TENDER NOTICE NO.
HY/ES/LML MAULI/CIE/12

CIE jobs - Erection, Testing, Pre commissioning &

Commissioning of 1X30 MW STG Sets at Lokmangal Mauli Industries, Osmanabad, Maharashtra

Tender Submission

On or before 16 - January -2013, at 11.00 Hrs.

TENDER OPENING

On 16 - January -2013 at 13:30 Hrs.

at

VENDOR COMPLEX

BHEL, HYD (ADMIN BLOCK)

(Phone: 040 – 23183415 / 23183416 / 23184497)

BHARAT HEAVY ELECTRICALS LIMITED

Ramachandrapuram, Hyderabad-502032 (A.P.)

TENDER SCHEDULE

PROJECT INFORMATION

Installation, Testing & Commissioning of Control, Instrumentation and Electrical Jobs are to be carried for 1X30 MW Steam Turbine driven Generator Sets at M/S Lokmangal Mauli Industries, Osmanabad, Maharashtra.

PROJECT DATA

1. Project Authority	:	M/S Lokmangal Mauli Industries Osmanabad, Maharashtra
2. Project Consultant	:	NIL
3. Name of the Project	:	Lokmangal Mauli Industries, Osmanabad, Maharashtra
4. Location of Site	:	Lokmangal Mauli Industries, Distt.-Osmanabad, Maharashtra
5. Nearest Railway Station	:	Sholapur
6. Nearest Air Port	:	

SIGNATURE & SEAL OF BIDDER

SCOPE OF WORK

SCOPE OF CONTROL, INSTRUMENTATION AND ELECTRICALS JOBS

It is not the intention in this specification to specify each and every activity in the scope of work. However broadly they are brought out in this section and specification nos. 101, 102 & 103 of this Tender Schedule. Bidder may kindly note the same. For the completeness of the job, bidder to note that, all activities of erection, testing and commissioning should be completed. Any minor modifications including strengthening by additional welding etc., if required on the equipment to be erected shall be considered as part of the erection and shall not call for any extra payment.

1.0 Bidder should quote most competitive and "FIRM" Prices only. Tenders shall be evaluated on total cost basis (i.e. Grand Total in Summary Sheet). The terms of payment will be operated based on Specification 205 & 205A. Service taxes will be paid extra as per the prevailing government rate on submission of necessary documents.

2.0 Bidder should note at least 50% of Security Deposit should be paid before start of the work. Balance Security Deposit shall be recovered from running bills at the rate of 10% till full amount is recovered.

3.0 Receipt, Inspection, Storage and drawal of Materials at site:

3.1 After the materials (Instruments and associated items) are received at site, the contractor shall Identify them with reference to the completion schedules and relevant part lists and tag every item with the connected tag number with reference to P&I diagram. Any clarifications/assistance required for identifying the items will be extended by the BHEL Site Engineer. Instruments' Body (not the cover) shall bear tag no. in paint.

3.2 All the items shall be stored, after tagging, in separate locations service wise.

3.3 Temporary sheds required for the storage of these items shall be constructed by the contractor. Storage of these items shall be done in such a way that these can be reached and retrieved easily and conditions for storage are good, to the satisfaction of BHEL site engineer.

3.4 Materials drawn from BHEL / Contractor's store shall be transported to installation site as per requirement. The contractor shall make proper arrangements for safe transporting these materials to avoid damage or disturbance. The contractor shall also maintain a register and record the description and quantity of materials drawn by him from BHEL stores and their actual utilization. All entries made by the Contractor in the register shall be initiated by the BHEL's site Engineer. After completion of the works un-utilized instruments and associated items shall be returned to BHEL stores and due receipt obtained.

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4.0 ERECTION OF INSTRUMENTATION

4.1 The Contractor shall, execute the entire instrumentation work within the battery limits as indicated in BHEL drawings and the work includes erection, testing, calibration, and commissioning of instrumentation and control panels and gauges, boards for all equipment and associated auxiliaries.

4.2 BHEL will furnish the contractor with necessary P&I diagrams in which all the instruments required for the control & protection of the system are shown.

4.3 The Contractor shall erect all local instruments and junction boxes in the field with suitable and permanent supports as per BHEL standards. Vibration free locations at which instruments shall be installed will be indicated by BHEL site engineer.

4.4 The mechanical contractor will provide necessary tap off points on the equipment, vessels, auxiliaries and pipe lines up to the first isolation valve. The CIE contractor shall carryout further process connection from these tap off points to various instruments like pressure gauges, pressure transmitter, differential pressure transmitters, pressure switches etc. All temperature gauges with capillary type should be mounted on separate stand and capillary to be routed in separate perforated tray.

4.5 The process line connections between the tap off points and respective instruments shall be carried out in accordance with the BHEL standards furnished to the contractor, or as instructed by BHEL Engineer at site.

4.6 The contractor shall route process impulse lines from the respective tap off points up to the primary instruments via the shortest possible route employing minimum number of bends. They shall be carried out with the concurrence of the BHEL site engineer.

4.7 The instrument air (2" header) for each services will be provided at the battery limit of the respective services. The instrumentation contractor shall route the instrument air header to the local control panels and the various local pneumatic instruments, which shall be carried out under the supervision of BHEL site Engineer.

4.8 The CIE contractor shall install an isolation valve and air filter regulator near the local instrument on a permanent support and carryout connections from air header to various pneumatic instruments.

4.9 The Contractor shall connect the primary pneumatic instruments to the secondary instruments as per the P & I diagrams by means of 6 X 1 mm PVC covered copper tubes / S. S. tubes joined by S.S. socket weld straight coupling by Argon welding, or compression fittings as required at site.

4.10 The Contractor shall plan the routing of pneumatic impulse lines and cables with the concurrence of BHEL Engineer. He shall carryout pre-modifications suggested by BHEL site Engineer in line with layout of pneumatic tubes and electrical cables, wherever found necessary.

4.11 After finalizing routing plan for cables and tubes, the contractor shall erect slotted sheet metal trays/angle trays as the case may be from the local instruments and junction boxes up to panels & gauge boards and from the junction boxes to the local control panels. The Contractor shall use natural bends wherever slotted sheet metal/ angle tray junctions are encountered. These cable trays shall be erected securely and shall be fixed to the walls or steel beams with proper support or with hangers. The routing shall be carried out in such a way that they should be kept away from hot environment and allow enough room to lay additional cables easily at a later date.

4.12 The contractor shall lay pneumatic tubes and electrical cables on independent trays. All cables shall be protected at both ends and also strands shall be ferruled for easy testing and termination. All tubes, cables shall be laid properly and fixed securely to the trays by means of clamps. All junction boxes shall be numbered using paint as per the directions of BHEL site engineer.

4.13 Metallic tags inscribing the junction box number shall be tied securely to the cable or tube at the primary elements like pressure transmitters, pressure switches, etc. and a metallic tag at the junction boxes inscribing the tag number of the instrument.

4.14 The contractor shall connect multi-tube/ multi-core cables to the control panel bulk head/terminal box from the respective junction boxes. Multi-cable/multi-tube shall be laid in the same way as mentioned before, and shall be secured by cable glands/ bulk heads.

5.0 CONTROL PANELS & LOCAL GAUGE BOARDS:

5.1 Panel erection shall include chipping, levelling, grouting, fabrication of base frame if required and modifications in panel wiring if any, removal of instruments/ relays for calibration, testing and re-fixing of the same after calibration / testing.

5.2 Gauge boards, as and when received at site, shall be unloaded, cleaned and shall be immediately installed at location as shown in layout / as suggested by BHEL engineer.

5.3 The Contractor shall drill required No. of holes on gland plates of panels and local gauge boards for entry of electrical cables, pneumatic tubes and process impulse lines. All cables shall be provided with suitable glands. Any extra hole shall be plugged to avoid dust/moist air entry into panel**.**

5.4 All cables & pneumatic tubes shall be identified and tagged with the instrument tag numbers connected to terminal strip/bulk heads as per the panel drawing supplied to the contractor.

5.5 On completion of work, all carbon steel components viz, impulse line, instrument supports, angles, cable racks shall be properly cleaned and painted firstly with a coat of suitable/applicable primer and double coat of suitable / applicable anti corrosive paint.

6.0 CALIBRATION AND TESTING:

6.1 All local pneumatic/ electrical instruments shall be calibrated, aligned, and set as per the data furnished and priority set by BHEL Engineer. Calibration shall be carried out by the contractor in the presence of BHEL Engineer or staff deputed by BHEL Engineer. The contractor shall fill in the pro-forma for each instrument indicating data, tag. No, service, instrument make, and calibration values etc. Each pro forma shall be signed by BHEL Engineer and customer's representative.

6.2 All panel instruments, service wise, shall be calibrated, aligned and set as per the data furnished by BHEL Engineer in the order of priority. The Contractor shall fill in the pro forma as said above and shall be signed by BHEL Engineer & Customer representative.

6.3 Calibration of all local instruments and instruments mounted on local gauge boards and control panels shall be carried out in position as far as possible and any deviation shall be duly certified by BHEL Engineer.

6.4 All control valves shall be checked/ calibrated for full range operation with required pneumatic/electric signal. Report shall be prepared and countersigned by BHEL Engineer/Customer Engineer.

6.5 All safety valves shall be removed by the mechanical contractor. The instrument contractor shall carry it to the instrument room, to be checked with the set value as advised by the BHEL engineer and if necessary contractor shall adjust and set value. Contractor shall fill in pro-forma indicating the service, tag No. set value etc. and BHEL engineer and customer's representative shall sign. After setting the safety valve shall be handed over to mechanical contractor for installation in its original position.

6.6 The contractor shall carry hydraulic test for all process impulse lines with 1.5 times the normal operating pressure of the line, isolating the instrument. The test pressure shall be maintained for thirty minutes. If any leak is found in the process impulse line the contractor shall rectify the same. After rectification, hydraulic test shall be carried out once again & BHEL Engineer shall certify each line after successful hydraulic test.

6.7 Contractor shall arrange for necessary standard test equipment/kits required for calibration of instruments. Test equipment / instruments shall be accredited by an authorized agency or the OE M & a copy of the certificate, indicating accuracy, validity period of the instrument usability etc., shall be furnished to BHEL engineer for approval.

6.8 All pneumatic impulse lines shall be tested by the contractor for leakages at connections with air/nitrogen at a pressure of 10kg/sq. cm. or at the value advised by BHEL Engineer, isolating instruments and with soap solution for loop checking. If any leakage is found contractor shall rectify the same and repeat the test. The Contractor shall obtain signature of BHEL Engineer for each line after successful testing.

6.9 All pneumatic air headers shall also be tested by the contractor in the same way as mentioned in 6.8.

6.10 All electrical cables shall be tested for continuity and insulation. Contractor shall earth the equipment and cables where ever required as per BHEL Engineer's advice.

7.0 PNEUMATIC LOOP CHECKING:

7.1 All pneumatic loops shown in P & I schemes shall be checked / tested for their functioning. The loop shall include primary elements and final elements etc. The loop shall be checked / tested by simulating the process condition by means of variable inputs to the primary elements/transducers. If any of the instrument's calibration is found drifted, the contractor shall re calibrate the instrument and check the loop again.

7.2 The Contractor shall check/test all panel internal Electrical / Pneumatic circuitry with ref to the panel drawings / schemes, and if any deviations noticed, he shall intimate the BHEL Engineer and shall act as per his advice.

8.0 PRE-COMMISSIONING AND COMISSIONING:

8.1 All electrical switches connected to the trip / inter lock circuit shall be checked / tested for their functioning by simulating the service condition.

8.2 On advice of BHEL Commissioning Engineer, contractor shall put all instruments in line with the process. The Contractor shall modify the settings or ranges in case suggested by the BHEL Commissioning Engineer. During Commissioning of main equipment and other related equipment / auxiliaries, the contractor shall fine tune instruments in auto control mode to suit system requirements.

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8.3 Before charging pneumatic supply air header, the lines shall be blown for a period specified by BHEL Engineer at full parameter and all signal tubes shall be blown at least once.

8.4 When the pre-commissioning activities are concluded, the contractor shall render all necessary help to BHEL Commissioning Engineer in regard to CIE during the commissioning of the main equipment.

8.5 Contractor shall co-operate with BHEL and customer in reviewing the progress and method of work.

9.0 Preparation & Submission of Documentation includes Instrument Calibration or electrical test equipment accreditation / fitness certificate, field instrument calibration report, Panels/ Bus-duct/ relays test report , loop checking, control & logic checking etc., Erection, Pre commissioning & Commissioning protocol on prescribed format approved by BHEL/Client/ Consultant and as build drawings if any. Site activities viz. Installation / Pre commissioning / commissioning documents / protocols to be submitted in FIVE copies. No separate charges will be applicable.

10.0 The unit rates for all items mentioned in specification number 204 covers erection, testing, calibration, loop checking, pre commissioning ,commissioning, preparation & submission of five copies of report/protocol (as detailed in clause 9.0) etc. unless stated otherwise.

11.0 Necessary tools and accessories like crimping material, identification tag ferrules, U clamps, bolts & nuts etc. required for laying pneumatic tubing, impulse tubing & piping, are not in BHEL scope of supply. The same has to be supplied by the contractor.

12.**0** **Erection of instruments shall include fabrication of instrument stands and hardware like nut & bolt for mounting instruments on to stands. For instrument stands fabrication consumable like gas, welding rods, nuts, bolts and anchor fasteners etc. are also in contractor's scope.**

13.0 Erection, calibration, testing, loop checking and commissioning of Local, Field and Panel mounted instruments, Relays, CTs & PTs Panels, Valves, Junction boxes, Proximeter housings, Impulse lines, cables between local / field mounted instruments to JBs & JBs to Turbine / Generator control & relay panels. Cable trays for Turbine and Generator and its auxiliaries and some materials are to be supplied by the contractor and the same are mentioned clearly in specification No. 204.

14.0 Un-armored Communication cable to be laid through GI pipes/ conduits. The GI pipe/ conduit along with the necessary fittings & supports are to be supplied by bidder. Bidder shall include the cost of the same along with cable laying.

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15.0 Cable laying shall include drilling of gland holes, dressing & clamping of cables using Aluminium clamps on trays, glanding, tagging, ferruling, terminations & continuity checking. Consumables like Cable Glands, aluminium tags, lugs and ferrules shall be supplied by erection contractor and their cost is deemed to be included in the unit rates quoted. All cable ferruling should be printed / punched and cross ferruled. Single and loose ferruling is not acceptable.

16.0 For cable tray / duct erection and some instruments, mounting support structures and stands are to be fabricated as per BHEL engineer's guidelines. For this work no separate rate will be applicable. Hence this job including materials for support structures and stands, fasteners like nuts, bolts, washers etc., shall be included in the unit rates of cable tray/duct / instrument erection. For cable tray/duct erection the tray /duct couplers, bolts, nuts, washers etc., are to be supplied by the contractor.

17.0 Mounting of loose supplied items, includes termination of loose wires to the mounted items with proper ferruling and any modification of wiring with printed/ punched cross ferruling if necessary or as suggested by BHEL Site engineer as per O & M requirements.

18.0 **Proximeter housing & installation of junction boxes includes making of required hole for cable entry on the housing(if required) and fabrication of structure for the same & painting. For fabrication of structure consumables like welding electrode, gas, nuts, bolts etc. including paint with primer are to be supplied by the contractor.**

19.0 Installation of TSI probes shall include support tube erection, support tube modification & re-threading (if required), installation of support tubes, installation of protective flexible conduit and clamping using aluminium clamps. Aluminium clamps are to be provided by bidder.

20.0 Bidder shall make his own arrangements for material handling, shifting of materials from store to site and tools & tackles, hoisting equipment etc., during the erection period.

21.0 Process impulse piping & tubing includes oil, steam, condensate, cooling water and gas scheme etc. and pneumatic tubing fabrication & erection with all the fittings, valves etc., and hydraulic tests are in the contractor's scope. No separate payments are applicable. Necessary tools & accessories like clamping bolts, nuts, U clamps, tags etc for laying pneumatic tubing, process impulse piping are to be arranged by the contractor. No separate payments are envisaged. Impulse tubing & piping jobs are to be carried out as per enclosed BHEL "Instruments Hook up Diagrams" Drawing No 4-312-00-50126 Rev.00 (Annexure-2) and "Instrument Installation Drawing" Drg. No. 4-381-21-03032 Rev 02 (Annexure-3).

22.0 Calibration of safety relief valves and control valves, loop checking, re-fixing and commissioning is under the scope of bidder.

23.0 Bidder shall agree to keep the rates valid for any variation in quantities indicated in Price Schedule.

24.0 Bidder to note that the construction power and water will be provided at a single point at fabrication area or at site. The successful bidder shall have to make necessary arrangements for cables energy meters & safe distribution etc., by himself. The bidder has to ensure that the statutory regulations are met with while executing the work**. Bidder to note that the construction power and water shall be chargeable as per BHEL client's terms and condition.**

25.0 **PAINTING: The Bidder shall consider about 5 (five) coats of painting (supply and application including the primer for Epoxy paint) for the items to be erected i.e. Instrument stands, panels, piping and auxiliaries etc., and the work is subject to inspection / approval by BHEL's client. All piping & structural materials are to be sand blasted before painting. Sandblasting, supply and application of paint are in bidders' scope. No separate payments are envisaged.**

26.0 The bidder shall submit test and calibration reports for protection /auxiliary relays, instruments, control & safety valves, cables etc. including pre commissioning & commissioning report as per the BHEL/CUSTOMER formats in five copies.

27.0 During erection, testing, pre- commissioning and commissioning works, some repairs, rectification and modifications etc. are likely to occur. Contractor should note that they are part of erection, testing, pre-commissioning and commissioning scope. No extra payment will be entertained on this account.

28.0 For any extra equipment & structural jobs, the approved unit rates of erection only will be applicable, and this will not be treated as extra work for payment on man hour rates basis.

29.0 The bidder shall consider testing of CTs & PTs in bus duct / generator phase & neutral side terminal boxes erection (if applicable), Relays & Panel instruments as a part of panel erection, testing commissioning. No separate payments are envisaged.

30.0 Bidder shall consider that PLC erection & commissioning includes assembly / mounting and testing of loose parts whatever supplied along with PLC cabinets. No separate payments are envisaged.

31.0 **Bidder to note that they have to provide commissioning assistance as per the site requirement during commissioning. No separate payments are envisaged and the unit rates quoted for erection and commissioning are deemed to have taken care of this requirement. Commissioning is deemed to be completed on successful run of the unit for 72 hours, uninterrupted allowing for minor variation in load**.

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32.0 Segregated Phase Bus-duct and Accessories erection including erection of open bus- bar, flexible links, etc. with support insulators & structural support (supplied by the vendor) inside generator air cooling chamber from generator terminal to Seal off bushing and erection of structure for bus-duct support (supplied by the bus duct vendor) as per the drawing attached. **Considering the criticality & specialized nature of this job bidder is to ensure vendor supervision during the job execution & no separate charges are applicable in this regard.**

33.0 CO2 piping erection includes fixing of CO2 nozzle, tubing from CO cylinder with tube fittings, threading, welding of pipes as per the lay out drawing, after consulting with BHEL engineer / Customer / Consultant representative. This is in consideration of O & M aspects from Customer side. Tools, tackles and consumables for carrying out the job are to be arranged by bidder.

34.0 **ACCEPTANCE OF THE TENDER**

Acceptance of the tender will be intimated to the successful bidder through a Letter of intent / Fax of intent. The contractor shall then be required to execute an agreement annexed (Annexure I & II), within seven (7) days from the date of issue of the letter of Intent. In the event of failure on the part of the contractor to sign the agreement within the specified time, the earnest money deposit shall be forfeited and the bidder shall be considered as withdrawn.

35.0 **CONTENTS OF THE CONTRACT DOCUMENTS**

The letter of submission of tender, notice inviting tender, scope of inquiry, Instruction to tenderers, general conditions of contract, general and technical specifications, tender proposal forms, tender drawings, contract form between the contractor and BHEL, forms of different deeds (as applicable), amendments / addenda / corrigenda and interpretations / clarifications as issued by BHEL subsequent to issue of tender documents (if any), contractor's tender No..... dated ..... all correspondences, minutes of meetings, agreed variations etc., between the tenderer and BHEL till issue of the letter of intent by BHEL, agreed quality assurance programme and time schedule network together with the letter of intent issued by BHEL, all pertaining to this tender, agreed man power deployment together with their technical qualifications etc., shall form the contract.

36.0 The contract document shall contain, the scope of inquiry, general and technical specifications and amendments / addenda / corrigenda, interpretation / clarifications issued by BHEL on technical aspects, as well as all correspondences, minutes of meetings etc., between the bidder and BHEL on technical aspects, agreed quality assurance programme, time schedules network, and the rest of documents listed in clause 35.0 above.

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37.0 The bidder shall prepare, one (1) Original of Contract as described in clause 34.0, 35.0 & 36.0 within seven (7) days of signing the contract agreement and shall arrange six (6) true copies of contract documents free of charge within 4 weeks from the date of signing the contract agreement. After retaining one copy with them for their use, the contractor shall hand over remaining 5 copies to BHEL for their use at site & headquarters including their finance department.

SAFETY:

Observation & complying with standard applicable Safety norms during job execution is of paramount importance to BHEL. Contractor / their authorized representatives shall adhere to the safety norms as applicable in line with tender schedule which forms an integral part of the work order. Also an annexure covering, engineering standards and practices prevalent in works is enclosed for bidder's reference. Since the erection work shall be carried out in close proximity to operating plant, necessary safety / work permits shall be obtained from whom so ever, authorized to issue, prior to commencement of any job at site. Contractor shall appoint and inform BHEL site office the name & qualification of the person / persons who shall be responsible for safety during job execution. For safety related issues contractor safety supervisor will work in close coordination with Safety Officer authorized by customer.

SAFETY REGULATIONS

Contractor will ensure that trained men attend work in safe apparel and are provided with requisite safety appliances (PPE), tools & tackles etc. there by ensuring safe working conditions. The work to be carried out under the supervision of nominated safety supervisor only. For commencement of job contractor shall use duly tested tools/ tackles/appliances /(PPE) as per statutes in force and a copy of test certificates shall be produced to BHEL / Customer Site engineer/ safety officer on demand. Bidder shall be solely responsible and shall ensure that all safety requirements under relevant statutes in force are complied with. In case of failure to observe above regulations while undertaking the job BHEL/Customer Site engineer/ safety officer can order to stop work.

Note: 1) Instruments used for calibration and testing should be certified by an accredited agency, as per our quality policy. Certificate of accreditation should be valid through the period of contract.

2) Licensed electrical supervisors should execute the work at site.

3) The bidder shall take necessary clearances and approvals from local/state Electrical Inspectorate / any related statutory authority. It is deemed that the bidder has considered any expenditure that he may be incurring in order to obtain needed licensees or relevant approvals from concerned authorities while quoting unit rates. Separate charges shall not be entertained on this account.

4) BIDDER SHALL NOTE THAT TENDER HAS TO BE FILLED IN ORIGINAL SCOPE FORMAT (SPEC NO. 204) SUPPLIED BY BHEL. RE- TYPED OR FORMAT WITH CHANGES/CORRECTIONS (SPEC NO. 204) WILL LEAD TO CANCELLATION OF BID.

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ERECTION SCHEDULE

The Schedule for completion of Erection, Calibration, testing, loop checking and commissioning of control Instrumentation and Electricals for Main equipment, auxiliaries and piping shall be tentatively as below:

SL.No	DESCRIPTION	DATES
1.	Start of Erection	January 2013
2.	Commissioning of Turbine	August 2013
3.	Load run	September 2013

For the purpose of contract, the contract period shall be taken as 9 months. Completion of the work shall be as per BHEL work schedule, revised from time to time. However schedule may be advanced also. In order to expedite the work, the contractor has to deploy manpower on two-shift basis, if required, **without any extra cost to BHEL.**

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SCOPE : ERECTION, CALIBRATION,TESTING, LOOP - CHECKING & COMMISSIONING

1.01.00 - LOCAL / FIELD MOUNTED INSTRUMENTS

SL.NO	DESCRIPTION	UNIT	QTY	UNIT RATE	TOTAL COST
1.01.01	PRESURE GAUGES	NOS	101		
1.01.02	BIMETTALIC THERMOMETERS	NOS	42		
1.01.03	MERCURY IN STEEL THERMOMETERS	NOS	15		
1.01.04	LEVEL GAUGES	NOS	7		
1.01.05	DIFFRENTIAL PRESSURE INDICATORS & SWITCHES	NOS	9		
1.01.06	PRESSURE SWITCHES	NOS	31		
1.01.07	LEVEL SWITCHES	NOS	10		
1.01.08	LEVEL TRANSMITTER	NOS	3		
1.01.09	SPEED MEASURING LOOP NOS	NOS	5		
1.01.10	VIBRATION, AXIAL DISPLACEMENT,VELOCITY PROBES	NOS	18		
1.01.11	RTD WITH THERMOWELLS	NOS	10		
1.01.12	BEARING THERMOELEMENTS	NOS	14		
1.01.13	THERMOELEMENTS (K-TYPETHERMOCOUPLE)	NOS	15		
1.01.14	ELECTRONIC PRESUTRETRANSMITTERS	NOS	25		
1.01.15	PROXIMITTERS	NOS	19		
1.01.16	THERMOWELLS	NOS	94		
1.01.17	CONTROL VALVES	NOS	7		
1.01.18	DE SUPERHEATER STATION	NOS	1		
1.01.19	I/H CONVERTOR	NOS	1		
1.01.20	LIMIT SWITCHES	NOS	8		
1.01.21	SOLENOID VALVE	NOS	4		
1.01.22	DIFFERENTIAL PRESSURE TRASNMITTERS	NOS	7		
1.01.23	AIR FLOW ROTAMETER	NOS	3		
1.01.24	PRESSURE SAFETY VALVE	NOS	1		
	TOTAL				

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

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1.02.00 - PANELS & CUBICLES

1.02.01	LOCAL GAUGE RACK 1300 (w) X 1600 (h)	NOS	01		
1.02.02	GOVERNING CONSOLE BOARD 1300(w) X 1800(h) X 450 (d)	NOS	01		
1.02.03	TURBINE CONTROL PANEL 1600 (H) X 2300(W) X 800(D)	NOS	01		
1.02.04	AUTOMETIC VOLTAGE REGULATOR 2000(L) X 2200(H) X 1250(D)	NOS	01		
1.02.05	GENERATOR CONTROL PANEL 1000(L) X 2200(H) X 1000(D)	NOS	02		
1.02.06	GENERATOR RELAY PANEL 800(L) X 2200(H) X 800(D)	NOS	01		
1.02.07	GEAR BOX STARTER PANEL 800 (L) X 1200 (H) X 300 (D)	NOS	01		
	TOTAL				

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

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1.03.00 - PANELS MOUNTED INSTRUMENTS.

1.03.01	TSI RACK WITH DESK TOP PC & PRINTER	NOS	01		
1.03.02	WOODWARD GOVERNOR	NOS	01		
	TOTAL				

1.04.00 - JUCNTION BOXES & LOCAL CONTROL STATIONS (LCS)

1.04.01	ELECTRTICAL JUNCTION BOXES 12 INLET / 2 OUTLET	NOS	19		
1.04.02	ELECTRTICAL JUNCTION BOXES 8 INLET / 2 OUTLET	NOS	15		
1.04.03	WEATHER PROOF JUNCTION BOXES 8 INLET / 2 OUTLET	NOS	13		
1.04.04	PROXIMITTER HOUSINGS	NOS	09		
	TOTAL				

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

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1.05.00 - PROCESS AND PNEUMATIC TUBING & PIPING

SL.NO	DESCRIPTION	UNIT	QTY	UNIT RATE	TOTAL COST
1.05.01	CS PIPE 21.3 X 3.73	MTR	450		
1.05.02	Cr-Mo PIPE 21.3 X 3.73	MTR	700		
1.05.03	SS TUBE 12.7 X 2.1	MTR	350		
1.05.04	SS TUBE 21.3 X 3.7	MTR	950		
1.05.05	SS TUBE 21.3 X 4.8	MTR	150		
1.05.06	CS PIPE 60.3 X 3.91	MTR	250		
1.05.07	SS PIPE 6.3 X 0.9	MTR	70		
	TOTAL				

1.06.00 - CABLES (LAYING ,TERMINATION & TESTING)

1.06.01	1P X 1.5 SQ. MM SIGNAL CABLE	MTR	5000		
1.06.02	6P X 1.5 SQ. MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD	MTR	500		
1.06.03	12P X 1.5 SQ. MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD	MTR	450		
1.06.04	1T X 1.5 SQ MM COPPER CABLE	MTR	600		
1.06.05	10T X 0.5 SQ MM COPPER CABLE	MTR	1000		
1.06.06	3C X 4 SQ MM COPPER CABLE	MTR	1200		
1.06.07	3C X 6 SQ MM COPPER CABLE	MTR	500		

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

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SL.NO	DESCRIPTION	UNIT	QTY	UNIT RATE	TOTAL COST
1.06.08	5C X 2.5 SQ MM CONTROL CABLE	MTR	2000		
1.06.09	10C X 2.5 SQ MM CONTROL CABLE	MTR	1300		
1.06.10	1P THERMOCOUPLE EXTENSION CABLE	MTR	600		
1.06.11	2T X 1.5 SQ. MM SHIELDED CABLE	MTR	600		
	TOTAL				

1.07.00 - ERECTION OF CABLE TRAYS & CABLE DUCT.

1.07.01	PERFORATED CABLE TRAY L=2.5M, W=50MM	NOS	500		
1.07.02	COUPLER PL+ FASTENERS OF CABLE TRAY W=50, F=25	NOS	400		
	TOTAL				

1.08.00 - FABRICATION,ERECTION OF STRUCTURAL STEEL

1.08.01	STRL ST CHANNEL 100 X 50	MTR	25		
1.08.02	ANGLE 50 X 50 X 6	MTR	100		
1.08.03	ANGLE 75 X 75 X 6	MTR	20		
1.08.04	PLATE 6 MM THICK 1500 X 5000	NOS	2		

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER

1.09.00 - SEGREGATED PHASE BUSDUCT & ACCESSORIES(To be carried out Under the supervision of M/s Spaceage as per Drawing No.BD11-283C-1286)

1.09.01	BUSDUCT (1400X500)	MTR	15		
1.09.02	3-Phase Tap off BUSDUCT (1400X500)	MTR	2		
1.09.03	PTSP CUBICAL 1950 (L) X 1900 (D) X 2200 (L)	NOS	1		
1.09.04	NGT 1250 (L) X 1250 (D) X 1500 (H)	NOS	1		
1.09.05	1-Phase Tie-Duct for NGR	MTR	12		
1.09.06	SUPPORT STRUCTURE	TON	2		
	TOTAL				

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER

SUMMARY SHEET

1.01.00	LOCAL / FIELD MOUNTED INSTRUMENT (1.01.01 TO 1.10.24)	
1.02.00	PANELS & CUBICALS (1.02.01 TO 1.02.07)	
1.03.00	PANEL MOUNTED INSTRUMENT (1.03.01 TO 1.03.02)	
1.04.00	JUNCTION BOXES & LOCAL CONTROL STATIONS (LCS) (1.04.01 TO 1.04.04)	
1.05.00	PROCESS & PNEUMATIC TUBING FITTING (1.05.01 TO 1.05.07)	
1.06.00	CABLES (1.06.01 TO 1.06.11)	
1.07.00	ERECTION OF CABLES TRAYS & CABLE DUCTS (1.07.01 TO 1.07.02)	
1.08.00	FABRICATION, ERECTION OF STRUCTURAL STEEL (1.08.01 TO 1.08.04)	
1.09.00	SEGREGATED PHASE BUSDUCTS & ACCESSORIES (1.09.01 TO 1.09.06)	
	GRAND TOTAL	

Note : Above rates are exclusive of govt. service taxes which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER

TERMS OF PAYMENT - SECTION VIII

The contractor shall submit Progress of work weekly with certification of computation of work from BHEL Site Engineer. The contractor may raise bill for the work carried out monthly as per rate accepted.

Payment to the contractor for the work done will be regulated as follows:

a) 50% of each item will be paid on completion of the erection and calibration of the items as applicable against progressive running bills.

b) 35% value of each item shall be paid on completion of testing, painting / final painting and putting into services as applicable against progressive running bills.

c) 5% of the value shall be paid on submission of E & C Documentation (Calibration / test equipment fitness certificate, Protocol, test reports, as-built drawings, etc.,)

d) 5% of the value shall be paid on commissioning of set after taking into consideration total value.

e) Final 5% of the total shall be paid after the expiry of the guarantee period. All payments shall be released from our headquarters at Hyderabad after the bills are duly certified by BHEL Site engineer & Construction Manager.

f) Security deposit will be deducted as per rules and paid on completion of guarantee period.

NOTE:

1) For supply items 85% cost of the items will be paid after receipt of material at site in good condition and acceptance thereof against Progressive running bills.

2) Balance payments for supplies will be released as per paras (d) and (e) above.

SIGNATURE & SEAL OF BIDDER

MAN HOUR RATES

Bidder shall consider the following single man-hour rate including cost of supervision and consumables for all categories of extra works that may arise during course of contract. Bidder to note that these rates shall not be applicable for, modification / rectification of works executed defectively contrary to the instructions of Engineers and drawings.

Sl. No.	DESCRIPTION	MAN HOUR RATE
1.	SKILLED / SEMI SKILLED / UN SKILLED	Rs. 25/-

SIGNATURE & SEAL OF BIDDER

DRAWINGS FOR 11KV, 2500A SPB.

REFERENCE DRAWING:

1. FOR EUQUIPMENT LAYOUT FOR TG BUILDING GROUND FLOOR, EL. 10.0M DWG. NO. 1-381-01-04779 REV.03.
2. FOR LAYOUT GENERATOR DWG. NO. 1-139-12-31324, REV.02.
3. FOR CLOSED CIRCUIT AIR COOLING SYSTEM DWG. NO. 0-139-31-31269, REV.06.
4. FOR TERMINAL ARRANGEMENT OF GENERATOR DWG. NO. 1-135-08-31438, REV.01.
5. FOR PANEL ROOM LAYOUT FOR TG HALL AT VARIOUS LEVELS DRW. NO.-1291799000466, REV.-04-S02.
6. FOR 11kV MV PANEL DRAWING NO.-896-1339.9

AS BUILT DRAWING

PROJECT
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

CUSTOMER
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

REV. NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	MOHIT
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

	DRN.	DATE
	ANAND	11.05.12
	CHD.	ANAND
	APPD.	V.PAL

CONSULTANT
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

JOB NO.	SHEET NO.
BD11-283	01

DRG. TITLE: FRONT COVER SHEET FOR 11KV, 2500A SPB.

DRG. NO.	REV. NO.
BD11-283C-1286	03

LIST OF DRAWINGS

SL. NO.	DRG. NUMBER	SHEET	REVISION	DRG. TITLE
1.	BD11-283C-1286	01	03	FRONT COVER FOR 11KV, 2500A SPB.
2.	BD11-283C-1286	02	04	LIST OF DRAWINGS FOR 11KV, 2500A SPB.
3.	BD11-283C-1286	03	03	SINGLE LINE DIAGRAM FOR 11KV, 2500A SPB.
4.	BD11-283C-1286	04	02	TECHNICAL DATA SHEET FOR PT, LA, SC, NGT & LOADING RESISTOR FOR 11KV, 2500A SPB.
5.	BD11-283C-1286	05	04	LAYOUT DRAWING FOR 11KV, 2500A SPB.
6.	BD11-283C-1286	06	04	LAYOUT DRAWING FOR 11KV, 2500A SPB.
7.	BD11-283C-1286	07	02	GA OF PTSP CUBICAL FOR 11KV, 2500A SPB.
8.	BD11-283C-1286	08	01	GA OF PTSP CUBICAL FOR 11KV, 2500A SPB.
9.	BD11-283C-1286	09	03	GENERAL ARRANGEMENT OF NG CUBICAL FOR 11KV, 2500A SPB.
10.	BD11-283C-1286	10	02	WIRING DIAGRAM OF CTs FOR 11KV, 2500A SPB
11.	BD11-283C-1286	11	02	WIRING DIAGRAM OF CTs & PTs FOR TVM FOR 11KV, 2500A SPB
12.	BD11-283C-1286	12	02	WIRING DIAGRAM OF PTs FOR 11KV, 2500A SPB
13.	BD11-283C-1286	13	01	WIRING DIAGRAM OF NG CUBICAL FOR 11KV, 2500A SPB
14.	BD11-283C-1286	14	03	GENERATOR TERMINATION FOR 11KV, 2500A SPB.
15.	BD11-283C-1286	15	03	CONNECTION DETAIL AT HT PANEL FOR 11KV, 2500A SPB.
16.	BD11-283C-1286	16	02	CONNECTION DETAIL AT PTSP CUBICAL FOR 11KV, 2500A SPB.
17.	BD11-283C-1286	17	02	CONNECTION DRAWING ND CUBICAL FOR 11KV, 100A SPB.
18.	BD11-283C-1286	18	02	BUSBAR SIZING, INSULATOR SPAN & THERMEL WITHSTAND CAPABILITY CALCULATION 11KV, 2500A SPB.
19.	BD11-283C-1286	19	02	TYPICAL CROSS SECTIONAL, ACCESS DOOR, ENCLOSURE FLANGE & RUBBER BELLOW FOR 11KV, 2500A SPB.
20.	BD11-283C-1286	20	02	TYPICAL DETAIL OF SUPPORT INSULATOR, INSULATOR ASSEMBLY, EPOXY SEAL OF BUSHING, BUSBAR RIGID & EXPANSION JOINT, & SPACE HEATER WIRING DIAGRAM FOR 11KV, 2500A SPB.
21.	BD11-283C-1286	21	02	WALL/FLOOR FRAME ASSEMBLY DETAIL FOR 11KV, 2500A SPB.
22.	BD11-283C-1286	22	03	DETAIL OF SUPPORTING STRUCTURE FOR 11KV, 2500A SPB.
23.	BD11-283C-1286	23	03	DETAIL OF SUPPORTING STRUCTURE FOR 11KV, 2500A SPB.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
04	AS BUILT DRAWING	18.12.12	MOHIT
03	DRAWING REVISED AS PER CUSTOMER COMMENTS ON DED.-17.12.12	17.12.12	ANAND
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01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE
ANAND	11.05.12
CHD.	ANAND
APPD.	V.PAL

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD.

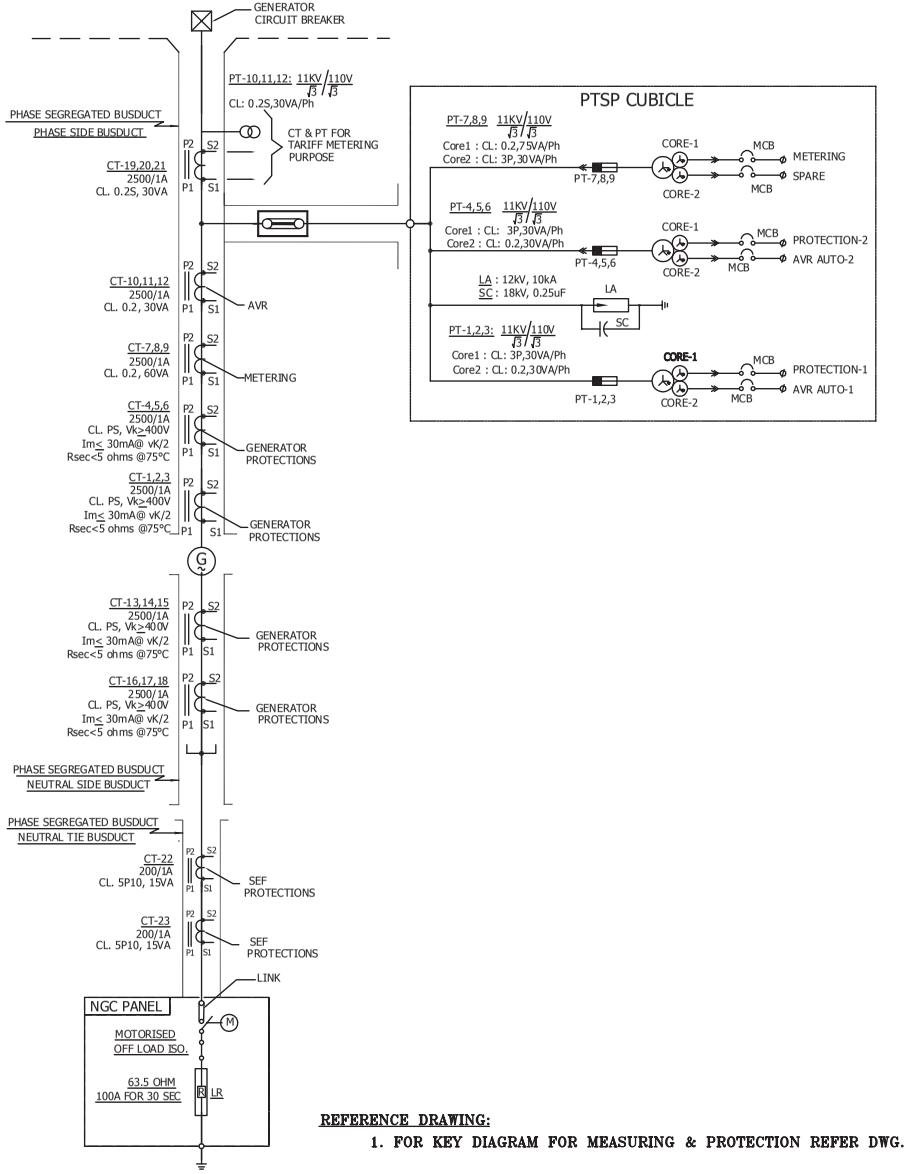
CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE:
LIST OF DRAWINGS 11 KV, 2500A SPB.

JOB NO.	BD11-283
SHEET NO.	02
DRG.NO.	BD11-283C-1286
REV. NO.	04



TECHNICAL PARTICULARS OF POTENTIAL TRANSFORMER

S.NO	PT REF.	RATIO & BURDEN	PURPOSE	CONNECTION	LOCATION
01	1,2,3	CORE-1: 11KV/√3 / 110V/√3, 3P, 30VA	PROTECTION-1	$Y_N Y_N$	PTSP CUBICLE
		CORE-2: 11KV/√3 / 110V/√3, 0.2, 30VA	AVR AUTO-1		
02	4,5,6	CORE-1: 11KV/√3 / 110V/√3, 3P, 30VA	PROTECTION-2	$Y_N Y_N$	PTSP CUBICLE
		CORE-2: 11KV/√3 / 110V/√3, 0.2, 30VA	AVR AUTO-2		
03	7,8,9	CORE-1: 11KV/√3 / 110V/√3, 0.2, 75VA	METERING	$Y_N Y_N$	PTSP CUBICLE
		CORE-2: 11KV/√3 / 110V/√3, 3P, 30VA	SPARE		
04	10,11,12	11KV/√3 / 110V/√3, 0.2S, 30VA	TERIFF METERING	$Y_N Y_N$	BUSDUCT

TECHNICAL PARTICULARS OF CURRENT TRANSFORMER

PHASE SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
1,2,3 4,5,6	2500/1A	PS	-----	GEN. PROTECTIONS RELAYS	PHASE SIDE SPB
7,8,9	2500/1A	0.2	60VA	METERING	PHASE SIDE SPB
10,11,12	2500/1A	0.2	30VA	AVR	PHASE SIDE SPB
NEUTRAL SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
13,14,15, 16,17,18	2500/1A	PS	-----	GEN. PROTECTIONS RELAYS	NEU SIDE SPB
NEUTRAL TIE BUSDUCT SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
22,23	200/1A	5P10	15 VA	SEF PROTECTIONS	NEU TIE BUSDUCT
FOR TVM					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
19,20,21	2500/1A	0.2S	30 VA	TARIFF METERING	TVM

FOR PS CLASS CTs:- 1 TO 6 & 13 TO 18
Vk>=400V, Im<=30mA AT Vk/2
Rsec=< 5 OHMS AT 75 DEG. C

REFERENCE DRAWING:

1. FOR KEY DIAGRAM FOR MEASURING & PROTECTION REFER DWG. NO. 1-561-01-31498, REV-04.

AS BUILT DRAWING

REV.NO	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	MOHIT
02	DRAWING REVISED AS PER CUSTOMER COMMENTS ON DED.-17.12.12	17.12.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: SINGLE LINE DIAGRAM FOR 11KV, 2500A SPB.

JOB NO.	BD11-283
SHEET NO.	03
DRG.NO.	BD11-283C-1286
REV. NO.	03

TECHNICAL DATA SHEET

TYPE OF BUSDUCT..... : SEGREGATED PHASE BUSDUCT
RATED VOLTAGE..... : 11KV
RATED CONTINIOUS CURRENT (MAIN)..... : 2500A
RATED HIGHEST SYSTEM VOLTAGE..... : 12KV
AMBIENT TEMP..... : 50°C
MAX. BUSBAR TEMPERATURE..... : 90°C
MAX. ENCLOSURE TEMPERATURE..... : 70°C
RATED CONTINIOUS CURRENT (TIE DUCT).... : 250 A
FREQUENCY..... : 50 Hz
NO OF PHASE..... : 3 POLE
FAULT CURRENT AND DURATION..... : 40 KA rms SYM. FOR 3 SECONDS, 102 KA PEAK
ENCLOSURE SIZE & MATERIAL..... : 1380X400X3 THK. Al ALLOY
BARRIER MATERIAL AND SIZE..... : 3 THK. AL ALLOY
BUSBAR SIZE AND MATERIAL PHASE.... : 2 Nos. 101.6X41.83X6.68 THK. Al ALLOY CHANNEL
BUSBAR JOINTS ..... : PLAIN WITH NO-OXIDE GREASE.
TYPE OF INSULATOR ..... : PORCELAIN
BASIC INSULATION LEVEL:
(a. ONE MINUTE POWER FREQUENCY..... : 28 KV RMS/ 10KV RMS.
(b. IMPULSE WITHSTAND VOLTAGE..... : 75 KV PEAK/ 60KV PEAK
GROUND BUS..... : 2-50X10 THK. AL
PAINTING-
ENCLOSURE INTERIOR & BUSBAR..... : MATT BLACK
ENCLOSURE EXTERIOR..... : EPOXY SPRAY PAINT OF SHADE RAL-7032.
DEGREE OF PROTECTION..... : IP:55
APPLICABLE STANDARD..... : IS: 8084

ELECTRICAL CLEARENCE-
PHASE TO PHASE..... : 127 mm
PHASE TO EARTH..... : 100 mm

CURRENT TRANSFORMERT-

1. MAKE..... : INSTARNS/KAPPA/KALPA/PRAGATI/AE/ECS
2. TYPE..... : EPOXY CAST, RING TYPE DRY TYPE. (PADESTAL MOUNTING)
3. REFERENCE STANDARD..... : IS - 2705 / IEC-60044-1
4. VOLTAGE CLASS..... : 12KV FOR CT - 1 TO 18, 19, 20, 21,24, 25, 26
   250A FOR CT - 22 & 23
5. INSULATION CLASS..... : B'
6. TEMP. RISE OVER AN AMBIENT..... : AS PER INSULATION CLASS B'
   AT RATED PRIMARY CURRENT
7. MOMENTRY RATING..... : 102 KAP FOR CT-1 TO 18, 19, 20, 21, 22, 23, 24, 25, 26
8. SHORT CIRCUIT RATING..... : 40KA FOR 3 SEC FOR CT-1 TO 18, 19, 20, 21, 24, 25, 26
   25KA FOR 1 SEC FOR CT-22 & 23
9. ONE MINUTE POWER FREQUENCY..... : 28KV (RMS) FOR CT-1 TO 18, 19, 20, 21, 24, 25, 26
   WITHSTAND VOLTAGE 3KV (RMS) FOR CT-22 & 23
10. IMPULSE WITHSTAND VOLTAGE..... : 75KV (PEAK) FOR CT-1 TO 18, 19, 20, 21, 22, 23, 24, 25, 26
11. NO OF PHASES..... : SINGLE
12. RATED FREQUENCY..... : 50 Hz

POTENTIAL TRANSFORMER-

1. MAKE..... : INSTARNS/KAPPA/KALPA/PRAGATI/AE/ECS
2. TYPE..... : INDOOR, DRY TYPE, SINGLE PHASE EPOXY CAST
3. REFERENCE STANDARD..... : IS - 3156 / IEC-60044-2
4. INSULATION CLASS..... : B'
5. OVER VOLTAGE FACTOR
   i) CONTINUOUS..... : 1.2
   ii) 30 SECOND..... : 1.9
6. MAX. TEMP. RISE ABOVE 50°C AMBIENT : AS PER INSULATION CLASS B'
7. WINDING CONNECTION PRIMARY/SECONDARY : STAR WITH GROUNDED
8. INSULATION LEVEL..... : 12:28:75KV
9. WINDING CONNECTION PRIMARY/SECONDARY : STAR WITH GROUNDED
10. RATED SHORT TIME CURRENT..... : 40KA FOR 3 SEC
11. RATED FREQUENCY..... : 50 Hz

LIGHTNING ARRESTOR-

1. NAME OF MANUFACTURER..... : IGE/ELPRO
2. TYPE..... : METAL OXIDE, STATION CLASS HERMTICALLY SEALED (GAPLESS)
3. SERVICE..... : INDOOR
4. REFERENCE STANDARD..... : IS-3070/IEC-99.4
5. RATED VOLTAGE..... : 12KV
6. NOMINAL DISCHARGE CURRENT..... : 10KA
7. POWER FREQUENCY WITHSTAND VOLTAGE.. : 35KV FOR 1 MIN FOR CASING
8. QUANTITY..... : 03 NOS.

SURGE CAPACITOR-

1. NAME OF MANUFACTURER..... : MADHAV CAPACITORS/WS INSULATORS/PRAGATI/POWERGEAR
2. TYPE..... : OIL TYPE
3. REFERENCE STANDARD..... : IS-11548
4. RATED VOLTAGE..... : 18KV
5. RATED FREQUENCY..... : 50Hz
6. RATED CAPACITANCE..... : 0.25 MICRO FARADS
7. POWER FREQUENCY WITHSTAND VOLTAGE.. : 35 KV
8. IMPULSE W/S VOLTAGE..... : 75 KV (PEAK)
9. QUANTITY..... : 03 NOS.

LOADING RESISTOR-

1. NAME OF MANUFACTURER..... : BHARTI INDUSTRIES/RESITECH/RSI/SR NARKHEDE Engg./LAKSHMAN ELEC.
2. TYPE..... : PUNCHED STAINLESS STEEL/ GRID TYPE
3. REFERANCE STANDARD..... : IEEE : 32
4. VOLTAGE LEVELO..... : 12 KV
5. CURRENT RATING..... : 100A FOR 30 SEC
6. CONTINOUOS CURRENT RATING..... : 15A
7. RESISTANCE VALUE..... : 63.5 OHMS
8. AMBIENT TEMPRETURE..... : 50°C
9. SERVICE CONDITION..... : INDOOR/NATURAL AIR COOLED
10. MAX. TEMP. RISE WITH 30 SEC..... : 300°C CURRENT RATING
11. QUANTITY..... : 01 NO.

ISOLATOR-

OFF LOAD & MOTORIZED ISOLATOR
100A, 2NO, 2NC, DREISHER PANICKAR/SIEMENS/NGEF/A- BOND

REFERENCE DRGS-

(M/s BHEL)

1. LAYOUT PLAN OF TURBO GENERATOR, DRG NO.-113912313224-REV-02.
2. KEY DIAGRAM FOR MEASURING & PROTECTION DRG NO.-15610131498-REV-04.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

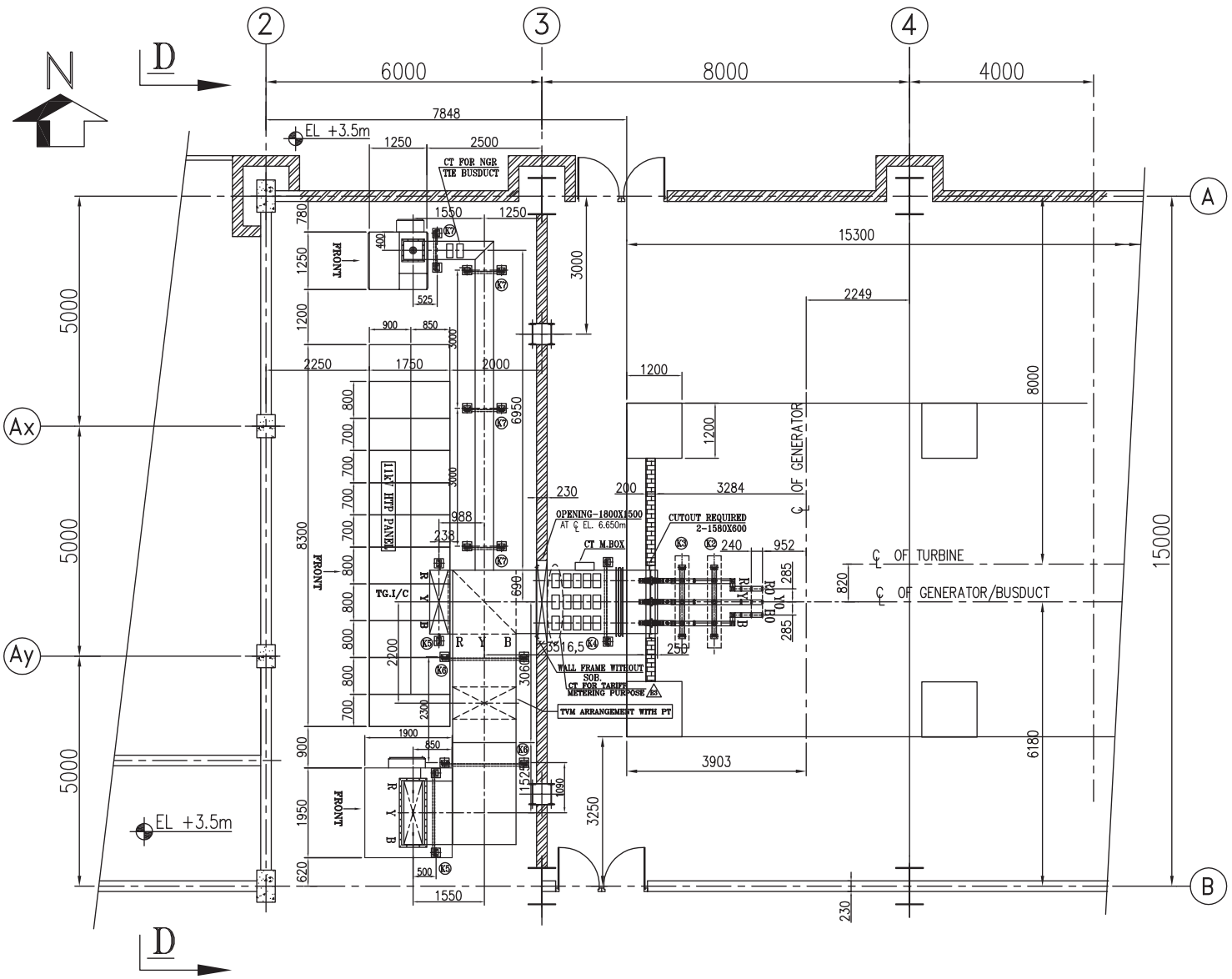
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: TECHNICAL DATA SHEET 11KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	04

DRG.NO.	REV. NO.
BD11-283C-1286	02



TG BUILDING OPERARTING FLOOR PLAN AT EL. +10.000m LEVEL

GEN. NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

PAINTTING:-

(i) ENCLOSURE INTERIOR – MATT BLACK

(ii) ENCLOSURE EXTERIOR – EPOXY SPRAY PAINT OF SHADE RAL-7032.

M/S BHARAT HEAVY ELECTRICALS LIMITED

1. BUSDUCT LAYOUT REFER DRG. NO.- 1-29179-900-0466 REV-04. (SHEET 1 OF 05)
2. MACHINERY ARRANGEMENT AND FOUNDATION (1-313-00-83235) SHEET NO. 1 TO 5,) REV. 05
3. TERMINAL ARRANGEMENT OF GENERATOR (1-135-08-31438/R1)

M/s SPACEAGE SWITCHGEARS LTD.

1. G.A. DRG. OF LAVT CUBICLE. BD11-283C-1286 REV-01.
2. G.A. DRG. OF NG CUBICLE. BD11-283C-1286 REV-01.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
04	AS BUILT DRAWING	18.12.12	MOHIT
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DRN.	ANAND
DATE	11.05.12
CHD.	ANAND
APPD.	V.PAL

CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

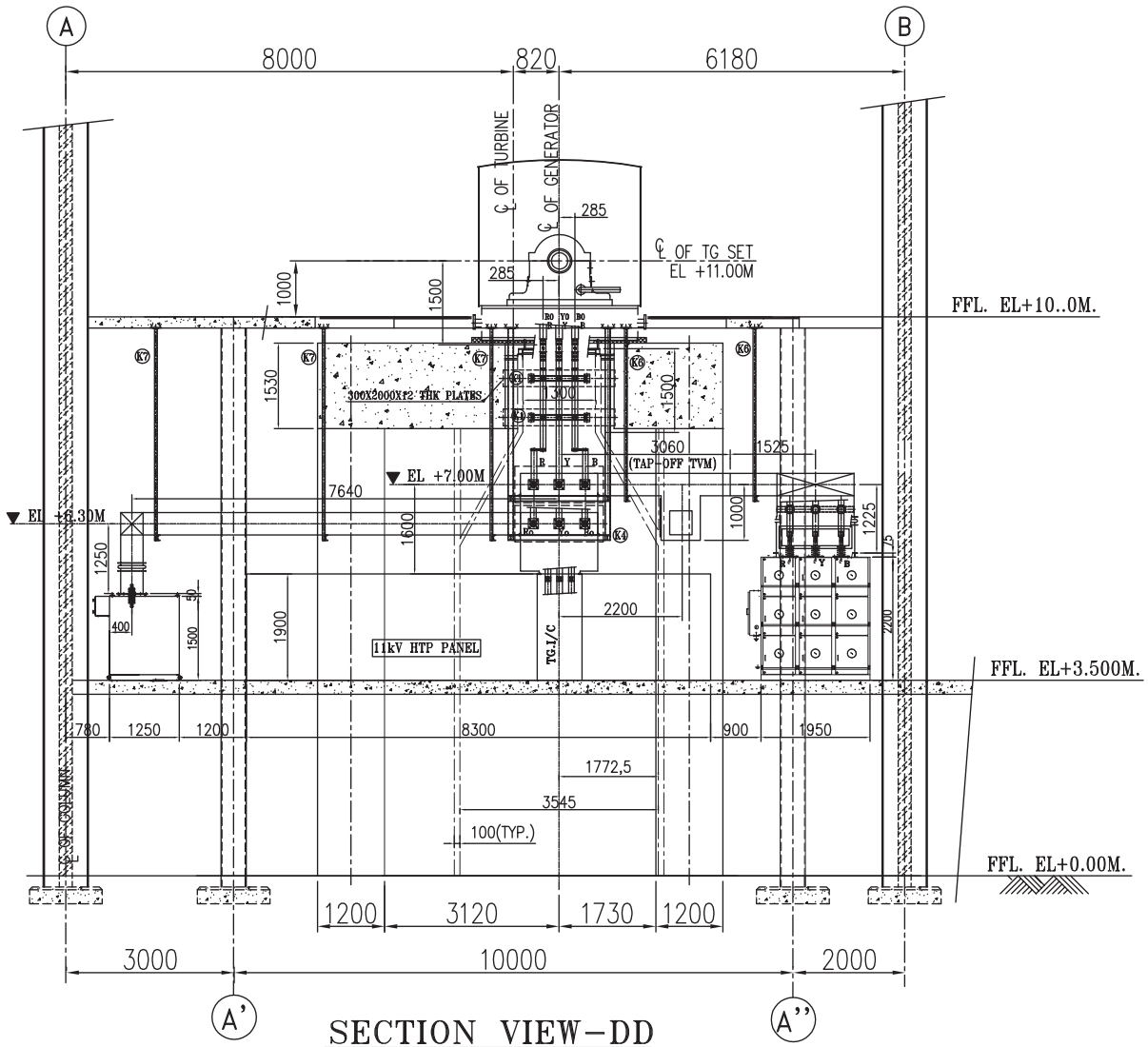
CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: LAYOUT DRAWING PLAN FOR 11KV,2500A SPB.

JOB NO.	BD11-283
SHEET NO.	05
DRG.NO.	BD11-283C-1286
REV. NO.	04



SECTION VIEW-DD

S.NO.	DESCRIPTION	QTY.
1.	OPEN BUSBAR(2-100X10) FOR 11kV, 2500A(11kV GRADE) WITH PVC SLEEVED	28.70M.
2.	11kV, 2500A SPB SUITABLE FOR 40kA FOR 3SEC. ON PHASE SIDE FROM GEN. TO BREAKER PANEL	6.355M.
3a.	11kV, 250A, SUITABLE FOR 40kA FOR 3SEC. TAP-OFF BUSDUCT FOR PTSP CUBICLE.	4.30M.
3b.	11kV, 250A, SUITABLE FOR 40kA FOR 3SEC. TAP-OFF BUSDUCT FOR TVM ARRAGEMENT.	4.06M.
4.	90 DEG. BEND (HORIZ./VERTICAL) FOR PHASE SIDE	7NOS.
5.	11kV, 2500A SPB SUITABLE FOR 40kA FOR 3SEC. ON NEUTRAL SIDE FROM GEN. N. TO NG CUBICLE.	4.446M.
6.	90 DEG. BEND (HORIZ./VERTICAL) FOR NEUTRAL SIDE	3NOS.
7.	11kV, 250A SINGLE PHASE TAP-OFF BUSDUCT FOR CONNECTION TO NG ON NEUTRAL SIDE	9.76M.
8.	SEAL OF BUSHING AT PTSP CUBICLE, NG CUBICLE TOP	3+1=4NOS.
9.	WALL FRAME ASSEMBLY WITH 03NOS. SEAL OF BUSHING AT GEN. WALL PHASE AND NAUTRAL SIDE	03+03=6NOS.
10.	CT'S AS PER WIRING DIAGRAM SHT#3&4	20 NOS
11.	LAPT CUBICLE AS PER SPEC.	1NO.
12.	LIGHTNING ARRESTORS HOUSED IN LAPT CUBICLE	3NOS.
13.	SURGE CAPACITORS HOUSED IN LAPT CUBICLE	3NOS.
14.	NGE CUBICLE CONTAINING NGR ANGR CUBICLE SHALL BE PROVIDED WITH SUITABLE FLANGE FOR BUSDUCT TERMINATION.	1NO.
15.	NGR SHALL BE PROVIDED WITH OFF-LOAD MOTORIZED ISOLATOR	1NO.
16.	SUPPORT STEEL STRUCTURE (HOT DIP GALVANIZED)	1.212MT
17.	SILICA GEL BREATHERS	06 NOS.
18.	COPPER FLEXIBLES AS REQUIRED AT GENERATOR TERMINALS, & SEAL-OFF BUSHING AT GEN. FOR LINE SIDE BUSDUCT & NEU. SIDE BUSDUCT, PTSP CUBICLE,NG CUBICLE & BREAKER END	4+1+1+1=7SETS
19.	Cu. FLEXIBLES AT GEN. AIR DUCT WALL PHASE & NEUTRAL SIED.	1+1 SETS
20.	HARDWARE FOR BUSBAR Cadmiun Zn PLATED & FOR ENCLOSURE ETC. MS Zn PLATED	AS REQUIRED
21.	EPDM EXPANSION BELLOW AT GEN. PHASE & NEUTRAL	2NOS.
22.	EPDM EXPANSION BELLOW AT PTSP CUBICLE	1NO.
23.	EPDM EXPANSION BELLOW AT NG CUBICLE	1NO.
24.	EPDM EXPANSION BELLOW AT BREAKER	1NO.
25.	CABLE GLAND SUITABLE FOR 5CX2.5Sq.mm AND 10CX2,5Sq.mm CABLES	75+75=150NOS.
26.	SINGLE PHASE CT,s FOR TARIFF METERING	3NOS.
27.	SINGLE PHASE PT,s FOR TARIFF METERING	3NOS.
28.	SHORTING ARRANGEMENT ON PHASE SIDE	1NO.
29.	WALL FRAME ASSEMBLY WITHOUT SOB AT GT BUILDING	01NO.
30.	SPACE HEATHER MARSHALLING BOX.	3NOS.
31.	CT,s MARSHALLING BOX.	4NOS.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
04	AS BUILT DRAWING	18.12.12	MOHIT
03	DRAWING REVISED AS PER CUSTOMER COMMENTS ON DED.-17.12.12	17.12.12	ANAND
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.05.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

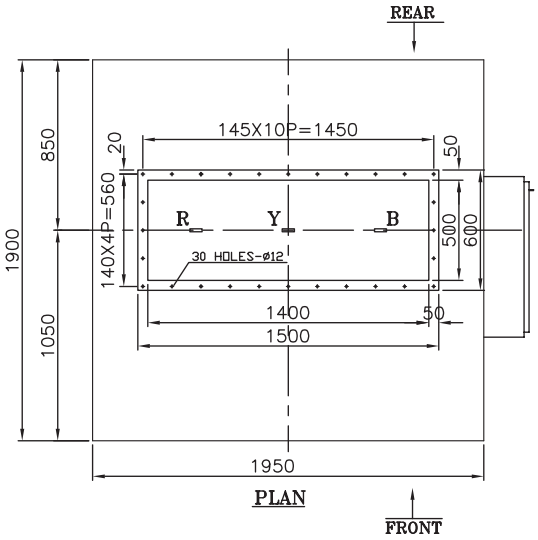
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.	JOB NO. BD11-283
ANAND	11.05.12		
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI	SHEET NO. 06
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA	DRG. NO. BD11-283C-1286 / REV. NO. 04

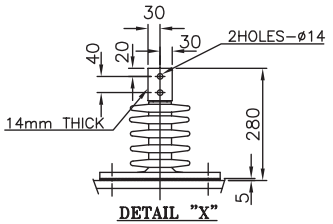
SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: LAYOUT DRAWING PLAN FOR 11KV,2500A SPB.

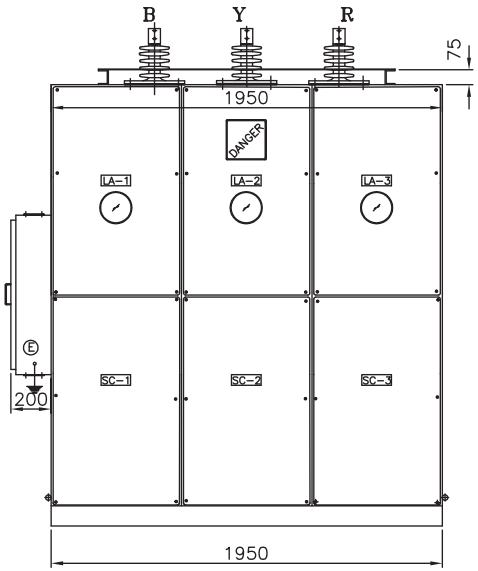
GEN. NOTE:-

1. EB:1 LA SC EARTH BUS.
2. EB:2 BODY AND PT EARTH BUS.
3. E-EARTH STUD M8x35 SHALL BE PROVIDED. ON THE LT MARSHALLING BOX.
4. ALL LA & SC IN INDIVLDUAL VERTICAL COMPARTMENT WILL BE INTER CONNECTED.
5. AND INTER CONNECTION OF LA & SC SHALL BE CONNECTED TO EB-1.

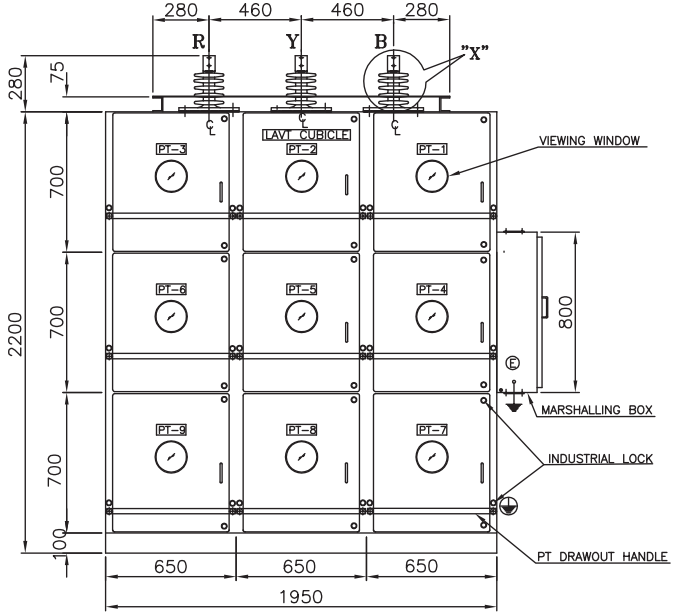




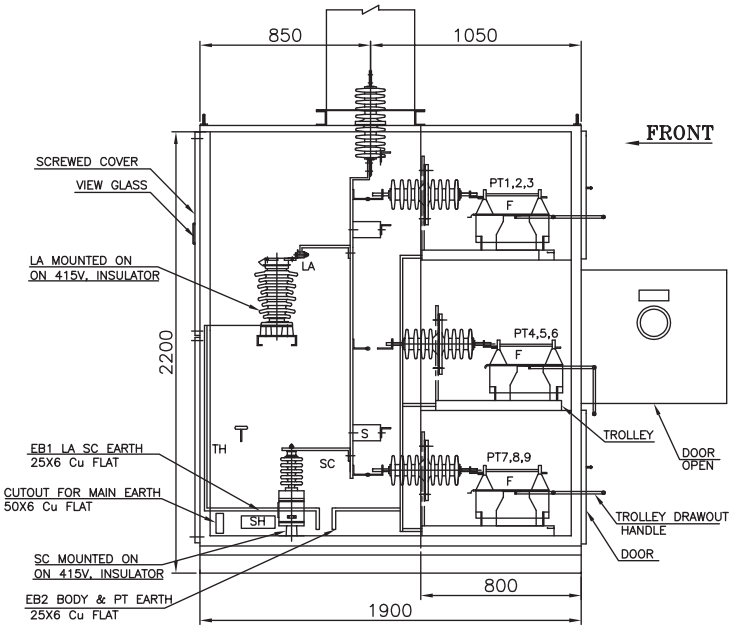
DETAIL "X"



REAR VIEW



ELEVATION
LOOKING FROM FRONT



VIEW-AA
(SIDE SHEET NOT SHOWN)

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE	
ANAND	11.05.12	
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

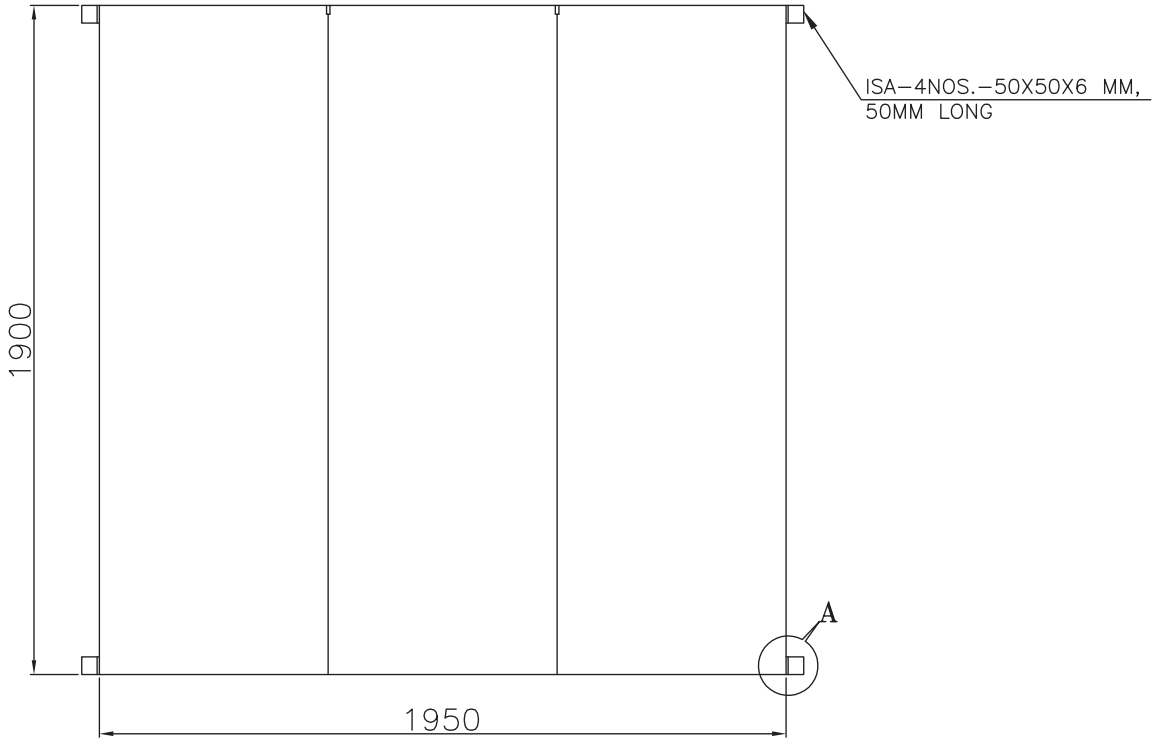
PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

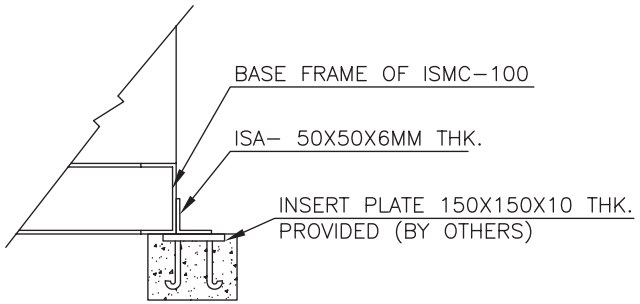
DRG. TITLE:
GA OF PTSP CUBICLE FOR 11 KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	07

DRG.NO.	REV. NO.
BD11-283C-1286	02



FRONT
FOUNDATION PLAN



DETAIL–A

SL NO.	DESCRIPTION	QTY.	MAKE/MATERIAL
PT1,2,3	POTENTIAL TRANSFORMER WITH FUSE, 11KV (AS PER SHEET#3&4)	3NOS.	(REFER SHEET#4)
PT4,5,6	POTENTIAL TRANSFORMER WITH FUSE, 11KV (AS PER SHEET#3&4)	3NOS.	(REFER SHEET#4)
PT7,8,9	POTENTIAL TRANSFORMER WITH FUSE, 11KV (AS PER SHEET#3&4)	3NOS.	(REFER SHEET#4)
10	METAL OXIDE LIGHTING ARRESTOR (AS PER SHEET#3&4)	3NOS.	(REFER SHEET#4)
11	SURGE CAPACITOR (AS PER SHEET#3&4)	3NOS.	(REFER SHEET#4)
12	EPOXY SEAL OFF BUSHING, 11KV (TYPE–I)	3+9=12 NOS.	EPOXY (A. BOND)
13	SUPPORT INSULATOR	6NOS.	EPOXY (BBI/PGI)
14	MAIN BUSBAR (1–50X10THK. Cu)	AS REQUIRED	Cu
15	PT/LA/SC EARTH BUS & LA/SC CONNECTORS (1–25X6THK. Cu)	AS REQUIRED	Cu
16	PT TAPPING BUSBAR (1–50X6THK. Cu)	AS REQUIRED	Cu
17	MARSHALLING BOX MS CRCA SHEET (FOR LAVT CUBICLE)	3NOS.	SSL
18	CFL	9NOS.	CGL/BAJAJ
19	SPACE HEATER, 80W, 230V AC.	3NOS.	REPUTED
20	THERMOSTAT, RANGE : 30–90° C	3NOS.	ANCO
21	3 PIN SOCKET WITH SWITCH RATING : 230VAC AC,15A	1NO	ANCHOR
22	EARTH TERMINAL M8X50+2N+4PW+2SW	4 SETS	MS GALV

NOTES:–

1. WIRING WILL BE DONE WITH (2.5mm SQ)PVC INSULATED 650/1100V GARDE COPPER WIRES.
2. WEIGHT OF PTSP CUBICLE IS 1500 KG. APPROX.
3. V.T. DOOR AND MARSHELLING BOX PROVIDED WITH LOCKS & KEYS.
4. IN DISCONNECTED POSITION THE VT PRIMARY AND SECONDARYCIRCUIT SHALL BE AUTOMATICALY DISCONNECTED AND THE PRIMARY FUSES SHALL BE VISIBLY GROUNDED. THE DRAW-OUT FRAME SHALL BE GROUNDED AT ALL TIMES.
5. BOLTED TYPE CABLE AL GLAND PLATE 6MM THK. WITH GASKET SHALL BE PROVIDED AT BOTTOM OF M.B.
6. DEGREE OF PROTECTION I.P. 54.
7. THE DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST FOR LAVT CUBICLE SHALL BE 28KV AC RMS FOR 1MIN.
8. ALL PTs SHALL BE DRAW-OUT TYPE.
9. DESIGN AMBIENT TEMPERATUR OF PANEL IS 50°C.
10. MESH IS PROVIDED AT REAR OF LAPT CHAMBER.
11. DANGER PLATE PROVIDING IN LAPT PANEL IS SHEET STEEL.
12. VT SHALL BE CAST RESIN TYPE & SUITABLE FOR DRAW OUT TYPE ARRANGMENT
13. ALL EQUIPMENT EARTH BUSBAR SHALL BE MATT BLACK EXCEPT AT CONTACT SURFACE TIN PLATED..
14. PAINTING:

ENCLOSURE: EXTERIOR: EPOXY SPRAY PAINT OF SHADE RAL-7032.
INTERIOR: GLOSSY WHITE

BUSBAR: BLACK PAINTED WITH R,Y&B COLOUR IDENTIFICATION IF REQUIRED.

15. 11KV CLEARENCE
    PHASE TO PHASE: 130MM
    PHASE TO EARTH: 120MM
16. SYSTEM FAULT LEVEL: 40kA FOR 3 SEC.
17. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
01	AS BUILT DRAWING	18.12.12	MOHIT

DRN.	DATE	
ANAND	11.05.12	
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

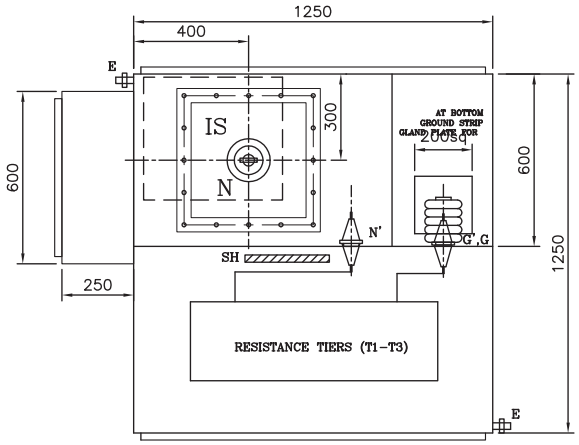
CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

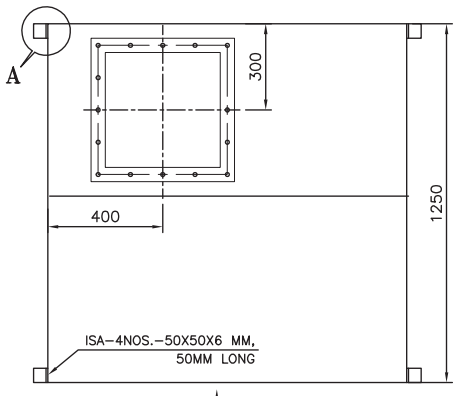
SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE:
FOUNDATION DETAIL OF PTSP CUBICLE FOR 11 KV, 2500A SPB.

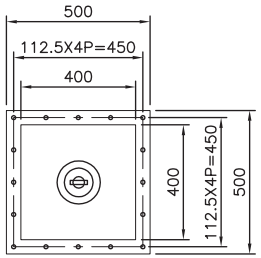
JOB NO.	BD11-283
SHEET NO.	08
DRG.NO.	BD11-283C-1286
REV. NO.	01



PLAN

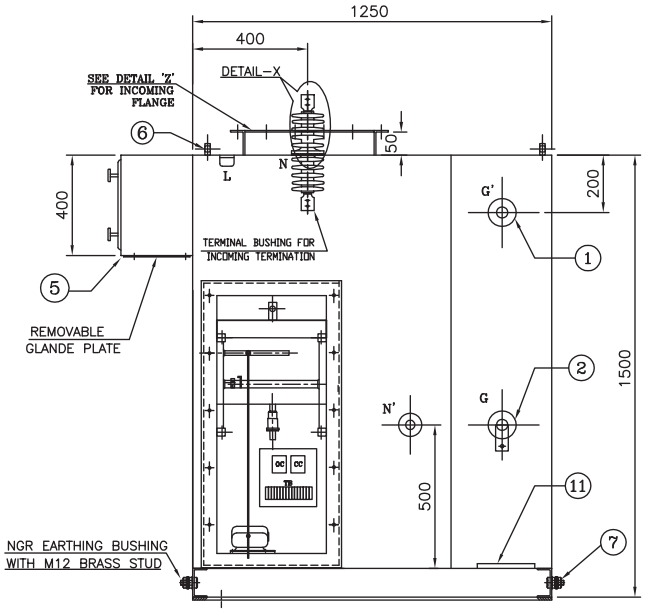


FRONT FOUNDATION PLAN

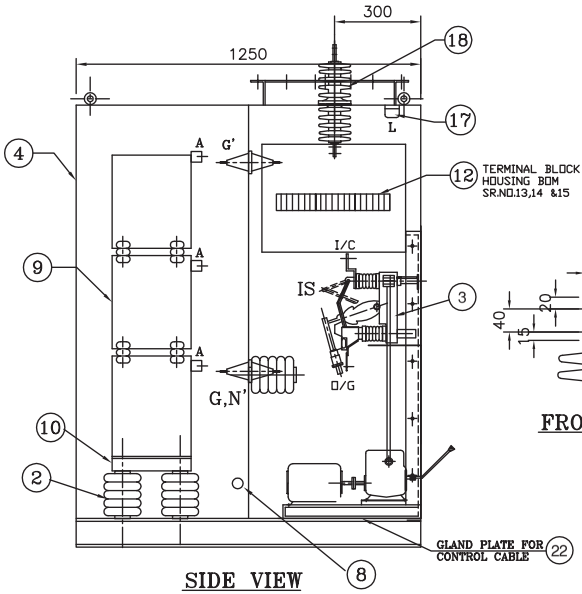


FLANGE DETAIL

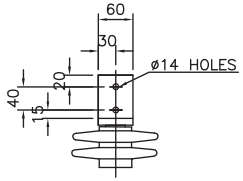
S.NO.	DESCRIPTION	MAKE	SIZE/SPECIFICATION	MATERIAL	QTY.
22.	GLAND PLATE FOR CONTROL CABLE	--	3 mm THK.	ALUMINIUM	1
21.	INDICATION LAMP L1 / L2	KAYCEE/TEKNIC	230 V AC	-	2
20.	PUSH BUTTON PB1 / PB2	KAYCEE/TEKNIC	230 V AC	-	2
19.	NGR LOCAL / REMOTE SELECTOR SWITCH	L & T	230 V AC	-	1
18.	EPOXY SEALING OF BUSHING	BBI	11KV	EPOXY	1
17.	FLOURSCENT TUBE (L)	CROMPTON	20W	-	1
16.	THERMOSTAT (TH)	EXPO	20-50°C	-	1
15.	HRC FUSE	E.E.	4A RATED FUSE + LINK	-	3
14.	SINGLE POLE TOGGLE SWITCH (SPTS)	KAYCEE	5A RATED	-	3
13.	DOUBLE POLE TOGGLE SWITCH (DPTS)	KAYCEE	10A RATED	-	1
12.	LT TERMINALS	ELMEX/PHOENIX	SUITABLE FOR 4 sq.mm CU. WIRE	-	18
11.	GLAND PLATE FOR GROUND STRIP	--	3 mm THK.	SRBP	1
10.	STACK MTG. FRAME	RSI	50x50x6 ISA	MS	1
9.	RESISTANCE TIER (T1 TO T3)	RSI	SUITABLE FOR 375°C TEMP.RISE MAX.	ASTM-A240-304	3
8.	SPACE HEATER	REPUTED	230V, 80W	-	1
7.	EARTHING BOLT	--	M10x40	BRASS	2
6.	LIFTING EYE BOLT	--	M12	MS	4
5.	LT CONTROL BOX	--	3MM THK. CRCA SHEET	MS	1
4.	SIDE COVER	--	3MM THK. CRCA SHEET	MS	-
3.	OFF-LOAD MOTORISED ISOLATOR	A.BOND	12KV,100A, 2NO+2NC	-	1
2.	INDOOR INSULATOR (INCLUDING G,N)	CJI/JSI/JP	12 KV	PORCELAIN	5
1.	INDOOR THROUGH BUSHING (G',N')	CJI/JSI/JP	12 KV	PORCELAIN	2



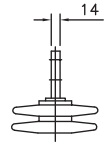
ELEVATION
(LOOKING FROM FRONT VIEW)



SIDE VIEW

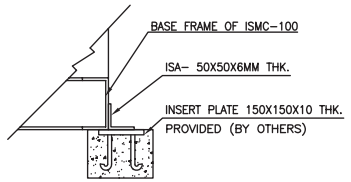


FRONT VIEW



SIDE VIEW

DETAIL-X



DETAIL-A

NOTES:-

1. WIRING WILL BE DONE WITH (2.5mm SQ)PVC INSULATED 650/1100V GARDE COPPER WIRES.
2. WEIGHT OF EACH CUBICLE 900 KG. APPROX.
3. BOLTED TYPE CABLE AL GLAND PLATE 5MM THK. WITH GASKET SHALL BE PROVIDED AT BOTTOM OF M.B.
4. DEGREE OF PROTECTION I.P. 33.
5. THE DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST FOR NGR CUBICLE SHALL BE 28KV AC RMS FOR 1MIN. EXCEPT NGR
6. DANGER PLATE PROVIDING IN NGR PANEL IS SHEET STEEL.
7. ALL EQUIPMENT EARTH BUSBAR SHALL BE MATT BLACK EXCEPT AT CONTACT SURFACE TIN PLATED..
8. PAINTING:
   ENCLOSURE: EXTERIOR:EPOXY SPRAY PAINT OF SHADE RAL-7032.
   INTERIOR: GLOSSY WHITE
   BUSBAR: MATT BLACK PAINTED WITH R,Y&B COLOUR IDENTIFICATION IF REQUIRED.
9. 11KV CLEARENCE
   PHASE TO PHASE: 130MM
   PHASE TO EARTH: 120MM
10. SYSTEM FAULT LEVEL: 40kA FOR 3 SEC.
11. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
12. ALL BOLTS & NUTS SHALL BE ZINC PASSIVATED.
13. LT TERMINALS SHALL BE HOUSED INSIDE LT CONTROL BOX.
14. PANEL SHALL BE FRONT ACCESS DOOR.
15. MAIN BUSBAR-50X6 CU.
16. EARTH BUSBAR-25X6 CU.

MOTOR NAME PLATE DETAILS

MAKE :	CGL
FRAME :	B56/370W/1425 RPM
INSULATION :	CLASS B
RATING :	CONTINUOUS
VOLTAGE RATING :	160 - 240 V
AMP. RATING :	4 A
NO. OF PHASES :	1
FREQUENCY :	50 Hz
NO. :	----
AMBIENT :	50°C
RUN CAPACITOR :	80uF, 440 V
STD. :	BS 5000 PART II / IS 996

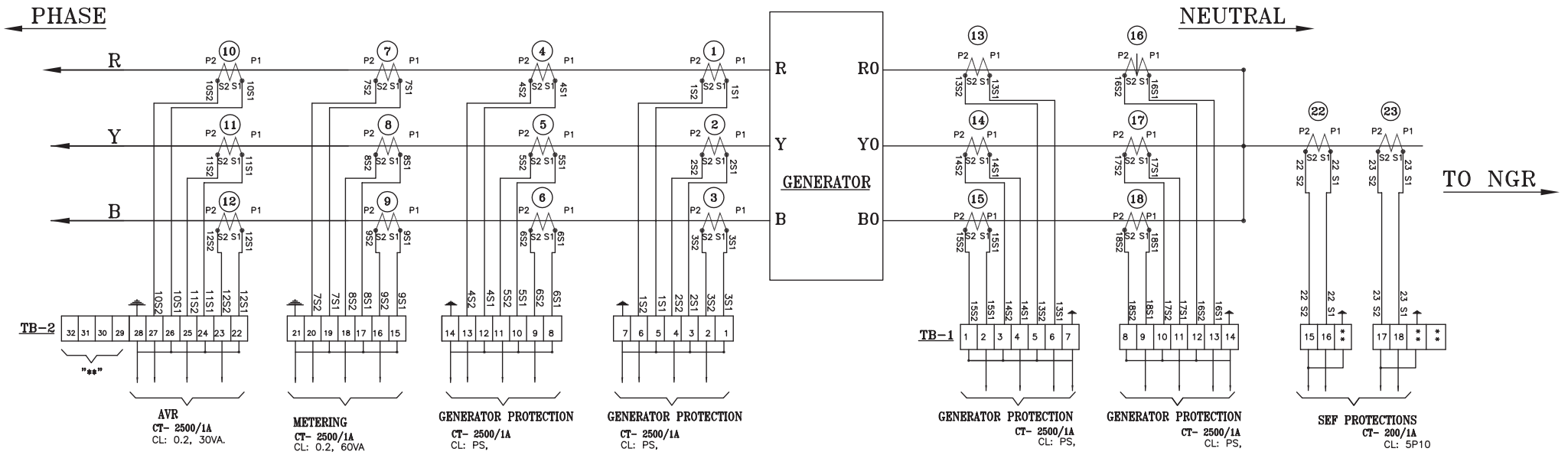
REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	MOHIT
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

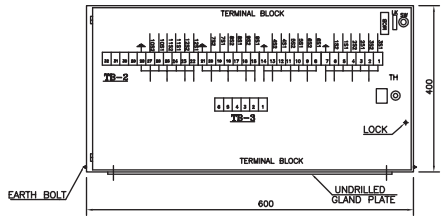
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

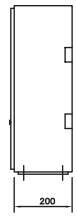
DRG. TITLE: GA DRAWING OF NGR CUBICLE FOR 11 KV, 2500A SPB.

JOB NO.	SHEET NO.	DRG.NO.	REV. NO.
BD11-283	09	BD11-283C-1286	03

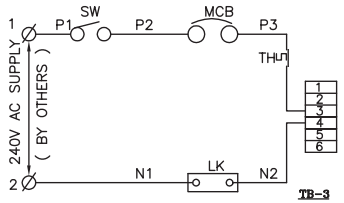




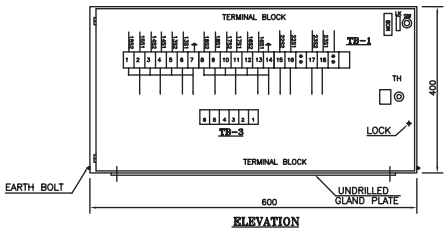
ELEVATION
MARSHALLING BOX FOR PHASE SIDE CTS



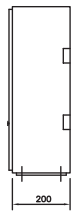
END VIEW



SPACE HEATER WIRING DIAGRAM



ELEVATION
MARSHALLING BOX FOR NEUTRAL SIDE CTS



END VIEW

NOTE:-

1. CT SECONDARY WIRING BETWEEN CT'S AND TERMINAL BOXES SHALL BE CARRIED OUT BY 2.5 mm, 650V GRADE STRANDED Cu. CABLE THROUGH PVC CONDUIT.
2. ALL TERMINAL BLOCKS ARE ELMAX MAKE AND SHALL BE PROVIDED WITH DISCONNECTING & SHORTING FACILITY FOR TESTING PURPOSES.
3. TERMINAL BLOCKS MARKED THUS ** ARE SPARES.

BILL OF MATERIAL

(FOR EQUIPMENTS INSIDE THE PHASE SIDE MARSHALLING BOX ONLY.)

REF.NO.	DESCRIPTION	MAKE	QTY./UNIT
MCB	MCB-6A,240V,SINGLE POLE	MDS/INDOKOPP	1 NO.
LK	LINK 15A, WITH BASE & CARRIER	HEMVIN	1 NO.
SW	SWITCH 10A, 240V SINGLE POLE	ANCHOR	1 NO.
SH	SPACE HEATER 60W, 240V AC	SSL	1 NO.
TH	THERMOSTAT 30°-110°C, 240V AC	ANCO	1 NO.
TB1	TERMINAL BLOCK 18 WAYS, 240V AC	ELMEX	1 SET
TB2	TERMINAL BLOCK 32 WAYS, 240V AC	ELMEX	1 SET
TB3	TERMINAL BLOCK 08 WAYS, 240V AC	ELMEX	1 SET

TECHNICAL PARTICULARS OF CURRENT TRANSFORMER FROM SHEET#3&4.

PHASE SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
1,2,3 4,5,6	2500/1A	PS	-----	GEN. PROTECTIONS RELAYS	PHASE SIDE SPB
7,8,9	2500/1A	0.2	60VA	METERING	PHASE SIDE SPB
10,11,12	2500/1A	0.2	30VA	AVR	PHASE SIDE SPB
NEUTRAL SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
13,14,15, 16,17,18	2500/1A	PS	-----	GEN. PROTECTIONS RELAYS	NEU SIDE SPB
NEUTRAL TIE BUSDUCT SIDE					
CT REF.	**RATIO**	**ACC. CL.**	**BURDEN**	**PURPOSE**	**LOC**
22,23	200/1A	5P10	15 VA	SEF PROTECTIONS	NEU TIE BUSDUCT

FOR PS CLASS CTs:- 1 TO 6 & 13 TO 18
Vk>=400V, Im<=30mA AT Vk/2
Rsec=< 5 OHMS AT 75 DEG. C

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	12.06.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

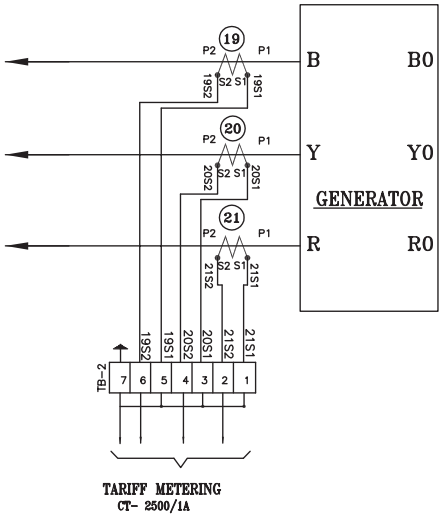
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

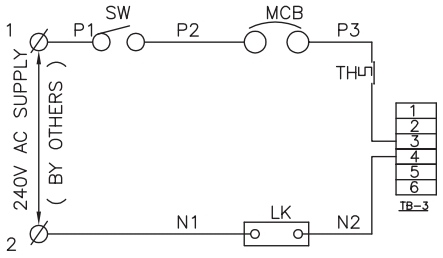
DRG. TITLE: CT WIRING DIAGRAM FOR 11 KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	10

DRG.NO.	REV. NO.
BD11-283C-1286	02



TARIFF METERING
CT- 2500/1A



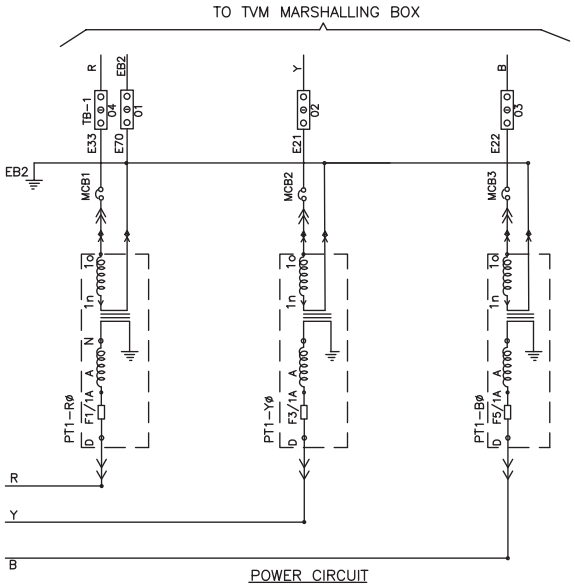
SPACE HEATER WIRING DIAGRAM

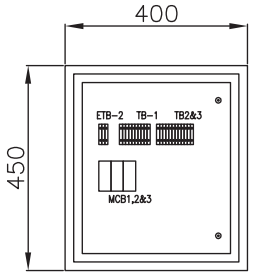
TECHNICAL PARTICULARS OF CURRENT TRANSFORMER

PHASE SIDE					
CT REF.	RATIO	BURDEN	ACC. CL.	PURPOSE	LOC
19,20,21 FROM SHT#3	2500/1A	30 VA	0.2S	TARIFF METERING	BUSDUCT

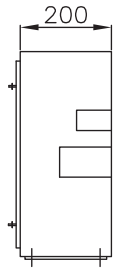
TECHNICAL PARTICULARS OF POTENTIAL TRANSFORMER

S.NO	PT REF.	RATIO & BURDEN	PURPOSE	CONNECTION	LOCATION
4 FORM SHT#03	10,11,12	$\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 0.2S, 30VA	TERIFF METERING	Y	BUSDUCT





ELEVATION
MB FOR CT&PT



SIDE VIEW

NOTE:-

1. THE CT WIRING COLOUR CODE SHAL BE RED, YELLOW, BLUE & BLACK 2.5 sqmm PVC CABLE.
2. THE PT WIRING COLOUR CODE SHAL BE RED, YELLOW, BLUE & BLACK 2.5 sqmm PVC CABLE.
3. MARSHALLING BOX-1 FOR CT & PT TO TVM. MARSHALLING BOX SHALL BE PROVIDED WITH SEALING FACILITY.
4. THE CT'S FOR TVM SHALL BE PROVIDED WITH SEALING FACILITY.
5. PT's ACCESS DOOR SHALL BE PROVIDED WITH SEALING FACILITY.

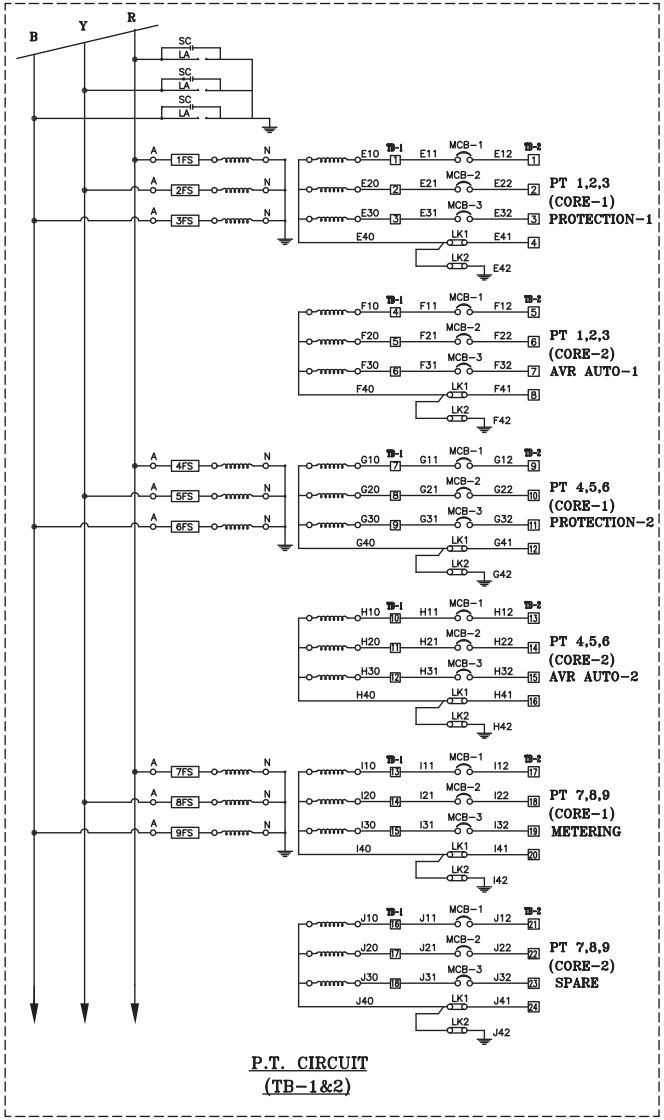
AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

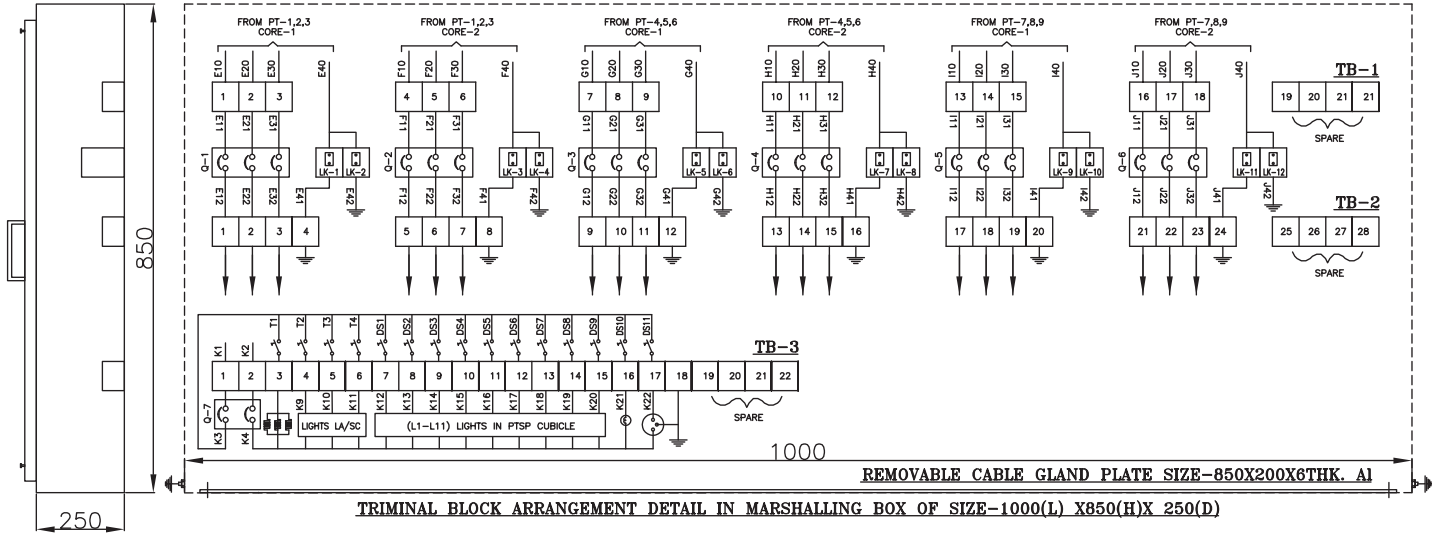
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.	JOB NO. BD11-283
ANAND	11.05.12		
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI	SHEET NO. 11
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA	DRG. TITLE: CT & PT WIRING DIAGRAM FOR TVM FOR 11 KV, 2500A SPB.

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG.NO.	REV. NO.
BD11-283C-1286	02

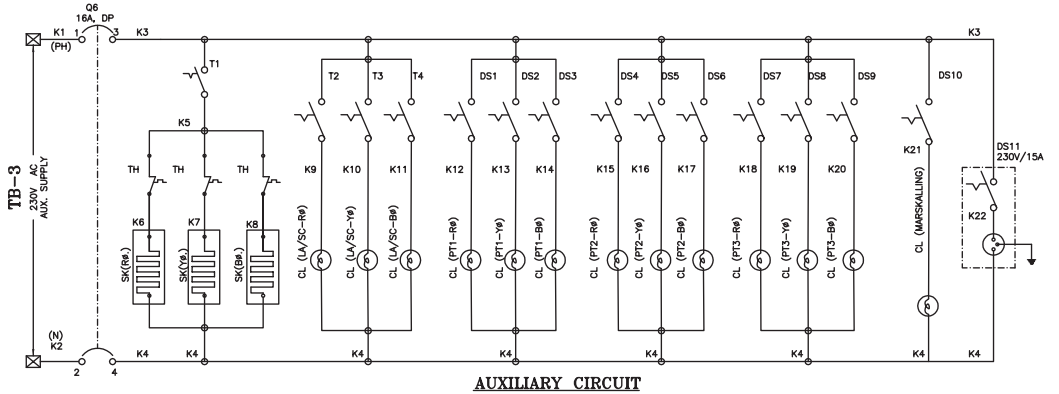


P.T. CIRCUIT
(TB-1&2)



REMOVABLE CABLE GLAND PLATE SIZE-850X200X6THK. Al

TRIMINAL BLOCK ARRANGEMENT DETAIL IN MARSHALLING BOX OF SIZE-1000(L) X850(H)X 250(D)



AUXILIARY CIRCUIT

TECHNICAL PARTICULARS OF POTENTIAL TRANSFORMER

S.NO	PT REF.	RATIO & BURDEN	PURPOSE	CONNECTION	LOCATION
01	1,2,3	CORE-1: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 3P, 30VA	PROTECTION-1		PTSP CUBICLE
		CORE-2: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 0.2, 30VA	AVR AUTO-1		
02	4,5,6	CORE-1: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 3P, 30VA	PROTECTION-2		PTSP CUBICLE
		CORE-2: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 0.2, 30VA	AVR AUTO-2		
03	7,8,9	CORE-1: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 0.2, 75VA	METERING		PTSP CUBICLE
		CORE-2: $\frac{11KV}{\sqrt{3}}/\frac{110V}{\sqrt{3}}$, 3P, 30VA	SPARE		

BILL OF MATEERIAL

SL NO.	DESCRIPTION	QTY.	MAKE
Q1-6 Q7	MINIATURE CIRCUIT BREAKER RATING: 6A, SP 16A,DP	06 NOS. 1 NO.	MDS/MG
DS1-10 DS11	DOOR SWITCH, 1 POLE, 5A POWER SWITCH, 1 POLE, 15A	10 NOS. 1 NO.	KAYCEE ANCHOR
T1-4	TOGGLE SWITCH, 1 POLE, 5A	4 NOS.	KAYCEE
TH	THERMOSTAT, RANGE : 30-90° C	3 NOS.	ANCO
SH	SPACE HEATER, 80W, 230V AC.	3 NOS.	REPOTED
SO	3 PIN SOCKET WITH SWITCH RATING : 230VAC AC,15A	1 NOS.	ANCHOR
CL	CFL WITH HOLDER , 18W, 230V AC	13 NOS.	PHILIPS
TB	TERMINAL BLOCK, STUD TYPE : CATD M4 (TB-1,2,3)	21+28+22 NOS.	ELMEX

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

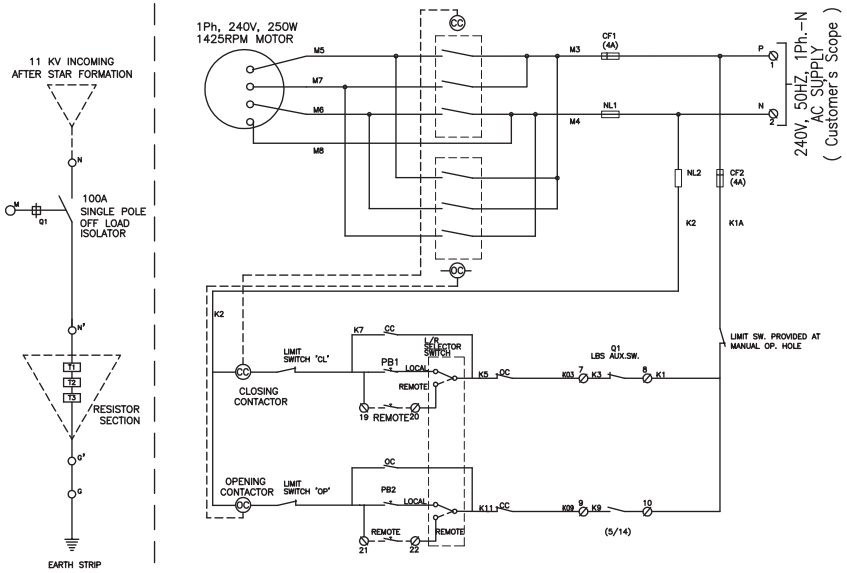
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.	JOB NO. BD11-283
ANAND	11.05.12		
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI	SHEET NO. 12
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA	

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

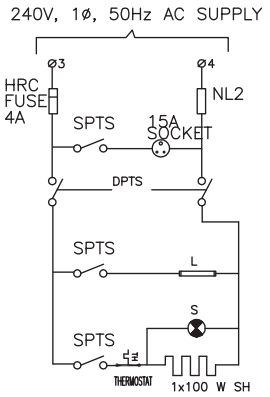
DRG. TITLE: PTSP CUBICLE WIRING DIAGRAM FOR 11 KV, 2500A SPB.

DRG.NO. BD11-283C-1286

REV. NO. 02

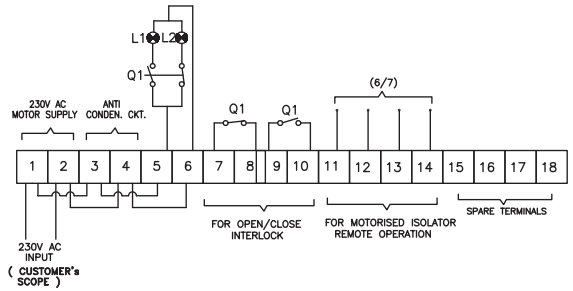


SCHEMATIC OF ISOLATOR

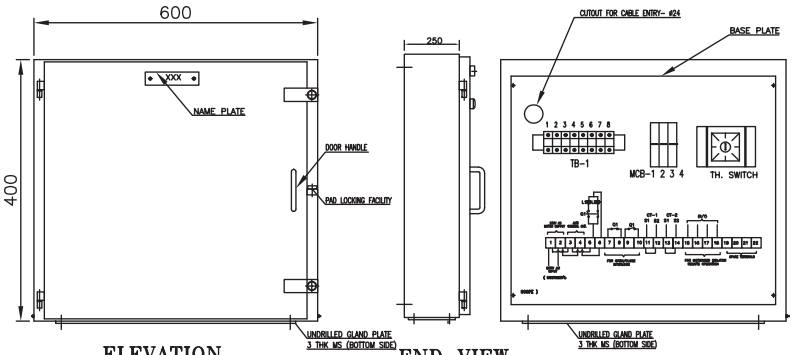


L – CUBICLE ILLUMINATION 20W FLOURESCENT TUBE
S – SPACE HEATER ON INDICATING LAMP

ANTI CONDENSATION CKT.

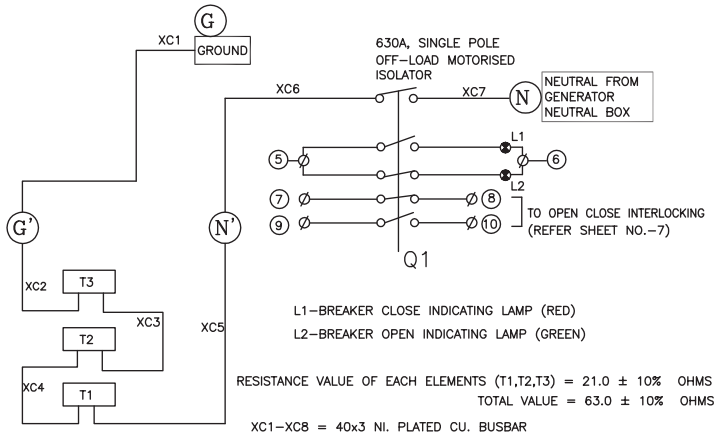


TERMINAL BLOCK ARRANGEMENT FOR NEUTRAL

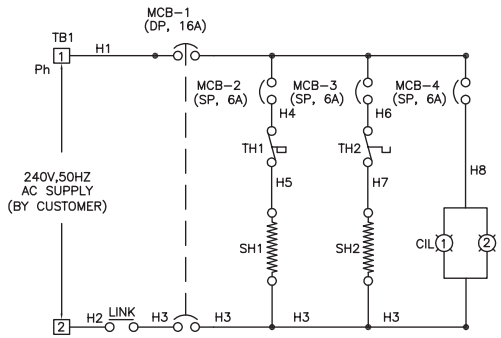


ELEVATION END VIEW (DOOR OPENED)

MARSHALLING BOX



SCHEMATIC / CONNECTION DIAGRAM
FOR NEUTRAL GROUNDING RESISTOR



SPACE HEATER & LAMP CIRCUIT
TB-1

BILL OF MATERIAL

AS BUILT DRAWING

S. NO.	REF.NO.	DESCRIPTION	QTY./UNIT	MAKE	TYPE
8	TB-1	TERMINAL BLOCK STUD TYPE	08+21 NOS.	ELMEX	CAT M4
7	MCB-2,3,4	MINIATURE CIRCUIT BREAKER 240V, AC, SP, 6A	3 NOS.	STANDARD/INDOKOPP	--
6	MCB-1	MINIATURE CIRCUIT BREAKER 240V, AC, DP, 16A	1 NO.	STANDARD/INDOKOPP	--
5	CFL	CFL 240V AC, 15W	2 NOS.	CGL/BAJAJ	--
4	TH	THERMOSTAT 30°-110°C, 240V AC	2 NOs.	ANCO	--
3	SH	SPACE HEATER	2 NOs.	REPUTED	--

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
01	AS BUILT DRAWING	18.12.12	MOHIT

DRN.	DATE	ANAND 13.05.12
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

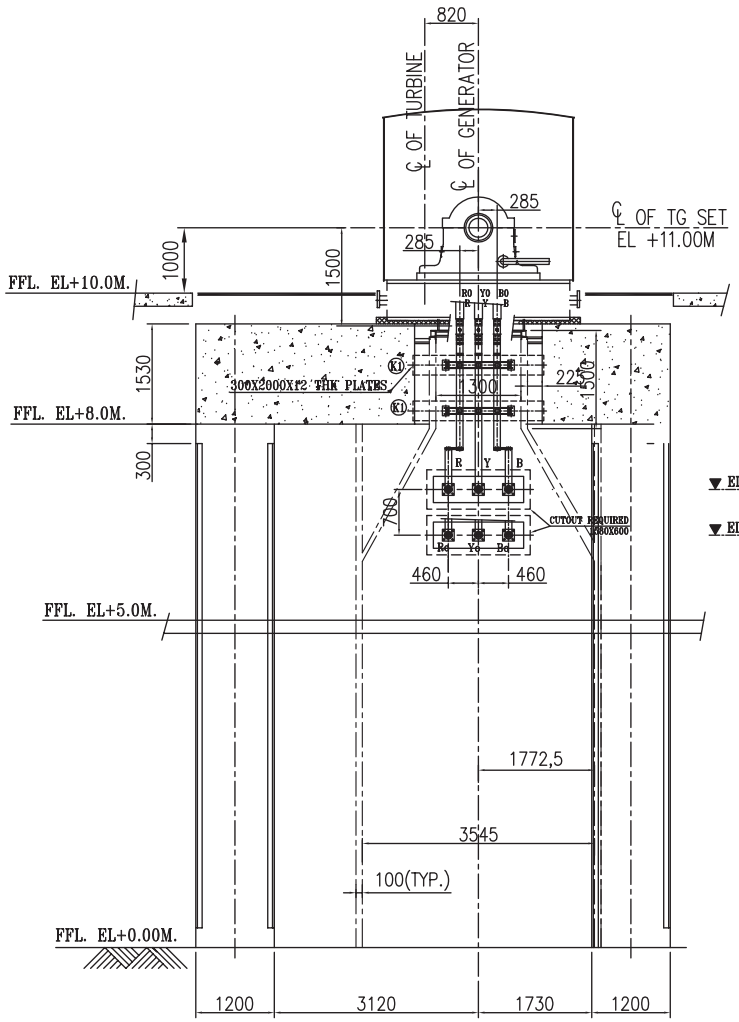
CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

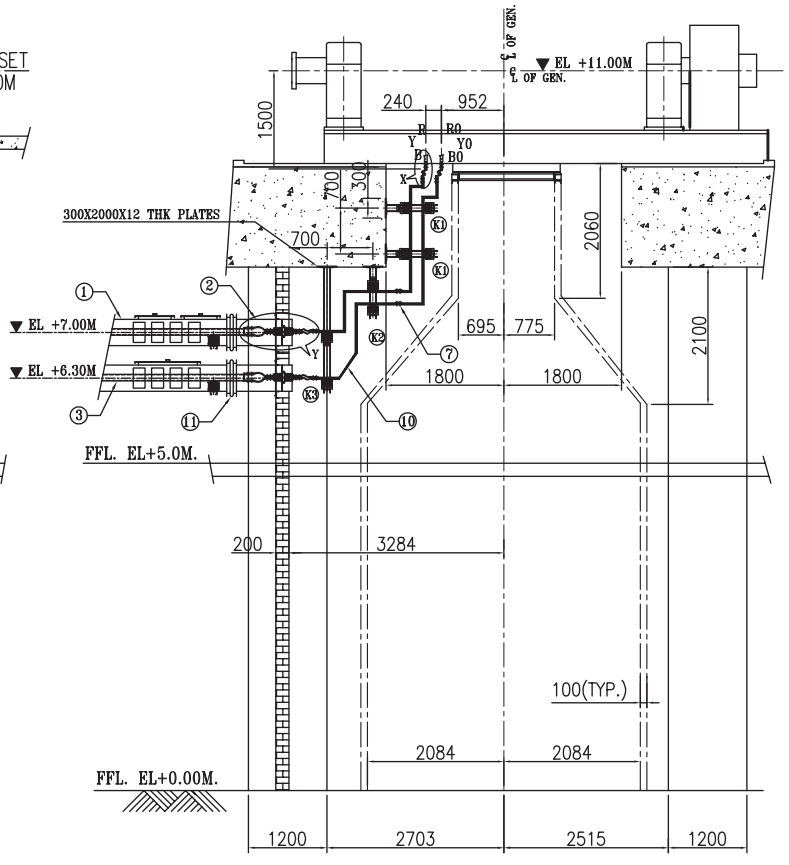
SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: WIRING DIAGRAM OF NGTR CUBICLE FOR 11 KV, 2500A SPB.

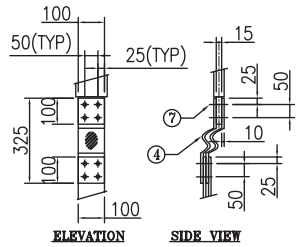
JOB NO.	SHEET NO.	DRG.NO.	REV. NO.
BD11-283	13	BD11-283C-1286	01



ELEVATION

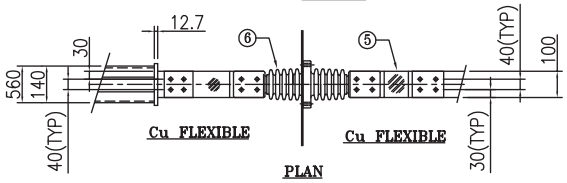


SIDE VIEW

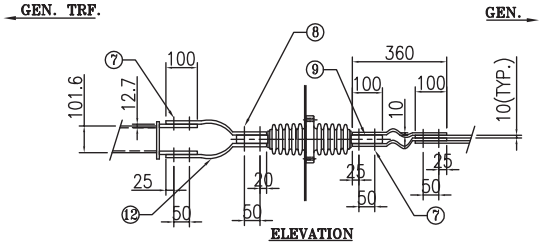


ELEVATION SIDE VIEW

Cu FLEXIBLE AT GEN TERMINAL DETAIL-X



PLAN



ELEVATION DETAIL-Y

BILL OF MATERIALS

SL.NO.	DESCRIPTION	MATERIAL	QTY.	REMARKS
13.	INSULATOR-150mm. HEIGHT	PORCELAIN	12+12NOS.	PH + N
12.	Cu. FLEXIBLE (100X12.5 THK.)	Cu.	06+06NOS.	PH + N
11.	RUBBER BELLOW	EPDM	01+01NO.	PH + N
10.	OPEN BUSBAR 2-100X10THK. WITH PVC SLEEVED	CU	28.70Mtrs.	06 PHASE
9.	BM STRIP 100X100	CU/AL	18+18NOS	PH + N
8.	BOLT M12X75+N+2PW+SW	Cad Zn PLATED	24 SETS	
7.	BOLT M12X65+N+2PW+SW	Cad Zn PLATED	168 SETS	
6.	EPOXY SOB	EPOXY	03+03NOS.	PH + N
5.	CU LAMINATED FLEXIBLE- 100X10THK.	COPPER	06+06NOS.	PH + N
4.	CU LAMINATED FLEXIBLE- 100X10THK.	COPPER	06+06NOS.	PH + N
3.	BUSBAR 2-101.6X41.83X6.68THK. CHANNEL IN BOX FORMATION	Al ALLOY	--	PH & N
2.	ADAPTOR BOX	Al	--	PH & N
1.	ENCLOSURE- 1380X400X3 THK.	Al	--	PH & N

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	ANAND
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	ANAND	DATE 11.05.12
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

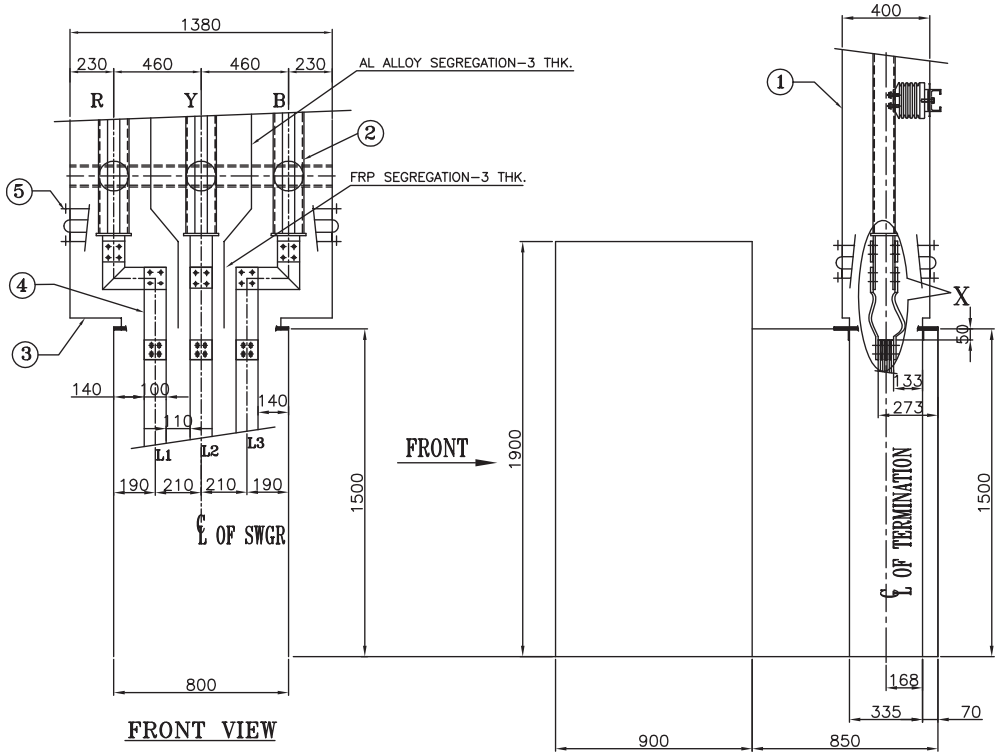
DRG. TITLE:
OPEN BUSBAR ARRANGEMENT AT GEN. PHASE & NEUTRAL FOR 11KV, 2500 SPB.

JOB NO.	SHEET NO.
BD11-283	14

DRG.NO.	REV. NO.
BD11-283C-1286	03

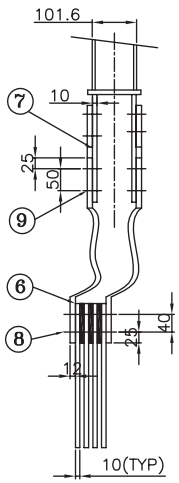
SL. NO.	DESCRIPTION	MATL.	QTY.	REMARKS
11.	SPACER;100X80X8 THK.	Al ALLOY	09 NOS.	
10.	BOLT M10X35+N+2PW+SW	MS GALVD.	12 NOS.	
9.	BOLT M12X50+N+2PW+SW	CAD Zn PLATED	24 NOS.	
8.	BOLT M12X120+N+2PW+SW	CAD Zn PLATED	12 NOS.	
7.	Al LINKS 101.6X12.7 THK.	Al ALLOY	------	
6.	BI-METALLIC STRIP (100X90X1THK.-18 NOS) (100X100X1 THK.-06 NOS)	Al/Cu ALLOY	18+6 NOS.	
5.	RUBBER BELLOW	EPDM	01 NO.	
4.	Cu LAMINATED FLEXIBLE -100X12 THK.	COPPER	06 NOS.	
3.	ADAPTOR BOX-3 THK.	Al ALLOY	01 NO.	
2.	BUSBAR-2-101.6X41.83X6.68 THK. CHANNEL	Al ALLOY	LOT	
1.	ENCLOSURE-1380X400X3 THK. SHEET	Al ALLOY	LOT	

BILL OF MATERIAL

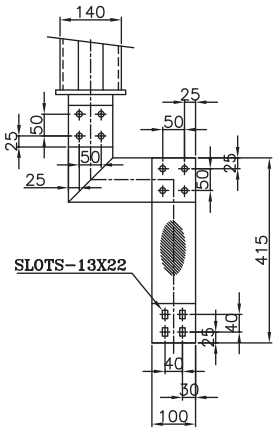


FRONT VIEW

ELEVATION

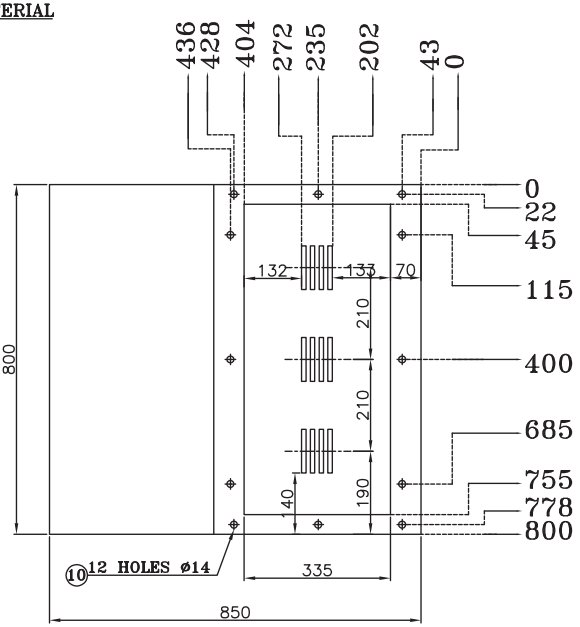


ELEVATION



FRONT VIEW

DETAIL:-"X"



SWGR.FLANGE DETAIL

GEN. NOTES:-

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

REFERENCE DRAWING NO.:M/s SIEMENS LTD.

1. GENERAL ARRANGEMENT
   REFER DRAWING NO. G71570-B5189-V003-A. SHEET NO.01 TO 03.
2. TOP BUSDUCT IN CB CHAMBER 1SET WINDOW CT IN CC 4X100X10Cu
   REFER DRAWING NO. 896-1339.9 SHEET NO. (01 OF 03.)

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	MOHIT
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

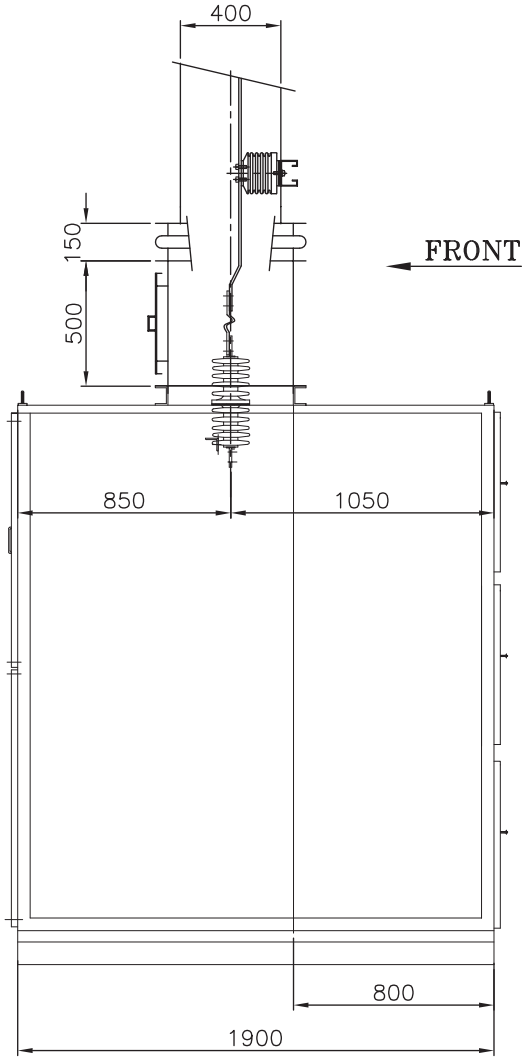
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

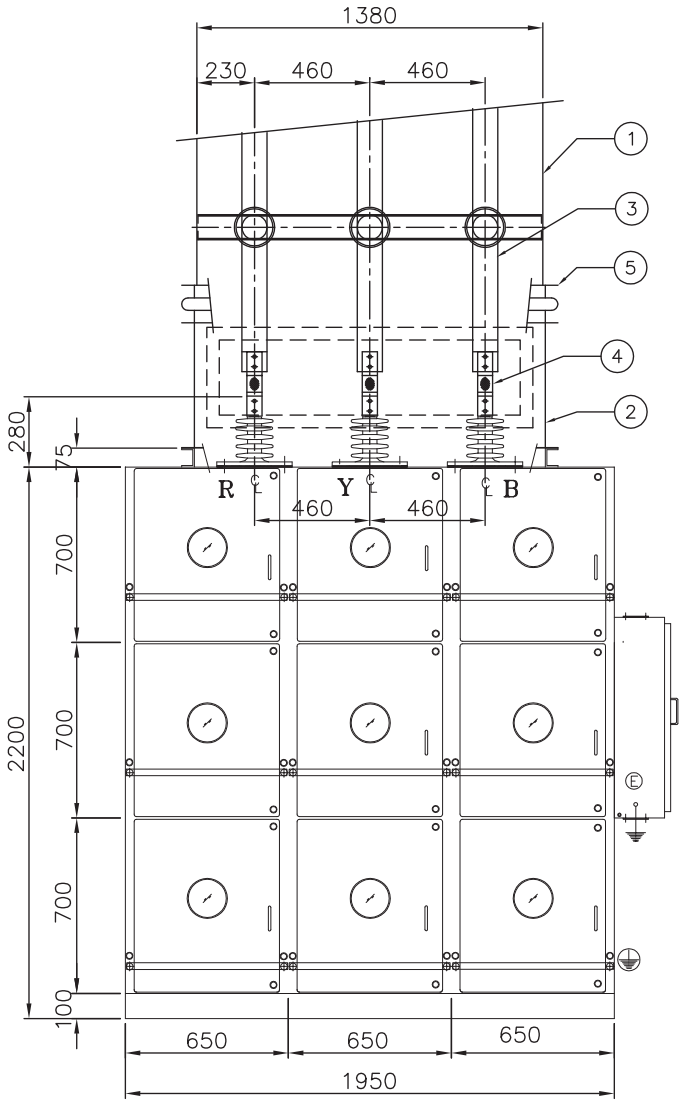
DRG. TITLE: TERMINAL DETAIL AT HT PANEL END FOR 11KV, 2500A SPB.

JOB NO.	SHEET NO.	REV. NO.
BD11-283	15	03

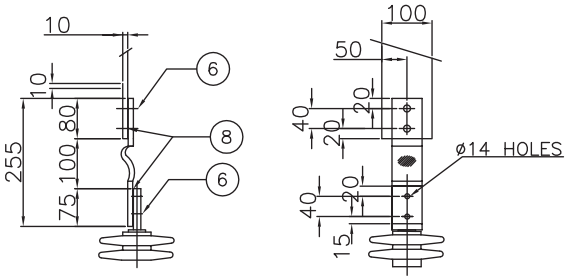
DRG.NO. BD11-283C-1286



ELEVATION

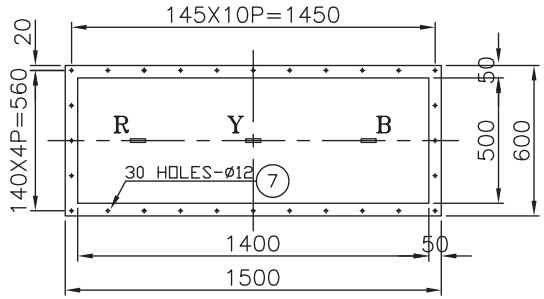


SIDE VIEW
LOOKING FROM FRONT



ELEVATION SIDE VIEW

DETAIL-X



FLANGE DETAIL AT LAVT CUBICLE

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

BILL OF MATERIALS — AS BUILT DRAWING

SL. NO.	DESCRIPTION	MATERIAL	QTY.	REMARKS
8.	BM STRIP 80x60, 1 THK.	CU/AL	06 NOS	
7.	BOLT M10X35+N+2PW+SW	MS Zn PLATED	30 SETS	
6.	BOLT M12X50+N+2PW+SW	Cad Zn PLATED	12 SETS	
5.	RUBBER BELLOW	EPDM	01 NO.	
4.	LAMINATED FLEXIBLE-60x10 THK. 255 LONG	COPPER	03 NOS.	
3.	BUSBAR 100x10 THK. FLAT	Al ALLOY	03 NOS.	
2.	ADAPTOR BOX	Al ALLOY	01 NO.	
1.	ENCLOSURE SIZE-1380X400X3THK.	Al ALLOY	01 NO.	

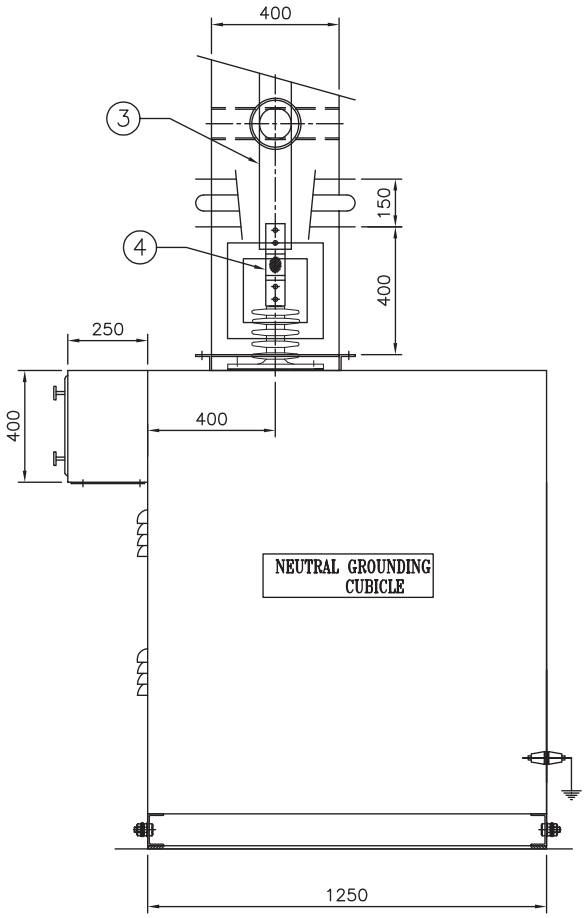
REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

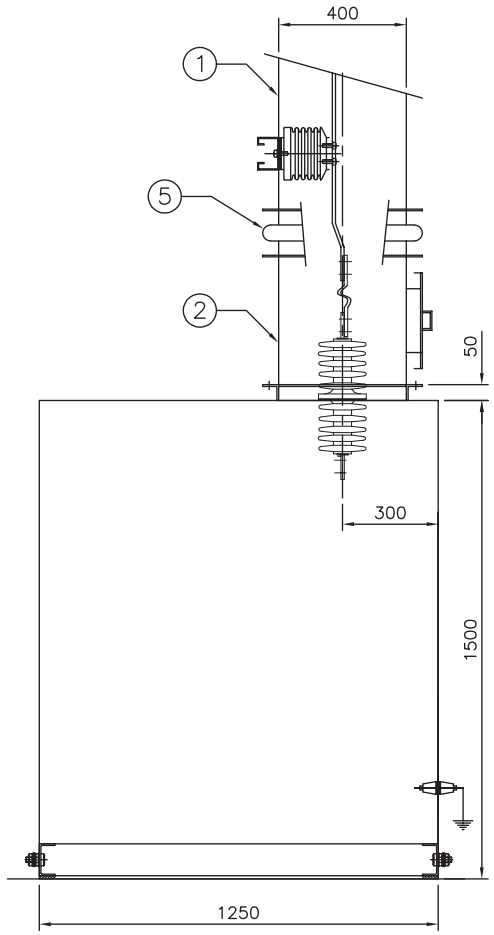
SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: TERMINATION DETAIL AT PTSP CUBICLE FOR 11 KV, 2500A SPB.

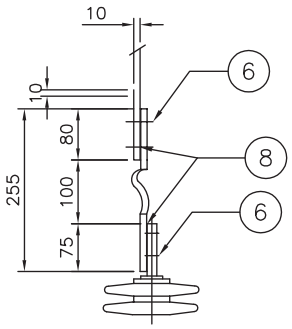
JOB NO.	SHEET NO.	DRG.NO.	REV. NO.
BD11-283	16	BD11-283C-1286	02



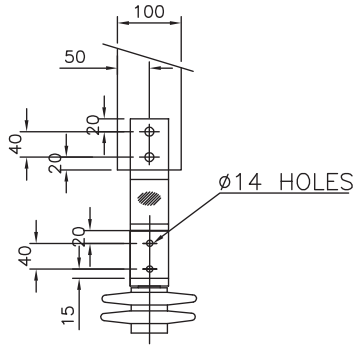
FRONT VIEW



SIDE VIEW

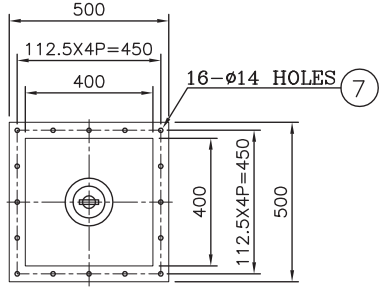


SIDE VIEW



FRONT VIEW

DETAIL-X



FLANGE DETAIL

BILL OF MATERIALS

AS BUILT DRAWING

SL. NO.	DESCRIPTION	MATERIAL	QTY.	REMARKS
8.	BM STRIP 80x60, 1 THK.	CU/AL	02 NOS	
7.	BOLT M10X35+N+2PW+SW	MS Zn PLATED	16 SETS	
6.	BOLT M12X50+N+2PW+SW	Cad Zn PLATED	4 SETS	
5.	RUBBER BELLOW	EPDM	01 NO.	
4.	LAMINATED FLEXIBLE-60x10 THK. 255 LONG	COPPER	01 NO.	
3.	BUSBAR 100x10 THK. FLAT	Al ALLOY	01 NO.	
2.	ADAPTOR BOX	Al ALLOY	01 NO.	
1.	ENCLOSURE SIZE-400X400X3THK.	Al ALLOY	01 NO.	

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE
ANAND	11.05.12
CHD.	ANAND
APPD.	V.PAL

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE:
TERMINATION DETAIL AT NGR CUBICLE FOR 11 KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	17

DRG.NO.	REV. NO.
BD11-283C-1286	02

BUSBAR SELECTION FOR CONTINUOUS CURRENT RATING

Sl. No.	Description	11KV, 2500A SPB
01	Busbar Chosen	2–101.6X41.83X6.68 THK. CHANNEL in box formation
02	Open air rating of Busbar for 50°C rise over ambient in still but unconfined air (Amps)	4190
03	Phase spacing in mm.	460
04	Enclosure size in mm.	1380 X 400 X 3 THK.
05	Design ambient temperature	50°C
06	Maximum allowable temp. rise	40°C
07	Enclosure material	Al ALLOY
	Derating Factors	
	a) Ambient correction factor for 40° rise	0.88
	b) Enclosure derating factor considered as per poor ventilated room	0.65
	c) Proximity effect factor	0.843
	d) Uprating for painting of busbar	1.2
	e) Magnetic enclosure factor	1
	f) Combined correction factor	0.5786
08	Rating busbar after applying combined correction factor	2424 Amps
09	Rating of busduct required.	2500Amps

Hence Busbar size chosen is adequate.
Ref.: "Aluminium Busbar Handbook" (Indal).

SUPPORT INSULATOR SPAN CALCULATION UNDER SHORT CIRCUIT

Sl. No.	Description	11KV 2500A SPB
01	Peak electromagnetic force along the centerline of Busbar without enclosure F_M (Kg/M)	$F_M = \frac{M \times 2.05 \times I_{sc}^2 \times 10^{-8} \times Is}{S}$
	Where,	
	I_{sc} = Peak short circuit current (Amps.)	102
	S = Phase spacing in meters.	0.46
	M = Multiplying factor	0.866
	Is = Shielding factor	0.375
	Therefore F_M (in Kg/M)	150.57
02	Force acting on the top of Insulator (F) =	$\frac{Fm\ (H+h)}{H} = 201.60$
		Where, H=Height of Insulator=150 mm.
		h=Distance between top of the Insulator to neutral axis of busbar=50.8 mm.
03	Maximum allowable insulator span in Mtrs.=	
	$\frac{\text{Cantilever strength of insulator}}{\text{Factor of safety x F}} = \frac{1200}{2.5 \times 201.6}$	= 2.38 Mtrs.
	(Factor of safety for cantilever =2.5)	
04	Average span adopted in between two Insulators Mtrs. **(Hence Safe)**	3.00 Mtrs.

Ref.: NGK Insulator Catalogue

SHORT TIME THERMAL WITHSTAND CAPABILITY OF BUSBAR

Sl. No.	Description	11KV, 2500A SPB
01	Minimum Cross Sectional Area of Busbar in Sq. Inches.	$A = \frac{Isc\sqrt{T}}{14 \times 10^4 \sqrt{\{\log^{10}[(\phi 2+258)/\phi 1+258]\}}}$
	Where,	
	I_{sc} = Short Circuit (rms) Symmetrical in Amps.	40×10^3
	T = Duration of Fault in Seconds.	3
	Ø1 = Initial Temperature of busbar in °C.	90°C
	Ø2 = Final Temperature in °C.(ANSI–C37–23)	200°
	Therefore, A (in Sq. Inches)	1.434
	Therefore, A (in Sq. mm)	1.434 X 645.16 = 925
02	Actual Cross Section Provided in Sq. mm	2374 For Main 1000 For Main

Hence the busbar Size chosen is safe for short time rating.
Ref.: "Aluminium Busbar Handbook" (Indal).

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	MOHIT
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND

DRN.	DATE	
ANAND	11.05.12	
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD.

CONSULTANT :
AVANT–GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

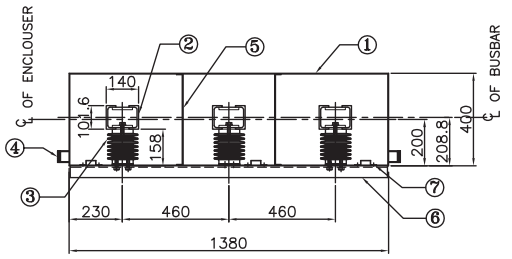
PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON–122001

DRG. TITLE:
TECHNICAL DATA SHEET, INSULATOR SPAN CALCLATION, BUSBAR SELECTION & SHORT TIME CAPABILITY FOR 11KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11–283	18

DRG.NO.	REV. NO.
BD11–283C–1286	02

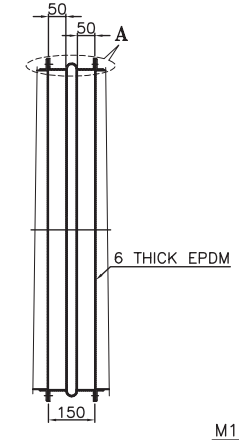


CROSS-SECTIONAL VIEW FOR 11KV, 2500A BUSDUCT
(INDOOR BUSDUCT)

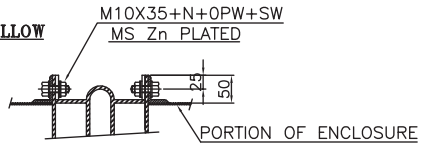
Sl. NO.	DESCRIPTION	MATL.	REMARKS
1.	ENCLOSURE- 1380X400X3 THK.	Al ALLOY	------
2.	BUSBAR 2-101.6X41.83X6.68 THK. (BOX FORM)	Al ALLOY	2 NOS./PH
3.	INSULATOR- 150 HEIGHT	PORCELAIN	------
4.	EARTH BUS- 2-50X10 THK.	Cu ALLOY	AS PER REQUIREMENT
5.	PHASE BARRIER-3mm THK.	Al ALLOY	------
6.	AL ALLOY CHANNEL INSULATOR MOUNTING	Al ALLOY	------
7.	SPACER HEATER	60W, 240V	------

GEN. NOTES:-

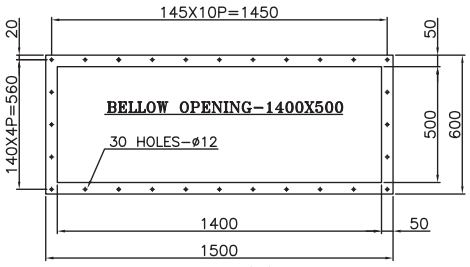
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. PAINTING:-
   i) ENCLOSURE INTERIOR & BUSBARS :- MATT BLACK.
   ii) ENCLOSURE EXTERIOR :- EPOXY SPRAY PAINT OF SHADE RAL.7032.
3. ALL BOLTS, NUTS AND WASHERS SHALL BE MS Zn PLATED.



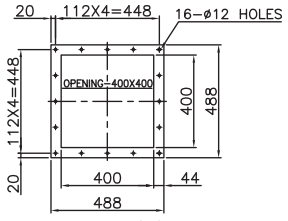
RUBBER BELLOW



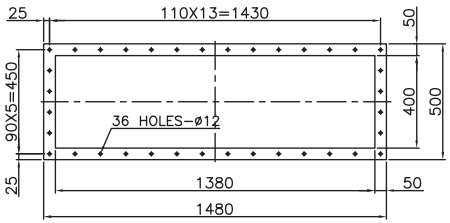
DETAIL-'A'



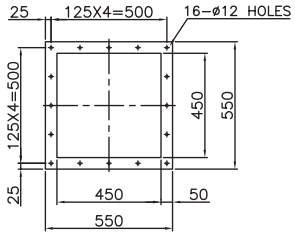
DETAIL-'Y'
DETAIL OF BELLOW FLANGE



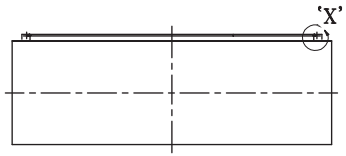
DETAIL-'Y'
DETAIL OF BELLOW FLANGE



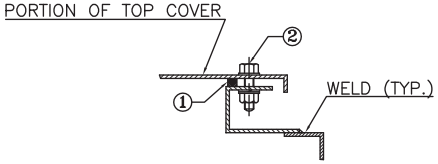
VIEW-'XX'
FIXING DETAIL OF ENCLOSURE FLANGE
(IN DOOR TYPE)



VIEW-'XX'
FIXING DETAIL OF ENCLOSURE FLANGE

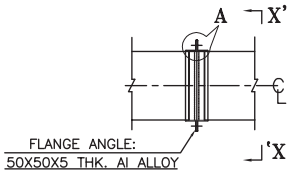


CROSS - SECTIONAL VIEW OF ENCLOSURE
(ENCLOSURE WITHOUT SLOPING TOP)

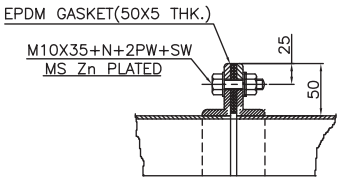


DETAIL-'X' (TYP.)

ITEM NO.	DESCRIPTION	SPECIFICATION	MATL.
1.	GASKET	15X10 THK.	EPDM
2.	HEX. BOLT	M8X35+1N+2PW+1SW	MS Zn PLATED



ELEVATION



DETAIL-'A'
(FOR INDOOR PURPOSE ONLY)

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL BOLTS, NUTS AND WASHERS SHALL BE MS Zn PLATED.

AS BUILT DRAWING

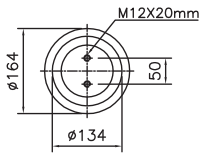
REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
01	AS BUILT DRAWING	18.12.12	ANAND
REV.NO.	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

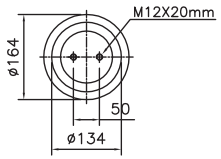
SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE: TYPICAL CROSS SECTIONAL, ACCESS DOOR, RUBBER BELLOW, & ENCLOUSER FLANGE DETAIL FOR 11KV, 2500A SPB.

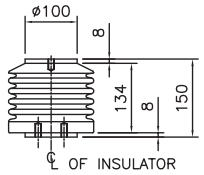
JOB NO.	BD11-283
SHEET NO.	19
DRG.NO.	BD11-283C-1286
REV. NO.	02



TOP VIEW



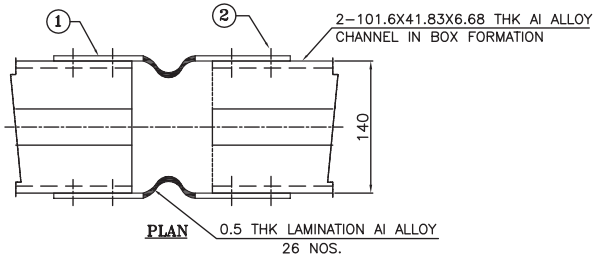
BOTTOM VIEW



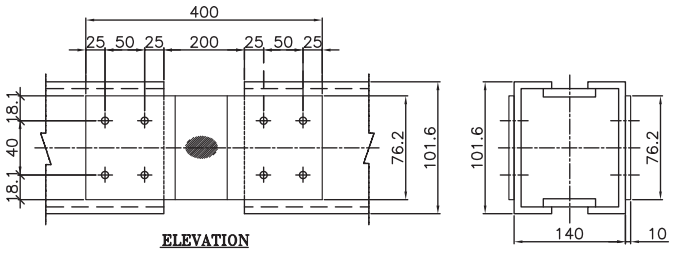
ELEVATION
INSULATOR

NOTES :-

1. RATED VOLTAGE – 12KV
2. MATERIAL – PORCELAIN BROWN GLAZED.
3. MIN. CREEPAGE DISTANCE – 250 mm (MINIMUM).
4. DRY ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE – 35 KV.
5. IMPULSE WITHSTAND VOLTAGE (1.2/50 MICRO SECOND WAVE) – 75 KV PEAK.
6. WEIGHT OF THE INSULATOR (APPROX.) – 6 KG.
7. COMPRESSION STRENGTH – 10000 KG.
8. TENSILE STRENGTH – 2500 KG.
9. STANDARD APPLICABLE – IS : 2544 – 1973.
10. MAKE – CJI.



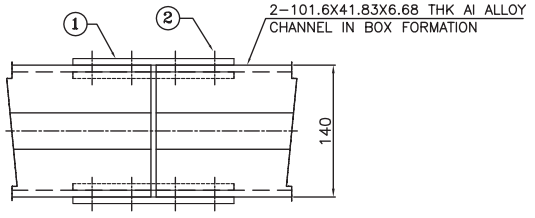
PLAN



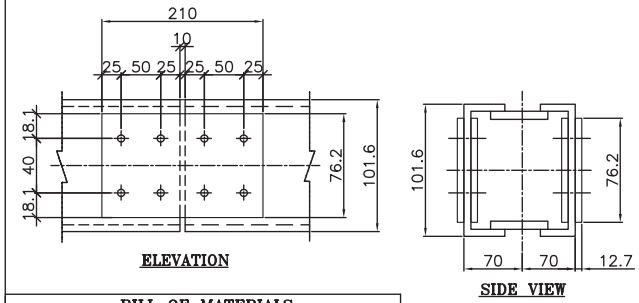
ELEVATION

END VIEW

BILL OF MATERIALS			
SL.No.	DESCRITION	MATL.	QTY.
1	Cu FLEXIBLE 100X12.5 THK. 400 LONG	Cu ALLOY	02 NOS.
2	M12X50 HEX BOLT WITH 1NUT+2PW+1SW	Cad ZN PLATED	08 SETS



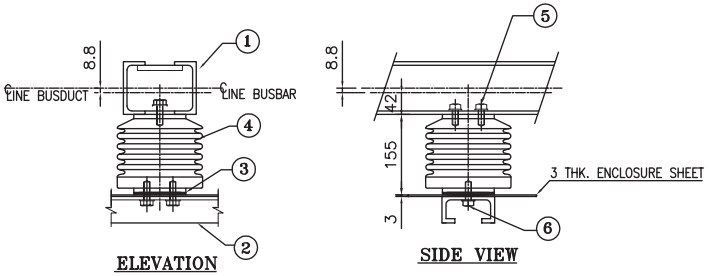
PLAN



ELEVATION

SIDE VIEW

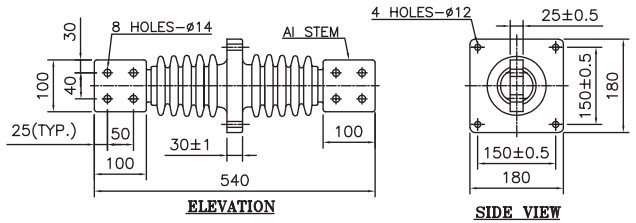
BILL OF MATERIALS			
SL.No.	DESCRITION	MATL.	QTY.
1	Al FISH PLATE 76.2X12.7 THK. 210LONG	Al ALLOY	04 NOS.
2	M12X60 HEX BOLT WITH 1NUT+2PW+1SW	Cad ZN PLATED	08 SETS



ELEVATION

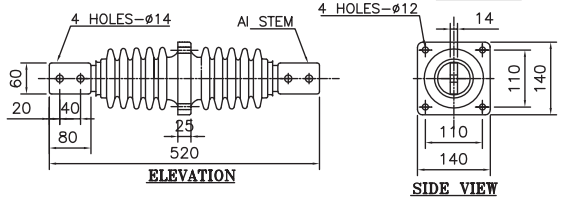
SIDE VIEW

Sl.NO.	DESCRIPTION	MATL.	QTY./PH.	RMKS.
1.	BUSBAR –2–101.6X41.83X6.68 THK. IN CHANNEL FORM	Al ALLOY	1 NO.	
2.	INSULATOR SUPPORTING CHANNEL	Al ALLOY	1 NO.	
3.	RESILIENT PAD– ø100X6 THK.	EPDM	1 NO.	
4.	INSULATOR	PORCELAIN	1 NO.	
5.	M12X25 BOLT+1PW+1SW	MS Zn PLATED	2 SETS	
6.	M12X25 BOLT+1PW+1SW	MS Zn PLATED	2 SETS	



ELEVATION

SIDE VIEW

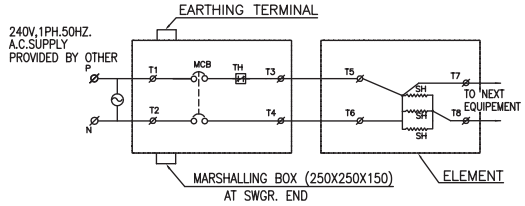


ELEVATION

SIDE VIEW

TECHNICAL PARTICULARS:–

1. RATED VOLTAGE	– 12KV
2. APPLICABLE STANDARD	– IS: 2099
3. ONE MINUTE DRY WITHSTAND	– 28KV RMS
4. IMPULSE WITHSTAND VOLTAGE (1.2/50 MICRO SECOND)	– 75KVP
5. CREEPAGE DISTANCE	– 250/250 mm MINIMUM
6. MATERIAL	– EPOXY CASTING (CLASS–B) CONDUCTOR Al ALLOY 91E–EWP GRADE
7. MAKE	– A BOND STRANDS– CHENNAI



SPACE HEATER WIRING DIAGRAM

SL. NO.	ITEM	SYMBOL	DESCRIPTION	QTY. PHASE
1.	MCB 2POLE		4 AMPS.	1 NO.
2.	THERMOSTAT	TH	30°C–110°C TEMPERATURE	1 NO.
3.	TERMINAL BLOCK	T	CST–2.5	8 NOS.
4.	SPACE HEATER	SH	60 WATT, 240 VOLT	3 NOS. FOR EACH EQUIPMENT

NOTES:–

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL 2.5 mm sq. Cu STRANDED PVC CABLES FOR WIRING WILL RUN THROUGH PVC CONDUIT PIPE.

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

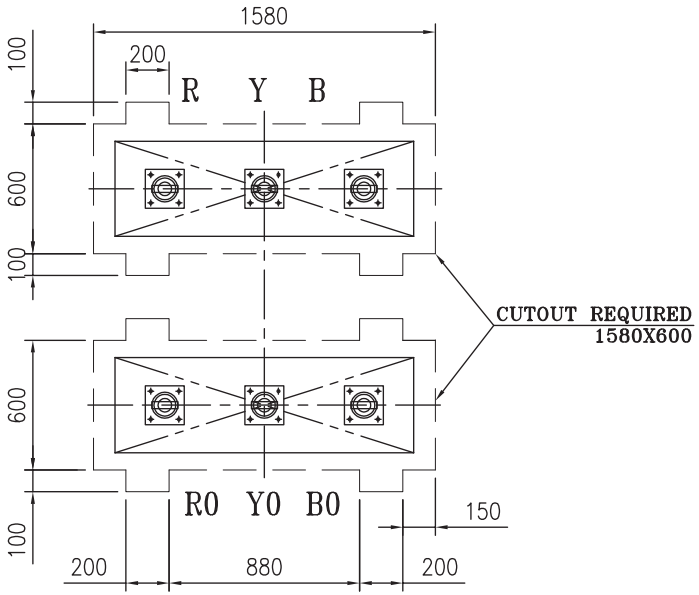
DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT–GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON–122001

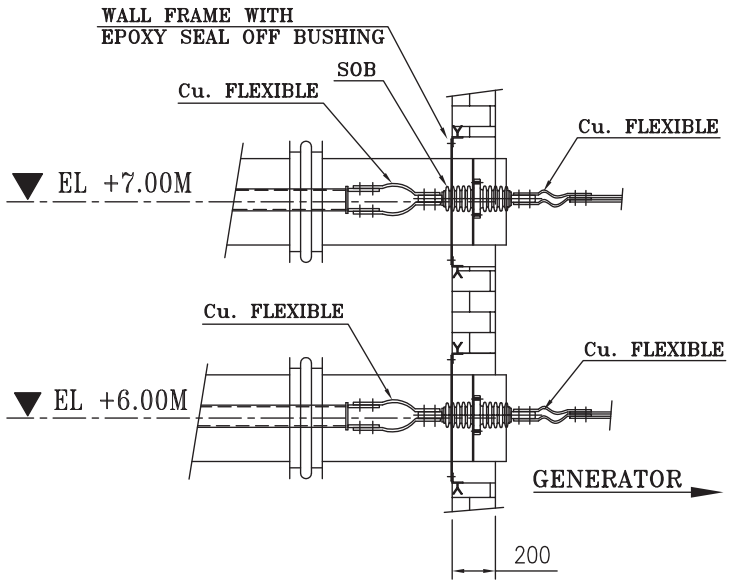
DRG. TITLE:
TYPICAL INSULATOR, INSULATOR ASSEMBLY,EPOXY SEAL OFF BUSHING, RIGID JOINT, EXPANSION JOINT & SPACE HEATER WIRING DETAIL FOR 11KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11–283	20

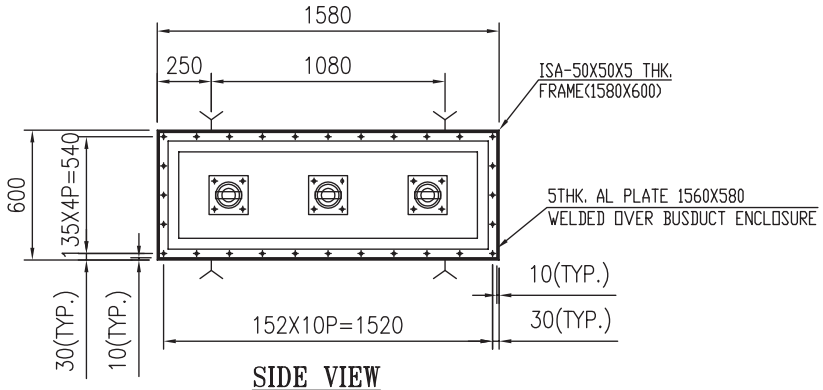
DRG.NO.	REV. NO.
BD11–283C–1286	02



SIDE VIEW



ELEVATION



SIDE VIEW

DRILLING DETAIL OF WALL FRAME & ENCLOSURE PLATE
TOTAL QTY. 03 NOS. (02 NOS. WITH SOB & 01 NO. WITHOUT SOB.

NOTES:–

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. MS FRAME OF WALL FRAME SHALL BE HOT DIP GALVANIZED.
3. ALL BOLTS, NUTS AND WASHERS SHALL BE MS Zn PLATED.

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
02	AS BUILT DRAWING	18.12.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	DATE	CUSTOMER : M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.
ANAND	11.05.12	
CHD.	ANAND	CONSULTANT : AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI
APPD.	V.PAL	PROJECT : LOKMANGAL MAULI INDUSTRIES LTD. 1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

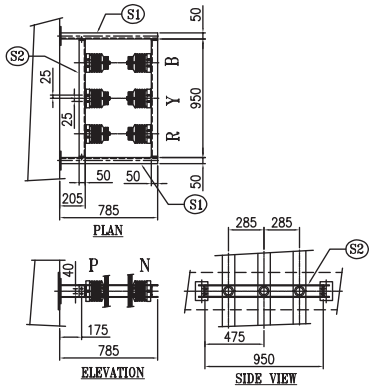
DRG. TITLE: WALL/FLOOR FRAME ASSEBLY DETAIL FOR 11KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	21

DRG.NO.	REV. NO.
BD11-283C-1286	02

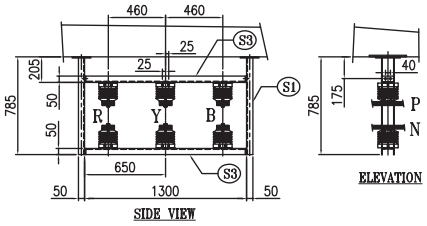
TYPE-K1

TOTAL QTY.-02NOS. (FOR OPEN BUSBAR)



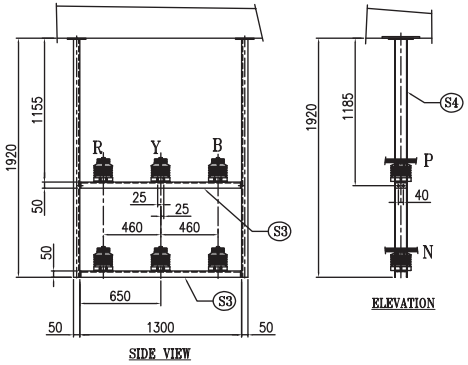
TYPE-K2

TOTAL QTY.-01NO. (FOR OPEN BUSBAR)



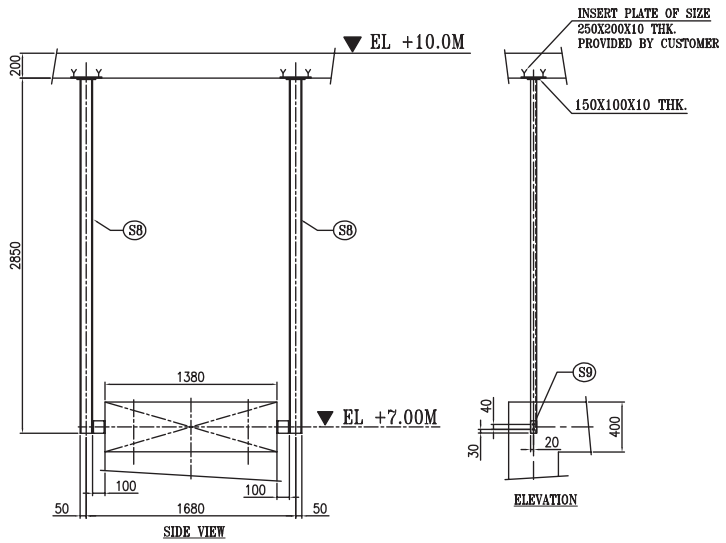
TYPE-K3

TOTAL QTY.-01NO. (FOR OPEN BUSBAR)



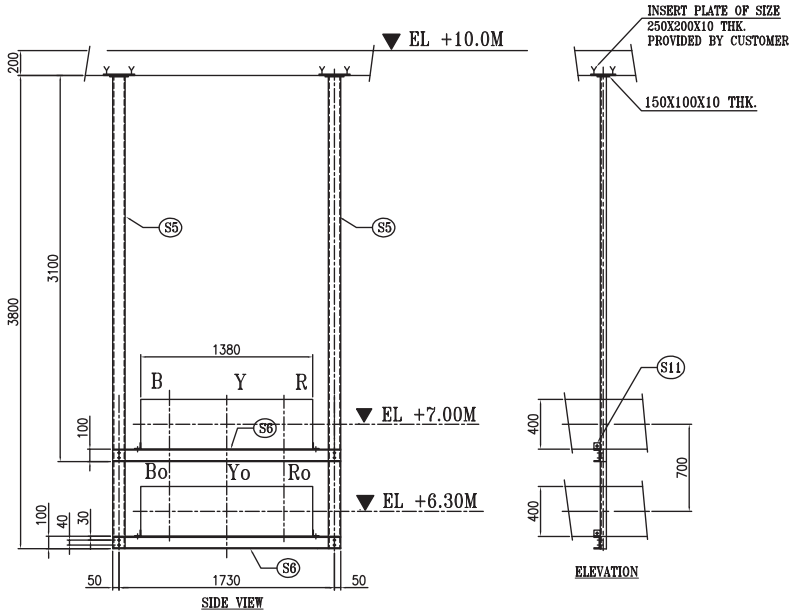
TYPE-K5

TOTAL QTY.-01 NO. (FOR MAIN RUN)



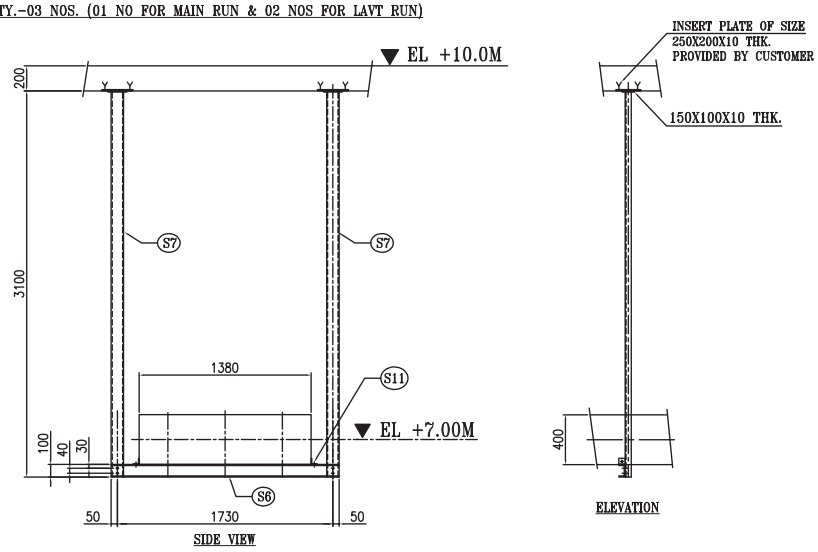
TYPE-K4

TOTAL QTY.-01NO. (FOR MAIN RUN P&N)



TYPE-K6

TOTAL QTY.-03 NOS. (01 NO FOR MAIN RUN & 02 NOS FOR LAVT RUN)



AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	MOHIT
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	ANAND	DATE 11.05.12
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD. HYDERABAD.

CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

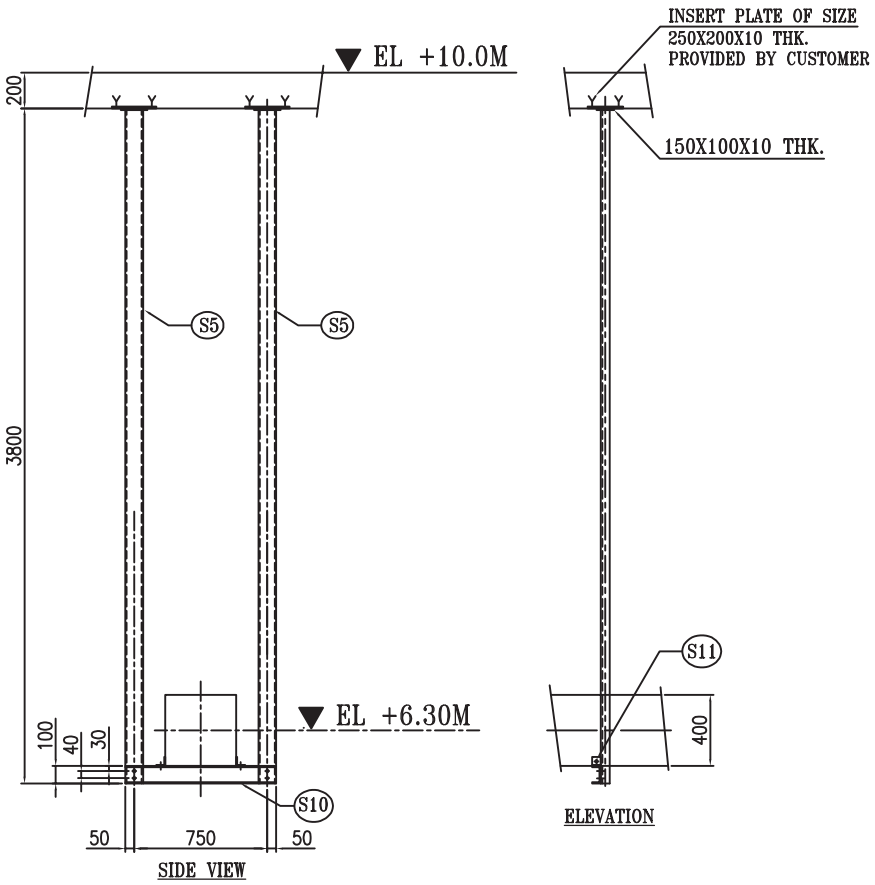
DRG. TITLE:
SUPPORT STRUCTURE DETAIL FOR 11KV, 2500A SPB.

JOB NO.	SHEET NO.
BD11-283	22

DRG.NO.	REV. NO.
BD11-283C-1286	03

TYPE-K7

TOTAL QTY.-04NOS (FOR NGT TIE RUN)



S.NO.	ITEM NO.	MEMBER DESCRIPTION	MEMBER SIZE LENGTH	TOTAL QTY.
1.	S1	1-ISMC-100 WITH 1-150X100X10THK. PLATE	785	06
2.	S2	1-ISMC-100 WITH 2-100X50X10THK. PLATE	950	04
3.	S3	1-ISMC-100 WITH 2-100X50X10THK. PLATE	1300	04
4.	S4	1-ISMC-100 WITH 1-150X100X10THK. PLATE	1920	02
5.	S5	1-ISMC-100 WITH 1-150X100X10THK. PLATE	3800	10
6.	S6	1-ISMC-100	1830	05
7.	S7	1-ISMC-100 WITH 1-150X100X10THK. PLATE	3100	06
8.	S8	1-ISMC-100 WITH 1-150X100X10THK. PLATE	2850	02
9.	S9	1-ISMC-100	100	02
10.	S10	1-ISMC-100	850	04
11.	S11	ISA-50X50X5 THK.	50	18
12.	---	M12X50+2PW+1SW+N	---	80
13.	---	ISA 50X50X5 THK. FOR WALL FRAME	=1580+600)X4	04

AS BUILT DRAWING

REV.NO.	DESCRIPTION OF CHANGE	DATE	SIGN.
03	AS BUILT DRAWING	18.12.12	ANAND
02	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 23.06.12	26.06.12	ANAND
01	DRAWING REVISED AS PER CUSTOMER COMMENTS/INPUT RECEICED ON 15&23.05.12	12.06.12	ANAND

DRN.	ANAND	DATE 11.05.12
CHD.	ANAND	
APPD.	V.PAL	

CUSTOMER :
M/s BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD.

CONSULTANT :
AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI

PROJECT :
LOKMANGAL MAULI INDUSTRIES LTD.
1 X 30 MW STG, OSMANABAD, MAHARASHTRA

SPACEAGE SWITCHGEARS LIMITED
68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

DRG. TITLE:
SUPPORT STRUCTURE DETAIL FOR
11KV, 2500A SPB.

JOB NO.	BD11-286
SHEET NO.	23
DRG.NO.	BD11-283C-1286
REV. NO.	03