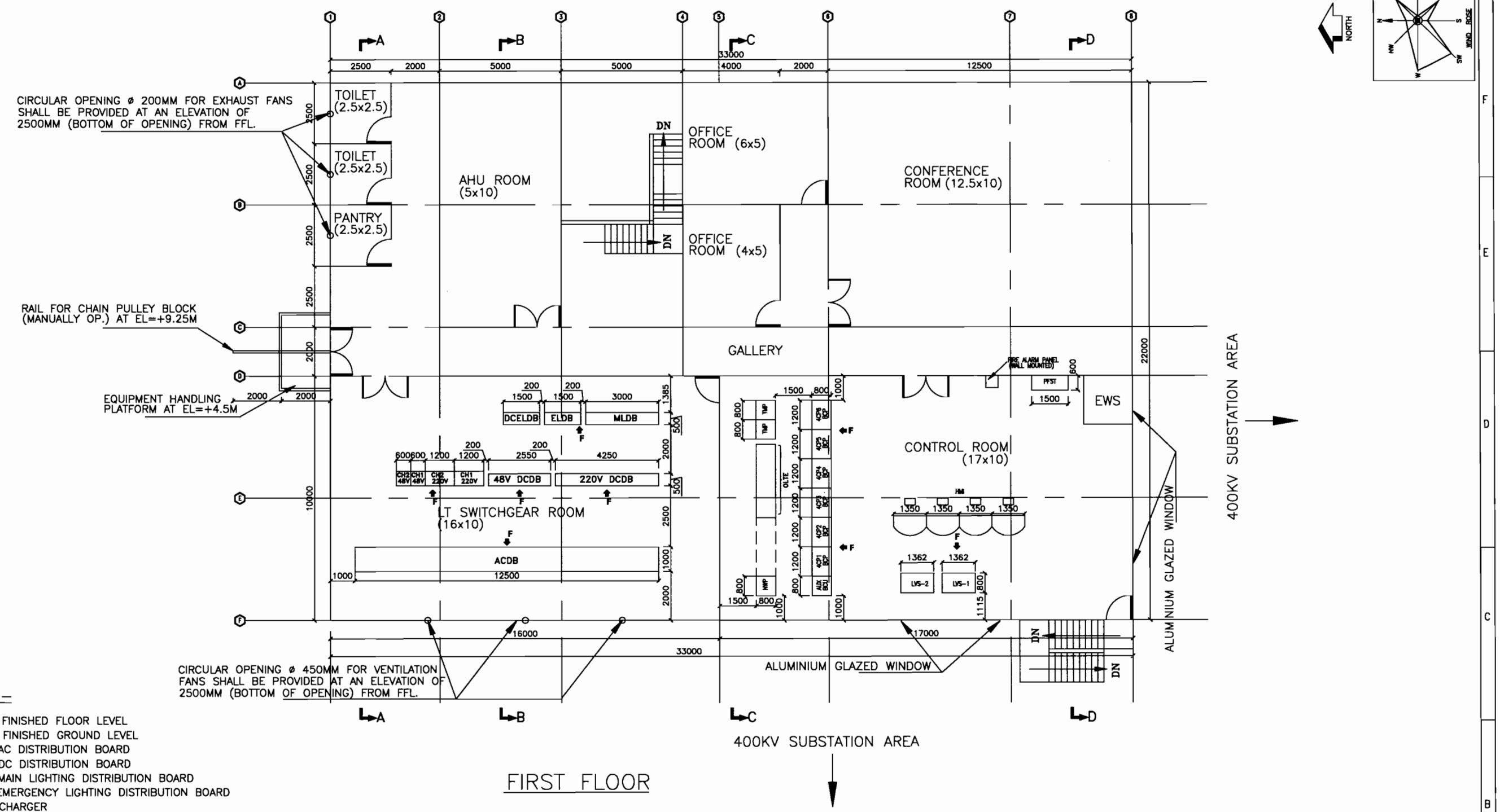
शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT

ड्रा.क./DRAWING NO. TB-3-380-316-008
पुनः/REV. 03
पृष्ठ क्र./SHEET No. 1 अगला पृष्ठ/NEXT SHEET 2

COMPUTER DRG. PATH NAME :
REF. DRG. No.
SIGN. & DATE
INVENTORY No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-3-380-316-008



FIRST FLOOR

LEGEND–

FFL = FINISHED FLOOR LEVEL
FGL = FINISHED GROUND LEVEL
ACDB = AC DISTRIBUTION BOARD
DCDB = DC DISTRIBUTION BOARD
MLDB = MAIN LIGHTING DISTRIBUTION BOARD
ELDB = EMERGENCY LIGHTING DISTRIBUTION BOARD
CH = CHARGER
AHU = AIR HANDLING UNIT
TMP = TARIFF METERING PANEL
BCP = BACK UP CONTROL PANEL
HMI = HUMAN MACHINE INTERFACE (MAIN OWS, BACKUP OWS, METERING WORK STATION)
LVS = LARGE VIDEO SCREEN
PFST = PRINTER CUM FILE STORAGE TABLE
AUX = AUXILIARY PANEL
NWP = NETWORKING PANEL
OLTE= OVERHEAD LINE TELECOMMUNICATION EQUIPMENT
EWS = ENGINEERING WORK STATION

REV.	DATE	
		ALTERED
		CHECKED
		APPROVED
ZONE		

REV.	DATE		
03	23.11.15	ALTERED	MVK
		CHECKED	MVK
		APPROVED	AS
ZONE	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.		

REV.	DATE		
02	11.10.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

REV.	DATE		
01	21.08.15	ALTERED	MVK SD/–
		CHECKED	MVK SD/–
		APPROVED	AS SD/–
ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		

ADDITIONAL INFORMATION
W.O.No. 84010

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT: TSGENCO
400KV SWITCHYARD AT 4x270 MW BHADRADRI TPS

CONSULTANT:– DESEIN PRIVATE LIMITED

BHEL भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
जाँचा CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

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

शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT

ड्राईंग सं./DRAWING NO. TB-3-380-316-008

पुनः/REV. 03

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

COMPUTER DRG. PATH NAME :
REF. DRG. No.
SIGN. & DATE
INVENTORY No.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

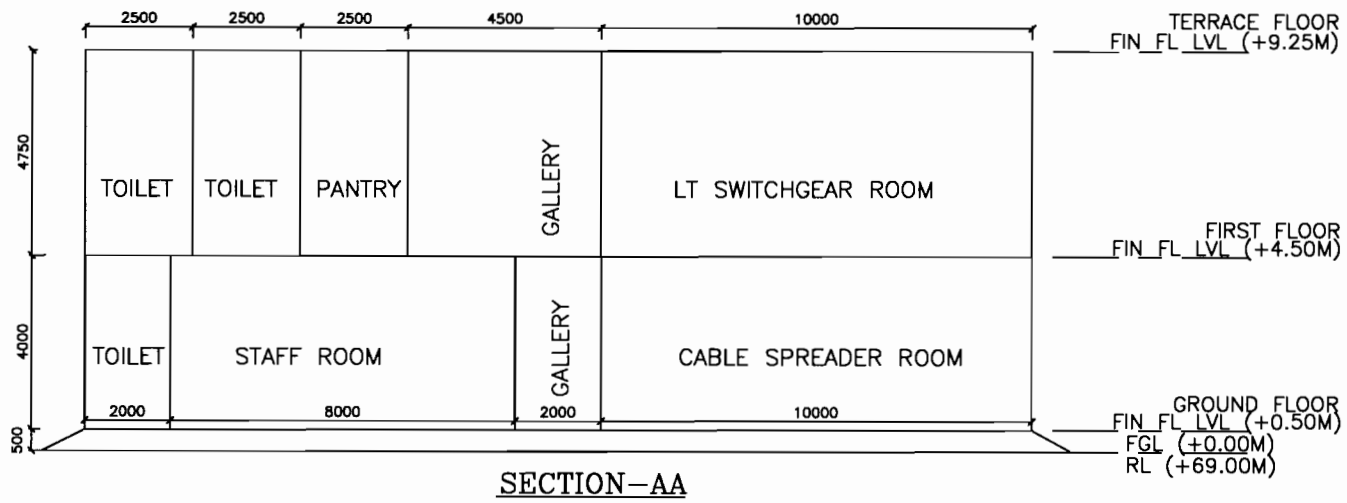
DRAWING No. TB-3-380-316-008

COMPUTER DRG. PATH NAME :

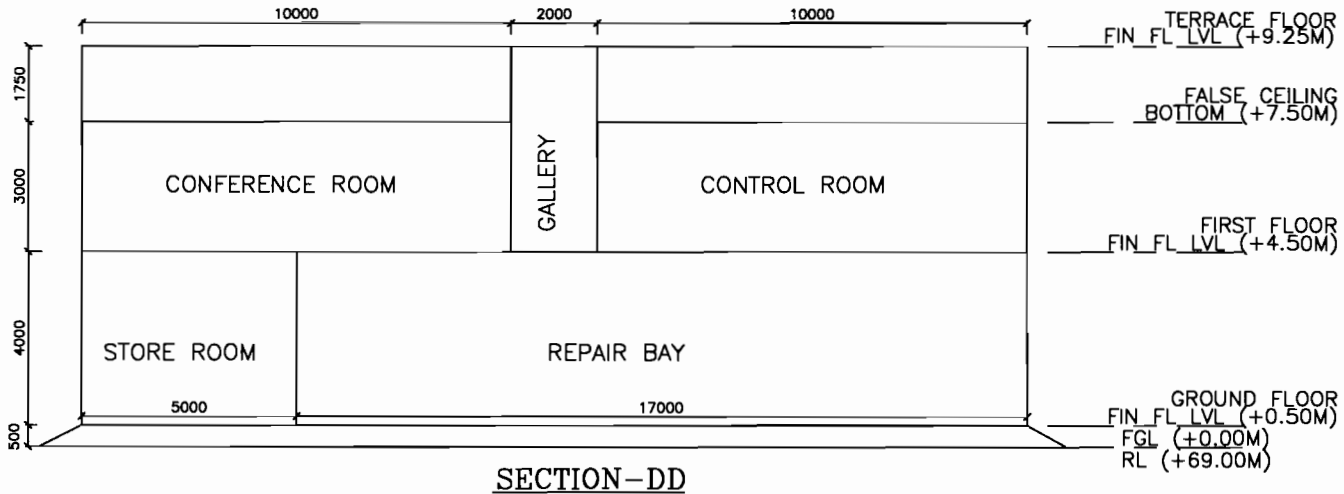
REF. DRG. No.

SIGN. & DATE

INVENTORY No.



SECTION–AA



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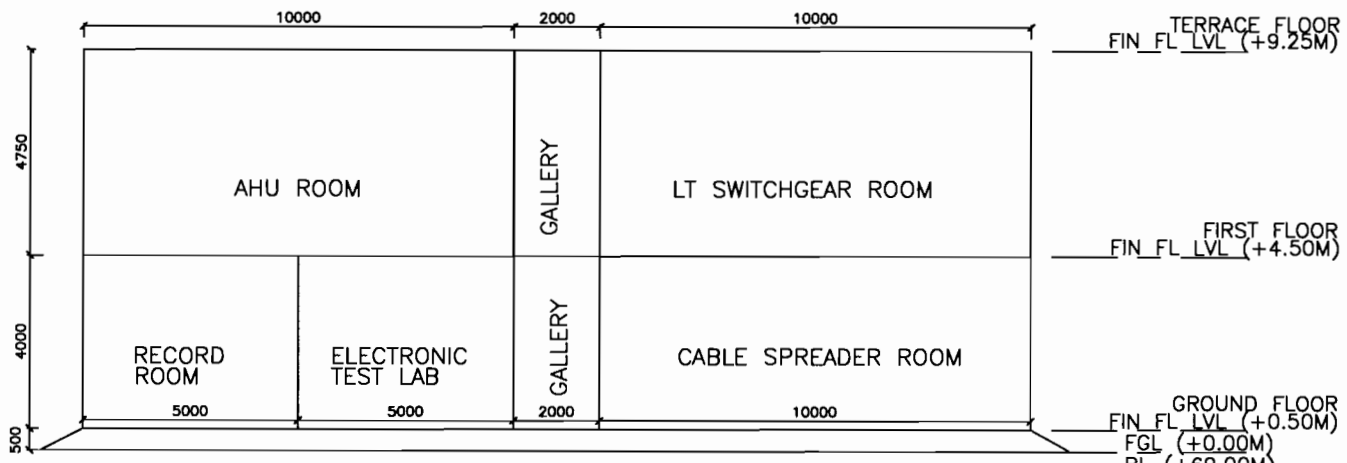

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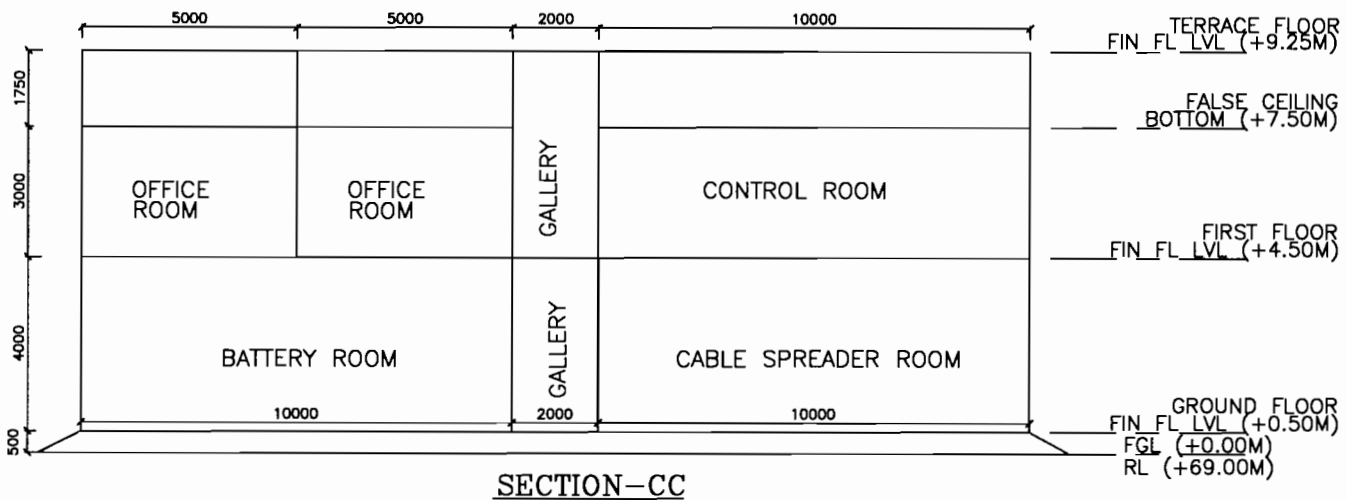

SECTION–CC

REV.	DATE		REV.	DATE		REV.	DATE		REV.	DATE	
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		CHECKED			CHECKED MVK			CHECKED MVK SD/–			CHECKED MVK SD/–
		APPROVED			APPROVED AS			APPROVED AS SD/–			APPROVED AS SD/–
ZONE			03	23.11.15		02	11.10.15		01	21.08.15	
			ZONE	1) REVISED AS PER CUSTOMER COMMENTS & LOCATION OF AHU ROOM MODIFIED.		ZONE	1) REVISED AS PER CUSTOMER COMMENTS.		ZONE	1) REVISED AS PER CUSTOMER COMMENTS.	

ADDITIONAL INFORMATION
W.O.No. 84010

STATUS OF DRAWING CONTRACT

DISTRIBUTION OF PRINTS

ग्राहक/परियोजना का नाम TSGENCO
NAME OF CUSTOMER/PROJECT 400KV SWITCHYARD AT 4x270 MW BHADRADRI TPS

CONSULTANT:– DESEIN PRIVATE LIMITED

BHEL भारत हेवी इलेक्ट्रिकल्स लिमिटेड
ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PR/RK	SD/–	28.05.15
जाँचा CHECKED	PR/SKS	SD/–	28.05.15
स्वीकृत APPROVED	AS	SD/–	28.05.15

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

शीर्षक/TITLE
CONCEPTUAL 400KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT

ड्राईग.क्र./DRAWING NO. TB-3-380-316-008
पुनः/REV. 03
पृष्ठ क्र./SHEET No. 3
अगला पृष्ठ /NEXT SHEET –

SECTION –2

GENERAL TECHNICAL REQUIREMENTS

2.0 GENERAL :

2.0.1 The lighting System design shall comply with acceptable norms and the best engineering practices. The lighting shall be designed to provide uniform illumination with minimum glare. The lighting system shall meet all the statutory requirements, local rules etc.

2.0.2 Feeders required for lighting shall be given from Main LVAC /DC boards. Further distribution using lighting DB's panels for Illumination shall be in Illumination contractor scope .Laying & termination of cables from LVAC /DC boards onwards shall be in illumination contractor scope.

2.0.3 APPLICABLE CODES AND STANDRADS

All material / work shall conform to the following standards & codes unless otherwise stated. All standards and codes of practice referred to herein shall be the latest edition including all applicable official amendments & revisions as on date of bid opening. In case of conflict between this specification and those (codes, standards etc) referred to herein, the former shall prevail.

(i)	IS:1913	General and safety requirements for electric light fittings
(ii)	IS:418	Tungsten filament lamp for domestic and similar general lighting purposes
(iii)	IS:10322	Luminaires
(iv)	IS:10276	Edison Screw lamp holders
(v)	IS:2418	Tubular fluorescent lamps
(vi)	IS:9974	High pressure sodium Vapour lamps
(vii)	IS:9900	High Pressure mercury vapour lamps.
(viii)	IS:6616	Ballasts for high pressure mercury Vapour lamps
(ix)	IS:1258	Specification for bayonet lamp holders
(x)	IS:3323	Bi-pin lamp holders for tubular fluorescent lamps
(xi)	IS:13021	AC Supplied electronic ballasts for tubular fluorescent lamps
(xii)	IS:1534	Ballasts for use in fluorescent lighting fittings
(xiii)	IS:1569	Capacitors for use in tubular fluorescent high pressure mercury vapour and low pressure sodium Vapour discharge lamp circuit.
(xiv)	IS:2215	Starters for fluorescent lamps
(xv)	IS:3324	Holders for starters for tubular fluorescent lamps
(xvi)	IS:418	GLS lamps
(xvii)	IS:13021	AC supplied electronic ballasts for tubular fluorescent lamps
(xviii)	IS:2713	Tubular steel poles
(xix)	IS:280	MS Wire for general Engg. Purpose.

2.0.4.1 Conduits, Pipes and Accessories

(I)	IS:9537	Rigid Steel conduit for electrical wiring
(ii)	IS:3480	Flexible steel conduits for electrical wiring
(iii)	IS:2667	Fitting for rigid steel conduits for electrical wiring
(iv)	IS:3837	Accessories for rigid steel conduits for electrical wiring.
(v)	IS:4649	Adaptors for flexible steel conduits

2.0.4.2 Lighting panels, Switch boxes, receptacles and junction boxes.

(i)	IS:13947	Specification for LV switchgear and control gear (Parts 1to 5)
(ii)	IS:8828	Circuit breakers for over current protection for house hold and similar installations.
(iii)	IS:5	Colours for ready mixed paints and enamels
(iv)	IS:2551	Danger notice plates
(v)	IS:5133	Steel and cast iron boxes
(vi)	IS:2629	Recommend practice for hot dip galvanizing of iron & steel.
(vii)	IS:3854	Switches for domestic and similar purposes
(viii)	IS:6875	Control switches (Switching devices for Control and auxiliary Circuits including contactor relays) for Voltages upto and including 1000V AC and 1200V DC.
(ix)	IS:13703	Low voltage fuses for voltages not exceeding 1000V AC or 1500V DC
(x)	IS:9224	HRC Cartridge fuse links for voltage above 650V(Part2)
(xi)	IS:5082	Wrought aluminum and Al. alloys, bars, rods, tubes and section for electrical purposes.
(xii)	IS:8623	Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200V DC.
(xiii)	IS:1248	Direct acting electrical indicating instruments .
(xiv)	IS:1293	Plugs & socket outlets of rated voltage upto and including 250 Volts & rated current upto and including 16 amps

2.0.4.3 Lighting Wires / Cables

(i)	IS:694	PVC Insulated cables for working voltages upto and including 1100V.
(ii)	IS:3961	Recommended current ratings for cables (PVC Insulated and PVC sheathed heavy duty cables and light duty cables)
(iii)	IS:8130	Conductors for insulated electric cables and flexible cords.
(iv)	IS:10810	Methods of tests for Cables

2.0.4.4 Electrical Installation & Miscellaneous :

(i)	IS:2062	Steel for general structural purposes.
(ii)	IS:6665	Code of practice for industrial lighting.
(iii)	IS:374	Electric ceiling fans & regulators

(iv)	IS:5216	Recommendations on safety procedures and practices in electrical work.
(v)	IS:732	Code of practice for electrical wiring installation (System voltage not exceeding 650 Volts)
(vi)	IS:1255	Code of practice for installation and maintenance of power cables upto and including 33kV rating.
(vii)	IS:3043	Code of practice for earthing.
(viii)	IS:3646	Code of practice of Interior Illumination.
(ix)	IS:1944	Code of practice for lighting of public through fares.
(x)	IS:5571	Guide for selection of electrical equipment for hazardous areas.
(xi)	IS:800	Code of practice for use of structural steel in general building construction
(xii)	IS:2633	Methods of testing uniformity of coating on Zinc coated articles.
(xiii)	IS:6005	Code of Practice for phosphating iron and steel.
(xiv)	IS:371	Ceiling roses
(xv)	BS:6121	Mechanical cable glands
(xvi)	IS:6631	Specification for Steel pipes
(xvii)		INDIAN ELECTRICITY ACT
(xviii)		INDIAN ELECTRICITY RULES
(xix)		NATIONAL ELECTRICAL CODE

2.1 TESTS :

2.1.1.1 All equipments to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

2.1.1.2 In case the Contractor is not able to submit report of the type test (s) conducted within last five year from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contact free of cost to the BHEL / Owner and submit the reports for approval.

2.1.1.3 All acceptance and routine tests as per the specification and relevant standards shall be carried out . Charges for these shall be deemed to be included in the equipment price.

2.1.2 Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant I.S.

2.1.3 Type test reports of the following items as per relevant standards shall be submitted for approval.

SI.NO.	DESCRIPTION
i	Lighting fixtures of each type.
ii.	Lamps of each type and rating (life cycle and rating test only)
iii.	Lighting panel of each type (Degree of Protection)
iv.	Junction Box of each type (Degree of protection)
v.	Receptacles of each rating.
vi.	M.C.B. of each rating.
vii.	Lighting transformer
viii.	Ballasts

2.1.4 Acceptance Test and Routine Test :

2.1.4.1 All lighting fixtures, lamps and other items shall be subjected to acceptance and routine test, as per relevant specified standards.

2.1.4.2 Junction boxes, switch boxes, receptacle enclosure etc. shall be subjected to physical and dimensional checks.

2.1.5 Galvanizing Tests :

2.1.5.1 The quality of galvanizing shall be smooth, continuous, free from flux, stains and shall be inspected visually.

2.1.5.2 In additional following test shall be conducted as acceptance tests.

(a) Uniformity of coating – The coating of any article shall withstand four 1 minute dips in standard copper sulphate solution without the formation of an adherent red spot of metallic copper upon the basic metal.

(b) The quality of cadmium/ Zinc plating on items with screw threads shall be free from visible defects such as unplated areas, blisters and modules and shall be inspected visually.

(c) In additional the plating thickness shall be determined microscopically / chemically or electronically.

2.1.6 COMMISSIONING CHECKS :

2.1.6.1 On completion of Installation work the Contractor shall request the Project manager for inspection and test with minimum of fourteen (14) days advance notice.

2.1.6.2 The Project Manager shall arrange for join inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.

2.1.6.3 The installation shall be then tested and commissioned in presence of the Project Manager.

2.1.6.4 The contractor shall provide all, men material and equipment required to carry out the tests.

2.1.6.5 All rectifications, repair or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the Contractor without any extra cost.

2.1.6.6 The testing shall be done in accordance with the applicable Indian Standards and codes of practices. The following tests shall be specifically carried out for all lighting installation.

(a) Insulation Resistance
(b) Testing of earth continuity path.
(c) Polarity Test of single phase switches
(d) Functional checks

2.1.6.7 The lighting circuits shall be tested in the following manner :

(a) All switches ON and consuming devices in circuit, both poles connected together to obtain resistance to earth.

(b) Insulation resistance between poles with lamps and other consuming devices removed and switches ON.

2.1.6.8 Lux level measurement to prove guranteed Illumination levels. The contractor shall submit a document on methodology of measurement for approval of BHEL / ultimate customer . This will become basis for measurements .

2.2 QUALITY PLAN :

Bidder shall submit immediately after award of Contract Manufacturing Quality plan & field Quality plan in prescribed format for approval of BHEL & customer. These approved Quality plans shall be followed for manufacture and ETC. Where standard quality plans of BHEL or customer are available , these shall be followed after written consent of BHEL/ Customer.

2.3 HANDING & TAKINGOVER :

It is the responsibility of bidder to handover the complete system to BHEL/ ultimate customer. Bidder shall assist BHEL to handover the system supplied by them to ultimate customer.

2.4 DOCUMENTATION :

2.4.1. Information / documents to be submitted by the bidder at tender stage shall be as follows :

(a) Check list
(b) Technical offer with equipment details & the makes, detailed unpriced schedule of equipment / material & spares .
(b) Guaranteed technical particulars.
(c) Activity Schedule.
(d) Catalogues & technical details of equipment / material offered.

2.4.2. Information / documents to be submitted by the Contractor at contract stage shall be as follows :

(a) Type test reports

(b) Manufacturing Quality plan. Where standard Quality plan of BHEL / Customer is available, this shall be followed.

(c) Field Quality plan for receipt, storage, installation, testing & commissioning with details of tests to be conducted and acceptance values .

(d) Outline and general assembly drawings of equipment, lighting layout conduit layout, wiring scheme, Catalogues of equipment, fixing details etc.

(e) Detailed photometric data of luminaires .

(f) Operation & maintenance manuals

(e) End documentation.

For approval 4 copies to be submitted and after approval 10 copies to be submitted unless otherwise specied else where.

ACTIVITY SHEDULE
(TO BE FILLED BY THE BIDDER AND RETURNED WITH THE OFER)

Tender enquiry no.:

Sl. no	Activity	Activity Time in weeks	Cumulative Time in Weeks from LOI / PO Date	Remarks if any
1.	Submission of documents / data for approval.			
2.	Approval of documents in Cat-I from BHEL/ Customer *			
3.	Manufacturing time			
4.	Inspection call			
5.	Customer inspection & dispatch clearance			
6.	Transportation to destination			
7.	ETC			

1) * Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete/ inadequate information shall be the responsibility of the contractor. CAT-I approval denotes final approval after successful incorporation of all comments made by BHEL/ ultimate customer on previously submitted versions of drawings documents.

2) Inspection call should be given in the prescribed format only. Inspection calls in any format, other than the prescribed format shall not be entertained.

3) Qty to be offered for inspection should be in accordance within delivery schedule. BHEL reserves the right not to entertain multiple inspection calls and delay on this account shall be the responsibility of the contractor.

Place

Date

Signature of the authorized representative of Bidder

Name _____

Designation_____

Company Seal_____

SECTION - 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

GENERAL TECHNICAL REQUIREMENTS

1.0 PROJECT DETAILS

A) Kothagudem TPS

A)

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	1x800MW Kothagudem Thermal Power Station Stage VII, Unit 12
Project Location	:	Paloncha Village, Khammam District, Telangana
Nearest Railway station	:	Bhadrachalam Road railway station.
Nearest Road Head	:	Khammam 16 km approx., Nearest Highway NH221 (Vijaywada – Jagdalpur Highway).
Nearest Airport	:	Hyderabad (about 200 Km)
Postal Address	:	Chief Engineer (O&M), Kothagudem Thermal Power Station Stage VII, Unit – 12, TSGENCO, Village - Paloncha, Dist. – Khammam, Telangana -507115

B) Bhadradri TPS

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	4x270MW Bhadradri Thermal Power Station
Project Location	:	Ramanujavaram Village, Khammam District, Telangana
Nearest Railway station	:	Manuguru railway station.
Nearest Road Head	:	Khammam
Nearest Airport	:	Hyderabad (about 345 Km)
Postal Address	:	Chief Engineer (O&M), Bhadradri Thermal Power Station Stage TSGENCO, Village - Ramanujavaram, Dist. – Khammam, Telangana

1.1 SITE CONDITIONS (FOR DESIGN PURPOSES)

1.1.1 SITE CONDITIONS

a). Average rainfall per year : 1124 mm

b). Maximum hourly rainfall intensity : 102 mm

c). Altitude : 1000 m

1.1.2 DESIGN AMBIENT

a). Minimum Temperature : 13.5°C

b). Maximum Temperature : 45°C

c). Design Ambient Temperature : 50 °C

1.1.3 RELATIVE HUMIDITY

a). Maximum :: 85%

1.1.4 WIND PRESSURE (AS PER IS:875-1987)

a). Design wind speed : 44 m/sec.

1.1.5 SEISMIC FACTORS

a). Horizontal Seismic Coefficient : As per latest IS : 1893

b). Vertical Seismic Coefficient : As per latest IS : 1893

} *Zone – III*

1.1.6 ELECTRICAL DATA

		400 kV System	415V AC System	240V AC System	220 V DC System	48 V DC System
1.	Nominal Voltage	400 kV	415 V	240 V	220 V	48 V
2.	Highest System Voltage	420 kV	457 V	264 V	242 V	55 V
3.	No. of phases	3	3	1	NA	NA
4.	Frequency	50 Hz	50 Hz	50 Hz	NA	NA
5.	Voltage variation	± 5%	± 10 %	± 10 %	+10 % to -15%	± 10 %

6.	Neutral Earthing	Effectively Earthed	Solidly Earthed	Solidly Earthed	-	-
7.	Fault Level	50 kA for 1 sec.	50 kA for 1 sec.	50 kA for 1 sec.	15 kA for 1 sec.	-

1.1.7 SYSTEM PARAMETERS

Dry and wet one minute power frequency withstand voltage	630 kVrms
Dry impulse withstand voltage positive and negative	1425 kVpeak
Minimum Total Creepage	25 mm/kV

1.1.8 MINIMUM CLEARENCE (AS PER IS: 10118)

Phase to phase (PP)	4200 mm
Phase to earth (PE)	3500 mm
Section clearance	6500 mm
Minimum ground clearance from plinth level (Plinth level : 300 mm)	8000 mm
Vertical ground clearance to nearest part not at earth potential of an insulator supporting live conductor/ equipment	2440 mm

1.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification. It is recognised that the Manufacturer may have standardised on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously.

1.3 STANDARDS

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards.

In addition to meeting the specific requirement called for in Sections 1 and 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other. When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

In case governing standard for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in the offer along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's / owner's approval. The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

1.4 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

All equipment being supplied shall conform to type tests and shall be subject to routine and acceptance tests in accordance with requirements stipulated under respective sections. Purchaser reserves the right to witness any or all the tests. The Manufacturer shall intimate the Purchaser the detailed programme about the tests at least three (3) weeks in advance in
case of domestic supplies & six (6) weeks in advance in case of foreign supplies. Purchaser reserves the option for getting any or all the type tests repeated on the equipment. The Manufacturer shall also submit type test procedure for approval of the Purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the technical specification or any/all additional type tests not carried out without any additional cost implication to the Purchaser.

The price of conducting all tests and additional type tests is deemed to be included in Bid price. In case any bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

The purchaser intends to repeat the type tests and additional type tests on cables for which test charges shall be payable as per provision of contract.

The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times free access to the Contractors premises or Works and shall have the power, at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if pert of the Works is being manufactured or assembled at other premises or works, the Manufacturer shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Manufacturer's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

The Manufacturer shall give the Purchaser/inspector thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Manufacturer's account except for the expenses of the inspector. Unless witnessing of the tests is virtually waived, the Purchaser/ inspector will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/ inspection, failing which the Manufacturer may proceed with the test which shall be deemed to have been made in the Inspector's presence and the Manufacturer shall forthwith forward duly certified copies of test reports in triplicate to the Inspector.

The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Manufacturer, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Manufacturer shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser/ inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Manufacturer's works, the Purchaser/ inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/inspector, the certificate shall be issued within fifteen (15) days of receipt of the Manufacturer's Test certificate by the Engineer/ Inspector. Failure of the Purchaser/inspector to issue such a certificate shall not prevent the Manufacturer from proceeding with the Works. The completion of this test or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests/ after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Purchaser.

In all cases where the Contract provides for tests whether at the premises or at the works of the Manufacturer or of any Sub-Contractor, the Manufacturer except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser Inspector or to his authorised representative to accomplish testing.

The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Manufacturer in respect of the agreed quality assurance programme forming a part of the Contract.

The Purchaser will have the right of having at his own expenses any other test(s) of reasonable nature carded out at Manufacturer's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Purchaser.

1.5 MATERIAL/WORKMANSHIP

1.5.1 GENERAL REQUIREMENT

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purposes for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfil their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be construed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting,

levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances /instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits. Suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. If such is the case, he shall declare in the proposal where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

1.5.2 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

1.6 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The contractor shall propose a colour scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser 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 steel structures, plates etc. shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all electrical equipment in switchyard are painted with shade 631 of IS-5. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, colour scheme will be approved by the purchaser.

1.7 PAINTING

a) All sheet steel work shall be phosphated in accordance with the following procedure and in accordance with IS: 6005 "Code of practice for Phosphating Iron and Steel".

b) Oil, grease, dirt and swerve shall be thoroughly removed from emulsion by cleaning.

c) Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

d) After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute bichromate solution and over drying.

e) The phosphate coating shall be sealed by the application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "Flash dried" while the second coat shall be stoved.

f) After application of the primer, two coats of finishing epoxy paint shall be applied, each coat followed by stoving. The panel shall have colour conforming to shade 631 of IS-5 for outside and inside of the panel with black colour for base frame.

g) Each coat of primer and finishing paint shall be of a slightly different shade to enable inspection of the painting.

h) Finished painted appearance of panel shall present an asthetically pleasing appearance free from dents and uneven surface.

i) A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of the panels.

1.8 PROTECTION

a) 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.

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

c) The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

d) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

1.9 FUNGISTATIC 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.

1.10 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be throughly 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 paintaing 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 other wise 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.

1.11 GALVANIZING

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanised conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvasized. Minimum weight of zinc coating shall be 610 gm/sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

1.12 AUXILIARY POWER SUPPLY

1.12.1 A.C power supply for auxiliaries will be available at 240 V, 50 C/s 1-phase, 2 wire and 415V, 50 C/s, 3-phase, 4 wire, neutral solidly earthed with variation in frequency of +/-5% and variation in voltage +/-10%

1.12.2 D.C. power supply at 220 V, 2-wire ungrounded will be available 187 V to 242 V.

1.13 INSPECTION AND TESTING

All tests and inspection of the equipment specified shall be performed to the extent and in the manner as stipulated in the relevant standards and in this specification. All type tests/routine tests/acceptance tests as specified shall be conducted in the presence of purchaser. Wherever equipment similar to the one being offered has already been type tested within 5 years from the date

of opening the bid. Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off. Otherwise the subcontractor will have to carry out the type tests without any extra cost and without any delivery implications.

1.14 PACKAGING

Aluminium Tube shall be partially packed with Hessians cloths. Similar items shall be grouped and tied with steel wires/strip for convenient handling during transits.

MARKINGS

The following details are to be clearly indicated in the material forwarding documents:

a) Name and address of the consignee.

b) Purchase order number.

c) Name of supplier/s.

d) Description of equipment / material.
e) Tare weight.

f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises, while packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage wagons and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Purchaser takes no responsibility of the availability of the wagons.

1.15 HANDLING, STORING AND INSTALLATION

In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the purchaser or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and

oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.

Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.

In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser.

Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the contractor at his own expenses.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. The Contractor shall submit to the purchaser every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the Contractor' account.

The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning. Contractor shall be responsible for the maintenance to the equipment/material while in storage as well as after erection until taken over by Purchaser, as well as protection of the same against theft, element of such nature, corrosion, damages etc.

The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipments which require indoor storage.

The words erection and installation used in the specification are synonymous. Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

1.13 TOOLS AND TACKLES

The Contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.

1.14 EQUIPMENT BASES

A cast iron or welded steel base-plate shall be provided for all rotating equipment, which is to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base-plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units shall have a raised lip all around, and shall have threaded drain connections.

1.15 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

1.16 DOCUMENTATION

1.16.1 DRAWINGS

All drawings shall be prepared in AutoCAD and ultimate documentation would include drawings/documents on CDs. All dimensions and data shall be in SI metric units.

All items of the equipment should be clearly identified by proper part nos. in the contract drawings. Such parts, which are to be dispatched to site from works in dispatchable units and are reassembled at site, should be marked by proper identification marks at works and indicated in the drawings and quantified. The shipping list should be sent along with the general arrangement drawings for engineer's approval. All the items of the shipping list should be identified in the drawing.

The drawing submitted by the supplier shall be reviewed by the purchaser as far as practicable within two weeks of receipt of drawings and shall be modified by the sub-contractor if any modifications and/or corrections are required by the purchaser. The sub-contractor shall incorporate such modifications and / or corrections and submit the final drawings for approval. Any delay arising out of failure of the subcontractor to rectify the drawings shall not alter the contract completion date.

Further work by the subcontractor shall be in strict accordance with these drawings and no deviation shall be allowed without the written approval of the purchaser.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at supplier's risk.

Approval of drawing or work by the purchaser/consultant shall not relieve the subcontractor of any of his responsibilities and liabilities under the contract.

In case of any modifications that may be necessary during erection or commissioning of the equipment, the subcontractor shall carry out modifications in the original drawing & submit 'As Built drawings' and required no. of prints thereof.

1.16.2 INSTRUCTION MANUALS

The supplier shall submit to the purchaser, draft instruction manuals for approval within 30 days of placement of order. The final instruction manuals complete in all respects shall be submitted 60 days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipment furnished, the erection procedures, testing, operation & maintenance procedures of the equipment.

If after the commissioning and initial operation of the plant, the instruction manuals require any modification/ addition / changes, the same shall be incorporated and the up- dated final instruction manuals shall be submitted as required.

1.16.3 TITLE BLOCK & DRAWING/ DOCUMENT NUMBERING SCHEME

Title block for drawing / document should be followed as per ANNEXURE-3

1.16.4 DOCUMENTATION SCHEDULE AT CONTRACT STAGE

A.	For approval	No of Copies
	Copies of all drawings with project details, dimension, shipping weights, No. of cases & dimensions, fixing details, tolerance etc.	10
	Copies of type test reports.	5
	Copies of works quality plan & field quality plan.	5

Copies of installation, operation & maintenance manual.	5
Copies of drawings on floppies/CDs	1 set

B. <u>After approval and for information / distribution</u>

Copies of all drawings	15
Copies of installation, operation & maintenance manual including Routine test reports	15
Sets of RTF of drawings	2
CDs of Drgs.	3

C. <u>As Built Drawings</u>

Hard copies of Drawings	15
CDs	3

NOTE:

1. Any revision of drawings / documents shall be submitted in the same no. of copies submitted first time for approval
2. Final drawings / documents shall be submitted in bound volume with customer and project details etc. written on the top.

SCHEDULE-IXC/15

ILLUMINATION SYSTEM

(Ψ): Additional data requirement after award of contract

Sl. No.	Description	Make (Ψ)	Cat No. (Ψ)	IS Ref.	Degree of Protection	Finish (Ψ)				Sheet Steel thickness of Reflect(Ψ) or	Control Gear type (Ψ)		
						Outside		Inside					
						Colour	Shade No. (As per IS-5)	Colour	Shade No. (As per IS-5)		Integral (Yes/ No)	Non-Integral (Yes/No.)	Cat No. if Non-integral type

1.0 **LIGHTING FIXTURES**

1.1 Fixture

Type-A(1)

Type-A(0)

Type-DC(cmp)

Type-DA

Type-DB

Type-DC

Type-DF

Type-FP

Sl. No.	Description	Make	Cat No.	IS Ref.	Degree of Protection	Finish				Sheet Steel thickness of Reflector	Control Gear type		
						Outside		Inside					
						Colour	Shade No. (As per IS-5)	Colour	Shade No. (As per IS-5)		Integral (Yes/ No)	Non-Integral (Yes/No.)	Cat No. if Non-integral type
	Type-LB												
	Type-LD												
	Type-HB												
	Type-MB												
	Type-EL												
	Type-NY												
	Type-DL												
	Type-DE												

1.2	(Ψ) Catalogue for all the fixtures furnished ?	:
1.3	(Ψ) Electrical and Optical Characteristics given in Catalogue guaranteed ?	:
1.4	(Ψ) If not, furnish guaranteed characteristics. Attach separate sheets, if required	:
1.5	(Ψ) Polar curve/light distribution diagram for all fixtures furnished	:
1.6	(Ψ) Utilisation factors for different room index for each fixture furnished ?	:
1.7	(Ψ) Isolux diagram for street lighting fixture furnished ?	:
1.8	Nominal working voltage	:
1.9	(Ψ) Power factor at nominal working voltage and frequency	:
1.10	(Ψ) Full load input current at nominal working voltage	:
1.11	(Ψ) Power loss per ballast at nominal working voltage and frequency	:
1.12	Maximum permissible supply voltage variation for satisfactory operation of fixture	:
1.13	(Ψ) Characteristics of fixture furnish for all types of luminaires -	
	a) Starting current and power factor	:
	b) Operating current and power factor	:
	c) Operating time	:

	Make (Ψ)	Average life-hrs	Lumen Output (Ψ)	Temo. Voltage	Cat. No. (Ψ)	Type of Lamp Base / Cap

1.14 Lamps

a) Incandescent lamp

100W GLS :

100W Comptalux :

b) Fluorescent tube

28W - Cool daylight :

28W - White :

c) High Pressure Sodium Vapour (HPSV)

70W :

150W :

250W :

400W :

d) High Pressure Mercury Vapour (HPMV)

125W :

e) CFL

9W :

Make		Cat.No.		Rating		Max. operating temp. (tw)		Average life-hrs.	
Fluorescent	HPSV & HPMV	Fluorescent	HPSV & HPMV	Fluorescent	HPSV & HPMV	Fluorescent	HPSV & HPMV	Fluore-scent	HPSV & HPMV

1.15 Control Gear

a) Ballast :

b) Capacitor :

c) Starter :

d) Igniter (Separate type) :

1.16 General

Any other items which are not indicated in this sheet

2.0	**MLDB & EMLDB/DCELDB/LP/ SLP/DCELP/FLP**			
2.1	(Ψ) Make			:
2.2	Type			:
2.3	Reference Standard			:
2.4	Enclosure			
	a)	Sheet metal thickness	mm	:
	b)	Degree of protection for		
		Indoor Panel		:
		Outdoor Panel		:
2.5	Bus-Bars			
	a)	Material		:
	b)	Size		:
2.6	Bus Rating			
	a)	(Ψ) Continuous at 50 Deg.C	Amp.	:
	b)	1 Sec. Current KA	rms	:
	c)	Maximum temperature rise over 50 Deg.C. ambient Deg.C.		:
2.7	Cable gland furnished ?			:
2.8	(Ψ) Finish			
	a)	Colour		:
	b)	Shade IS-5 #		:
2.9	Ground Bus			
	a)	Ground Bus furnished ?		:
	b)	Material		:
	c)	Size		:

					L x B x H mm	**Weight Kg.**
2.10	(Ψ) Dimension & Weight					
	a)	MLDB & EMLDB		:		
	b)	DCELDB		:		
	c)	LP-1		:		
	d)	LP-2		:		
	e)	LP-3		:		
	f)	SLP		:		
	g)	DCELP		:		
	h)	FLP		:		
2.11	Switch					
	a)	(Ψ) Make		:		
	b)	Type		:		
	c)	Reference Standard		:		
	d)	(Ψ) Rating	Amps	:		
2.12	Miniature Circuit Breaker (MCB)					
	a)	(Ψ) Make			:	
	b)	Type		:		
	c)	Reference Standard		:		
	d)	Rated Voltage		:		
	e)	No. of Poles		:		
	f)	Frequency		:		
	g)	(Ψ) Current Rating :				
		i) Continuous at 50 Deg.C	Amps	:		
		ii) 1 Second	KArms	:		
	h)	(Ψ) Breaking Capacity :				
		i) Symmetrical	KArms	:		

	ii)	Asymmetrical	KArms	:		
i)	(Ψ) Interrupting time		mS	:		
j)	(Ψ) Type of Blow out device			:		
k)	(Ψ) Type of overload			:		
l)	(Ψ) Terminal suitable for cable size			:		
m)	(Ψ) Catalogue furnished ?			:		
2.13	Timer Switch					
a)	(Ψ) Make				:	
b)	Type			:		
c)	Reference Standard			:		
d)	(Ψ) Rating/Range			:		
e)	(Ψ) Catalogue furnished ?			:		
2.14	Fuse					
a)	(Ψ) Make				:	
b)	Type			:		
c)	Reference Standard			:		
d)	(Ψ) Rupturing capacity (Sym.)		Karms	:		
e)	(Ψ) Continuous current at 50 Deg.C ambient and within cubicle			:		
f)	(Ψ) Cut off current		KA peak	:		
g)	(Ψ) Fuse characteristics furnished for various fuse ratings			:		
2.15	Magnetic Contactor				**240V A.C.**	**220V D.C.**
a)	(Ψ) Make				:	
b)	Type			:		
c)	Reference Standard			:		
d)	(Ψ) Rating				:	

	e)	Duty class		:	
	f)	Utilisation category		:	
	g)	Operating Coil :			
		i) Rated Voltage		:	
		ii) Drop-out Voltage		:	
	h)	(Ψ) Catalogue furnished ?		:	
	i)	No. of contacts furnished		:	
		i) Normally open (N.O)		:	
		ii) Normally closed (N.C)		:	
	j)	Rating of N.O/N.C contacts		:	
		i) Make and continuous	Amps	:	
		ii) (Ψ) Break (Inductive)	Amps	:	
2.16	Indicating Lamps (LED Type)				
	a)	(Ψ) Make		:	
	b)	Type		:	
	c)	(Ψ) Cat. no.		:	
	d)	Voltage		:	
2.17	Push Button				
	a)	Make & Type		:	
	b)	Contact Rating		:	

			Ammeter	**Voltmeter**
2.18	Meter			
	a)	(Ψ) Make	:	
	b)	Type	:	
	c)	Reference standard	:	
	d)	Size	:	
	e)	Scale	:	
	f)	Accuracy Class	:	

2.19 Current Transformer

a) (Ψ) Make :

b) Type :

c) Reference standard :

d) C.T. Ratings :

i) (Ψ) Current Ratio :

ii) Accuracy Class :

iii) (Ψ) Rated Burden :

3.0 **RECEPTACLES** (With Plug) **240V A.C** **415V**
5A 15A 63A 125A

a) (Ψ) Make :

b) Type :

c) Reference Standard :

d) (Ψ) Catalogue furnished ? :

4.0 **CEILING FAN** **Fan** **Regulator**

a) (Ψ) Make :

b) Type :

c) Reference Standard :

d) (Ψ) Sweep of the Fan mm :

e) (Ψ) Regulator control smooth or step :

f) (Ψ) Catalogue furnished ? :

5.0 **LIGHTING POLE/TOWER FOR FLOODLIGHTING** **Street Light Poles** **Flood Light Tower**

a) (Ψ) Make :

b) Type :

c)	Reference Standard		:	
d)	(Ψ) Height – Overall	m	:	
	- Fixture mounting	m	:	
e)	(Ψ) Catalogue sheet furnished ?		:	

6.0 LIGHTING TRANSFORMER (for each Lighting/Welding Transformer)

6.1 General

a)	(Ψ) Make		:	
b)	Type		:	
c)	Reference Standard		:	

6.2 Rating

a)	(Ψ) Rated output	KVA	:	
b)	Type of Cooling		:	
c)	Rated Voltage	Volt		
	Primary		:	
	Secondary		:	
d)	(Ψ) Rated Current	Amps.		
	Primary		:	
	Secondary		:	
e)	No. of phases		:	
f)	Rated Frequency	Hz	:	
g)	Vector Group reference		:	

6.3 Temperature

a)	Reference ambient temperature 50 Deg.C		:	
b)	Temp. rise over reference ambient :			
	i) On enclosure by thermometer Deg.C		:	

	ii)	In winding by resistance Deg.C		:
6.4	Tappings			
	a)	Type		:
	b)	Capacity		:
	c)	Range - Steps x % Variation		:
	d)	Taps provided on H.V. winding		:
6.5	Insulation Level		KV/KVp	
	a)	Primary		:
	b)	Secondary		:
	c)	Secondary neutral		:
6.6	(Ψ) Impedance at principal tap rated current & frequency		%	
	a)	Impedance		:
	b)	Reactance		:
	c)	Resistance at 75 Deg.C		:
	d)	Zero sequence Impedance		:
	e)	Zero sequence capacitance of H.V. winding	uf/ph	:
6.7	Losses at Principal tap, full load and 75 Deg.C KW			
	a)	No load losses		:
	b)	Load losses		:
6.8	(Ψ) Efficiency at 75 Deg.C and 0.8 power factor lag		%	
	a)	At full load		:
	b)	At 3/4 full load		:
	c)	At 1/2 full load		:
	d)	Maximum Efficiency		:

	e)	Load and power factor at which it occurs		:
6.9	(Ψ) Regulation at full load and 75 Deg.C		%	
	a)	At unity power factor		:
	b)	At 0.8 power factor lagging		:
6.10	(Ψ) No load current referred to HV Amps.			
	a)	At 90% rated voltage		:
	b)	At 100% rated voltage		:
	c)	At 110% rated voltage		:
6.11	Approximate maximum flux density		Web/Sq.m	
	a)	(Ψ) At 90% rated voltage		:
	b)	(Ψ) At 100% rated voltage		:
	c)	At 110% rated voltage		:
6.12	(Ψ) Maximum current density Amps/Sq.cm			
	a)	Primary winding		:
	b)	Secondary winding		:
6.13	Withstand time without injury for		Sec.	
	a)	Three phase dead short circuit at terminal with rated voltage maintained on the other side		:
	b)	Single phase short circuit at terminal with rated voltage maintained on other side		:
6.14	Details of Enclosure			
	a)	Material		:
	b)	Thickness	mm	:
	c)	Degree of protection		:

	d)	Padlocking provisions		:		
6.15	Core					
	a)	Type - Core or Shell		:		
	b)	Core material		:		
	c)	Thickness of lamination	mm	:		
	d)	Insulation of lamination		:		
6.16	Coils					
	a)	Type of coil :				
		i) Primary		:		
		ii) Secondary		:		
	b)	Conductor material		:		
	c)	Insulating material		:		
	d)	Separate encapsulation for Primary and Secondary windings provided ?		:	Yes/No	
6.17	Tap-Changer					
	a)	Tap-changer operable at standing height from ground ?		:		
	b)	Provided with arrangement to ensure that same tap is set on all three phases at a time ?		:		
	c)	All contacts silver plated ?		:		
6.18	Bushings				Primary	Secondary
	a)	(Ψ) Make			:	
	b)	Type		:		
	c)	Reference Standard		:		
	d)	Voltage class	KV	:		
	e)	Creepage distance	mm/KV	:		

	f)	(Ψ) Weight		:	
	g)	(Ψ) Free space required for bushing removal		:	
6.19	Minimum Cleaances			**Primary**	**Secondary**
	a)	Between phases	mm	:	
	b)	Between phase & earth	mm	:	
6.20	Terminal Connections				
	a)	Primary		:	
	b)	Secondary		:	
	c)	Secondary Neutral		:	
6.21	Junction Box				
	a)	Provided with removable gland plate/conduit knock out		:	
	b)	Degree of protection		:	
6.22	Terminal Blocks				
	a)	(Ψ) Make		:	
	b)	Type		:	
	c)	20% Spare terminals furnished ?		:	
6.23	Wiring				
	a)	Cable type		:	
	b)	Voltage grade	Volt	:	
	c)	Conductor size -	Sq.mm	:	
6.24	Trip & Alarm Contacts Ratings				
	a)	Voltage	Volt D.C.	:	
	b)	Rated/Making Current	Amps.	:	
6.25	Accessories				
	Each transformer furnished with				

fittings and accessories as per Annexure-F to Section-VII of Volume-II F/2 :

6.26 (Ψ) Approximate Overall Dimension

a) Length mm :

b) Breadth mm :

c) Height mm :

d) Crane lift for untaking core and coil assembly (including sling) mm :

6.27 (Ψ) Approximate Weights

a) Core and Coil Kg. :

b) Enclosure & fittings Kg. :

c) Total weight Kg. :

6.28 (Ψ) Shipping Data

a) Weight of the heaviest package Kg. :

b) Dimension of the largest package (L x B x H) mm :

7.0 PORTABLE EMERGENCY LIGHTING UNIT

a) (Ψ) Make :

b) Type :

c) Reference Standard :

d) (Ψ) Catalogue no. :

e) (Ψ) Overall dimension and weight (L x B x H) (mm x mm x mm) (Kg.) :

f) Lamp

i) Type :

ii) (Ψ) Make :

iii) Voltage Watts :

g)	Storage Cell				
	i)	(Ψ) Make		:	
	ii)	Type		:	
	iii)	Voltage	Volts D.C	:	
h)	Duration of lamp glowing after failure of AC supply			:	

8.0 MISCELLANEOUS ITEMS

8.1	Maintenance Ladder			**Car wheel mounted**	**Free-standing**
a)	(Ψ) Make			:	
b)	Material			:	
c)	Reference Standard			:	
d)	Height		m	:	
e)	(Ψ) Catalogue furnished ?			:	
8.2	Conduits			For use in all general plant area and bldg.	For use in all chemical hand-ling areas, Battery rooms etc.
a)	(Ψ) Make			:	
b)	Type/material			:	
c)	Reference Standard			:	
d)	Gauge upto 25mm dia			:	
e)	Gauge above 25mm dia			:	
f)	(Ψ) Catalogue furnished ?			:	
8.3	Junction Box				
a)	(Ψ) Make			:	
b)	Type/material			:	
c)	Reference Standard			:	

	d)	Degree of protection Indoor/Outdoor	:		
	e)	(Ψ) Catalogue furnished ?	:		
	f)	Material thickness	:		
8.4	Terminal Block				
	a)	(Ψ) Make		:	
	b)	Type	:		
	c)	Reference Standard	:		
	d)	(Ψ) Current Rating	:		
	e)	Voltage grade	:		
	f)	(Ψ) Catalogue furnished ?	:		
8.5	Wires (1 core)				
	a)	(Ψ) Make		:	
	b)	Type	:		
	c)	Reference Standard	:		
	d)	Voltage grade	:		
	e)	Wire Sizes		2.5 Sq.mm	10 Sq.mm
	f)	Conductor			
		i) Material	:		
		ii) (Ψ) No. & dia of wires/strands	:		
	g)	Insulation			
		i) Material	:		
		ii) (Ψ) Thickness mm	:		

SECTION - 5

CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

PLEASE NOTE:

a)The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

Hence bidder shall ensure the completeness of their offer in this regard.

Please mark "YES" if the specified requirement is met or put a mark "NO" if the specified requirement is not met and give reason in column 5.

BHEL Enquiry no :
Bidder offer reference :

EQUIPMENT: Illumination System

Sl.no	Parameter	Data	Bidder's conformation	Reason for non-compliance
(1)	(2)	(3)	(4)	(5)
1.	Provision of illumination for specified areas as per spec.		YES / NO	
2.	Guaranteeing the illumination levels specified as per spec.		YES / NO	
3.	Type of lighting luminaries included as per spec.		YES / NO	
4.	Lighting DBs & LPs included as per spec.		YES / NO	
5.	Lighting transformer included company with specification requirements		YES / NO	
6.	Lighting poles included as per spec.		YES / NO	
7.	Sockets, Plugs & other items included as per spec.		YES / NO	
8.	ETC of Package included in the offer		YES / NO	
9.	Supply & ETC of all wires / Cables / earthing material required for the package other than the items supplied by BHEL included in the package.		YES / NO	
10.	ETC of BHEL supplied Cables included in the offer		YES / NO	
11.	ETC of BHEL supplied earthing strip included in the offer		YES / NO	
12.	Additional flood light luminaries in switchyard for maintenance of equipment specified in specification included in offer.		YES / NO	
13.	Type and lumen output of lamps included in the offer are as per		YES / NO	

	specification.			
14.	Whether any new item other than the BOQ given required to meet the specification requirement.		YES / NO	
15.	If new item is required whether these are listed with quantities in the offer		YES / NO	
16.	Equipment included suitable for operation on voltage & frequency Variation limits specified in the specification without effecting their performance		YES / NO	
17.	Power factor of lamp circuit is as per specification		YES / NO	
18.	Fully filled in GTP enclosed		YES / NO	
19.	Auto change over arrangement for emergency AC/ emergency DC included in EAC & DC boards		YES / NO	
20.	Auto switching arrangement for outdoor flood lighting / street lighting through Timer / Photo call included		YES / NO	
21.	Spares included in the offer (a) Mandatory (b) Commissioning		 YES / NO YES / NO	
22.	Activity Schedule enclosed		YES / NO	
23.	Type test reports	Type test reports furnished shall be in line with clause 1.4 (Section-1) & 8.00.00 (Annexure-2 of Section-1)	Yes	
24.	Type test	If type test reports are not acceptable to TSGENCO /BHEL then above tests shall be conducted by the bidder free of cost	Yes	
25.	Mandatory spares quoted in line with Annexure-1 (BOQ) of section-1	Yes	Yes/No	
26.	Bidder to confirm that it will offer approved make of components & fitments at Contract stage. In case the offered make is not approved by the Customer, then alternate make shall be supplied without any commercial implication to BHEL.	Yes	Yes/No	

Bidder's

Sign :

Date :

Name :

Design :

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date:

Tenderer's Stamp & Signature