TENDER NOTICE NO.
HY/ES/OPGPGPL/CIE/12

CIE jobs - Erection, Testing, Pre commissioning &

Commissioning of Unit-2 of 2X80 MW STG Sets at OPG Power Generation Private Limited. (Customer Unit No.3)

Tender Submission

On or before 06 - November -2012, at 11.00 Hrs.

TENDER OPENING

On 06 - November -2012 at 13:30 Hrs.

at

VENDOR COMPLEX

BHEL, HYD (ADMIN BLOCK)

(Phone: 040 – 23183415 / 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 2nd Unit of 2x80 MW Steam Turbine driven Generator Sets (Customer Unit No. 2) at M/S OPG Power Generation P. Ltd., Gummidipoondi, Tamilnadu.

PROJECT DATA

1. Project Authority	:	M/S OPG Power Generation P. Ltd., Gummidipoondi, Tamilnadu.
2. Project Consultant	:	NIL
3. Name of the Project	:	OPG Power Generation P. Ltd., Gummidipoondi, Tamilnadu.
4. Location of Site	:	OPG Power Generation P. Ltd., OPG Nagar, Periya Obulapuram Village, Gummidipoondi, Distt. Tiruvalluru, Tamilnadu.
5. Nearest Railway Station	:	Gummidipoondi (Near Chennai)
6. Nearest Air Port	:	Chennai

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 initialed 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 equipments 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 equipments, 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.

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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, leveling, 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 equipments/kits required for calibration of instruments. Test equipments / 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 equipments / 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 Aluminum clamps on trays , glanding, tagging, ferruling, terminations & continuity checking. Consumables like Cable Glands, aluminum 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, nut 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 aluminum clamps. Aluminum 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 Hookup Diagrams" Drawing No 4-312-00-50126 Rev.00 (Annexure-2) and "Instrument Installation Drawing" Drg. No. 4-381-21-02948 Rev 00 (Annexure-3).

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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. Sand blasting, 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 Isolated 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 attached drawing No. C-952-1209-11277 (Annexure-1). **Considering the criticality & specialized nature of this job bidder is to ensure that erection, testing & commissioning is to be carried out under the supervision of bus-duct vendor, whose contact details are furnished. M/s Control & Switchgear Company Limited, Noida, U.P. Contact Details : Sri K.Venugopal (VP Operation), Busduct Division, Controls & Switchgear Electric Ltd., B1, Site 4,Surajpur Industrial Area, Kasna Road, greater Noida, U.P. PIN 201306, Ph No: 0120- 3914500, 01, 15, 18. e-mail id: kvenugopal@controlsindia.com. It is deemed that the bidder shall arrange for vendor supervision during the job execution & no separate charges are applicable in this regard.**

33.0 CO_2 piping erection includes fixing of CO_2 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 contact 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 & head quarters 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 / OPG 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/OPG 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

Spec. No.203 OPG Power Generation P. Ltd 2X80 MW STG Sets (Unit No. 2)

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 **(Unit No. 2)**
1.	Start of Erection	November 2012
2.	Commissioning of Turbine	March 2013
3.	Load run	April 2013

For the purpose of contract, the contract period shall be taken as 6 months. Completion of the work shall be as per BHEL work schedule, revised from time to time. 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
1.01.00	PRESURE GAUGES	NOS	68		
1.01.02	TEMPERATURE GAUGES	NOS	57		
1.01.03	LEVEL GAUGES	NOS	21		
1.01.04	DIFFRENTIAL PRESSURE GAUGES	NOS	2		
1.01.05	PRESSURE SWITCHES	NOS	21		
1.01.06	TEMPERATURE SWITCHES	NOS	3		
1.01.07	LEVEL SWITCHES	NOS	35		
1.01.08	DIFFERENTIAL PRESSURE SWITCHES	NOS	6		
1.01.09	LIMIT SWITCHES	NOS	12		
1.01.10	ELECTRONIC PRESUTRETRANSMITTERS	NOS	22		
1.01.11	TEMPERATURE TRANSMITTER	NOS	1		
1.01.12	LEVEL TRANSMITTER	NOS	10		
1.01.13	DIFFERENTIAL PRESSURETRANSMITTER	NOS	2		
1.01.14	BEARING THERMOELEMENTS	NOS	10		
1.01.15	THERMOELEMENTS (RTD)	NOS	6		
1.01.16	THERMOELEMENTS (K-TYPETHERMOCOUPLE)	NOS	18		
1.01.17	I/ P CONVERTOR	NOS	1		
1.01.18	I/H CONVERTOR NOS 2	NOS	2		
1.01.19	CONTROL VLVES WITH FEED BACK POSITIONER	NOS	2		
1.01.20	CONTROL VLVES WITH HART POSITIONER NOS	NOS	12		
1.01.21	SOLENOID VALVE NOS	NOS	23		

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
1.01.25	MOTORISED VALVE NOS	NOS	25		
1.01.26	SPEED MEASURING LOOP NOS	NOS	6		
1.01.27	VIBRATION, AXIAL DISPLACEMENT,VELOCITY PROBES NOS	NOS	15		
1.01.28	PROXIMITTERS NOS	NOS	14		
1.01.29	THERMOWELLS	NOS	86		
1.01.30	AIR FILTER REGULATOR	NOS	1		
1.01.31	AIR FLOW ROTAMETER	NOS	1		
	TOTAL				

1.02.00 - PANELS & CUBICLES

1.02.01	1.02.01 LOCAL GAUGE RACK 1200 (w) X 1600 (h)	NOS	02		
1.01.02	GOVERNING CONSOLE BOARD 1400(w) X 1800(h) X 350 (d)	NOS	01		
1.02.03	TURBINE CONTROL PANEL (EHTC) 2355 (H) X 750(W) X 800(D)	NOS	01		
1.02.04	TSE TP + GSPC 2355 (H) X 1500(W) X 800(D)	NOS	01		
1.02.05	CCA01, 02, 03, ATRS 2355 (H) X 1500(W) X 800(D)	NOS	01		
1.02.06	AUTOMETIC VOLTAGE REGULATOR 1200(L) X 2355(H) X 1200(D)	NOS	01		
1.02.07	GENERATOR CONTROL PANEL 2000(L) X 2300(H) X 1000(D)	NOS	01		
1.02.08	GENERATOR RELAY PANEL 1600(L) X 2315(H) X 800(D)	NOS	01		
1.02.09	TRANSMITTER RACKS 1250 (w) X 2000 (h)	NOS	10		
1.02.10	GENERATOR AIR FILTER PANEL 660 (L) X 1000 (H) X 400 (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	HMI SWITCH WITH ENCLOSURE	NOS	01		
1.03.03	DESKTOP PC FOR OWS	NOS	02		
1.03.04	DESKTOP PC FOR EWS	NOS	01		
1.03.05	DESKTOP PC FOR LINK NOS 1	NOS	01		
1.03.06	DOTMATRIX PRINTER, 24PIN, 136 CLMN, 450 CSPS	NOS	02		
1.03.07	A4 COLOUR LASER PRINTER-NETWORK READY	NOS	01		
1.03.08	19" TFT MONITOR	NOS	03		
1.03.09	17" TFT MONITOR	NOS	01		
	TOTAL				

1.04.00 - JUCNTION BOXES & LOCAL CONTROL STATIONS (LCS)

1.04.01	01 ELECTRTICAL JUNCTION BOXES 12 INLET / 2 OUTLET	NOS	10		
1.04.02	64 WAY FP JUNCTION BOXES FOR SIGNAL INPUTS	NOS	13		
1.04.03	24 WAY FP JUNCTION BOXES FOR THERMOCOUPLE INPUTS	NOS	03		
1.04.04	PROXIMITTER HOUSINGS	NOS	07		
	TOTAL				

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

SIGNATURE & SEAL OF BIDDER

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	MTRS	900		
1.05.02	Cr-Mo PIPE 21.3 x 3.73	MTRS	100		
1.05.03	SS PIPE 21.3 x 3.73	MTRS	100		
1.05.04	SS PIPE 21.3 x 2.8 MTR 15	MTRS	15		
1.05.05	SS TUBE 12.7 x 2.1	MTRS	1520		
1.05.06	SS PIPE 33.4 X 3.4	MTRS	100		
1.05.07	2" GI PIPE	MTRS	30		
1.05.08	CS PIPE 60.3 X 3.91 MTR 75	MTRS	75		
1.05.09	SS TUBE 6.3 X 0.9	MTRS	330		
1.05.10	SS TUBE SS PIPE 6 x 1.5	MTRS	100		
	TOTAL				

1.06.00 - CABLES (LAYING ,TERMINATION & TESTING)

1.06.01	1P X 1.5 SQ.MM SIGNAL CABLE	MTRS	1500		
1.06.02	2P X 0.5 SQ.MM COPPER SIGNAL CABLE	MTRS	2000		
1.06.03	1T X 1.5 SQMM SHIELDED CABLE MTR	MTRS	500		
1.06.04	2P X 0.5 SQMM PTEF INSULATED K-Type T/C EXTENTION CABLE	MTRS	1800		
1.06.05	SERIAL COMMUNICATION CABLE MTR	MTRS	100		
1.06.06	10T x 0.5 SQ MM COPPER CABLE	MTRS	800		
1.06.07	2C X 0.75 SQMM COPPER CABLE	MTRS	150		
1.06.08	3C X 4 SQ.MM COPPER CABLE	MTRS	1000		

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

SIGNATURE & SEAL OF BIDDER

SL.NO	DESCRIPTION	UNIT	QTY	UNIT RATE	TOTAL COST
1.06.09	3C X 6 SQ.MM COPPER CABLE	MTRS	500		
1.06.10	5C X 1.5 SQ.MM CONTROL CABLE	MTRS	500		
1.06.11	5C X 2.5 SQ.MM CONTROL CABLE	MTRS	1000		
1.06.12	10C X 2.5 SQ.MM CONTROL CABLE	MTRS	1500		
1.06.13	4P X 0.5 SQMM COPPER SIGNALCABLE	MTRS	4300		
1.06.14	12P X 0.5 SQMM COPPER CABLE	MTRS	3600		
1.06.15	3C X 0.75 SQMM UNARMERED PVC FRLS CABLE	MTRS	50		
1.06.16	1.06.16 COPPER CABLE (1.5SQMM 14C, 2C,3C)	MTRS	100		
	TOTAL				

1.07.00 - ERECTION OF CABLE TRAYS & CABLE DUCT.

1.07.01	PERFORATED CABLE TRAY L=2.5M, W=50MM	MTRS	200		
1.07.02	PERFORATED CABLE TRAY L=2.5M, W=150 MM	MTRS	50		
1.07.03	CABLE DUCT 60(w) X 60(h) X 1000 (L)	NOS	180		
1.07.04	CABLE DUCT 180(w) X 100(h) X 1000 (L)	NOS	60		
1.07.05	CABLE DUCT 250(w) X 100(h) X 1000 (L)	NOS	50		
1.07.06	CABLE TRAY 40 X 100 X 40	MTRS	25		
	TOTAL				

1.08.00 - FABRICATION,ERECTION OF STRUCTURAL STEEL

1.08.01	STRL ST CHANNEL 100 X 50	MTRS	51		
1.08.02	ANGLE 50 x 50 x 6	MTRS	48		
1.08.03	MS FLAT 50 X 6	MTRS	12		

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

SIGNATURE & SEAL OF BIDDER

SL.NO	DESCRIPTION	UNIT	QTY	UNIT RATE	TOTAL COST
1.08.04	PLATE 4 MM THICK 400x120	NOS	60		
1.08.05	SHEET 10 MM THICK 375x 770	NOS	10		
	SUPPORT STRUCTURAL STEEL	TON	03		
	TOTAL				

1.09.00 - ISOLATED PHASE BUSDUCT & ACCESSORIES(To be carried out Under the supervision of M/s C& S as per spec No. 202 clause 32)

1.09.01	LINE SIDE BUSDUCT	MTRS	135		
1.09.02	TAP OFF BUSDUCT FOR PT CUBICLE & UAT	MTRS	36		
1.09.03	SINGLE POLE BUSDUCT FOR NGT MTR	MTRS	05		
1.09.04	OPEN BUSBAR WITH INSULATORS	MTRS	54		
1.09.05	PTSP CUBICLE NOS 1	NOS	01		
1.09.06	NGT	NOS	01		
1.09.07	AIR PRESSURISATION UNIT, weight:2T (size:2350mmx750mmx1500mm)	NOS	01		
	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 10.01.26	
1.02.00	PANELS AND CUBICALS 1.02.01 TO 1.02.09	
1.03.00	PANEL MOUNTED INSTRUMENT 1.03.01 TO 1.03.09	
1.04.00	JUCTION BOXES & LOCAL CONTROL STATION (LCS) 1.04.01 TO 1.04.04	
1.05.00	PROCESS AND PNEUMATIC TUBING & FITTING 1.05.01 TO1.05.09	
1.06.00	CABLES 1.06.00 TO 1.06.15	
1.07.00	ERECTION OF CABLE TRAYS & CABLE DUCTS 1.07.01 TO 1.07.05	
1.08.00	FABRICATION,ERECTION OF STRUCTURE STEEL 1.08.01 TO 1.08.05	
1.09.00	ISOLATED PHASE BUSDUCTS & ACCESSORIES 1.09.01 TO 1.09.07	
	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 equipments 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 there of against Progressive running bills.

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

SIGNATURE & SEAL OF BIDDER

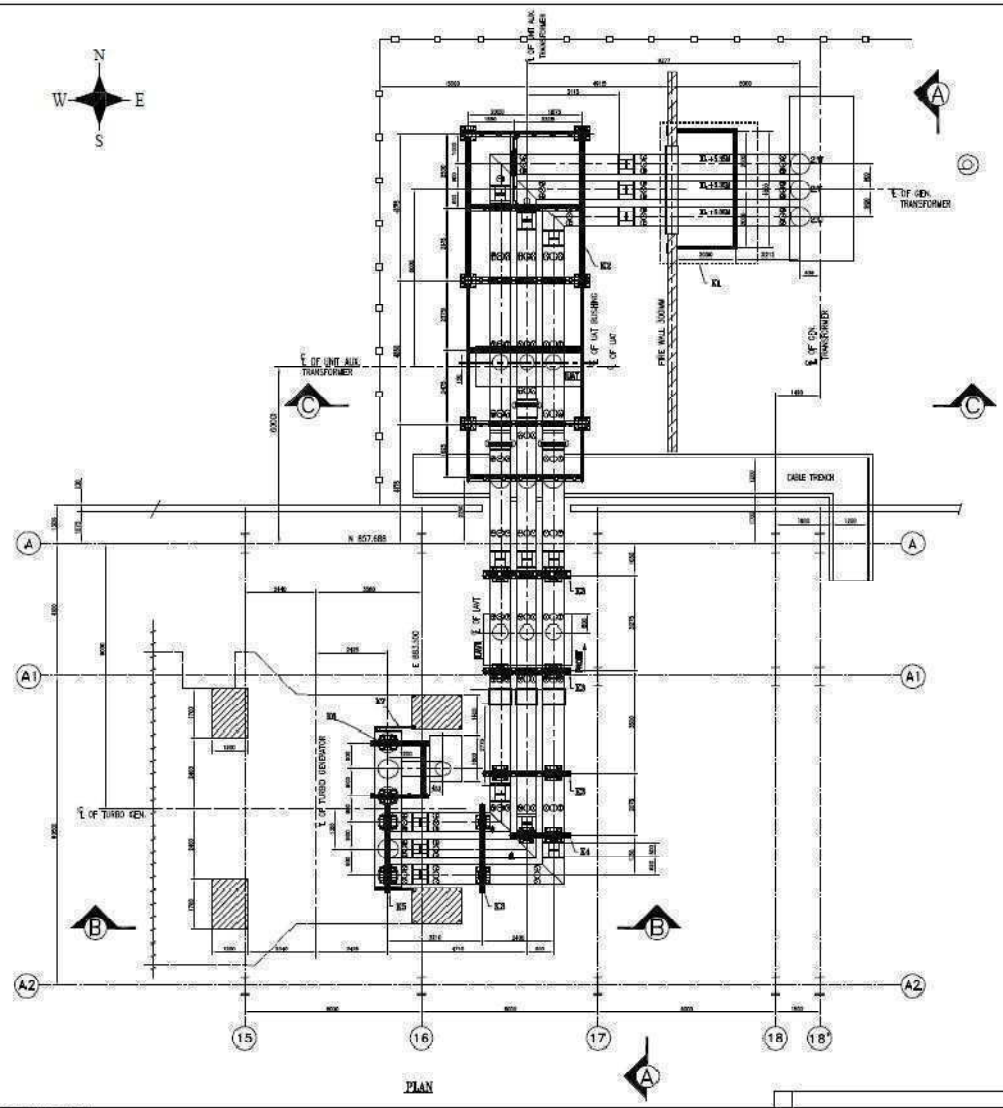
MAN HOUR RATES

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

Annexure 1



PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MM. AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL SUPPORTING STRUCTURE SHALL BE MS. HOT-DIP GALVANISED AS PER IS:4759.
3. ALL HARDWARE SHALL BE MS. 2n. ELECTRO PLATED

C&S REF. DRAWINGS:-

1. DRG. NO. C-952-1209-11277 (SHEET NNO. 05 & 06) LAYOUT & FOUNDATION DETAIL FOR BDWH, 11KV IPBD.

BUSDUCT SIZE

TPBD	ENCLOSURE	CONDUCTOR	SHORT CKT. RATING
MAIN GT 11KV, 8000A	Ø675, 5 THK. AL (GR-19501)	Ø325, 8 THK. AL (GR-19101)	80KA (rms) FOR 3 SEC. WITH 204KA (peak)
TAP-OFF, PTSP & NG DUCKLE-11KV, 800A	Ø500, 4 THK. AL (GR-19501)	Ø150, 7.5 THK. AL (GR-63401)	120KA (rms) FOR 3 SEC. WITH 306KA (peak)

PROJECT: 2x80 MW STG FOR SHRIRAM OPG GUJARAT

OWNER: OPG POWER GENERATION PVT LTD.

CLIENT: Shriram Y epc Limited., Chennai (Tamil Nadu)

CONSULTANT: AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.

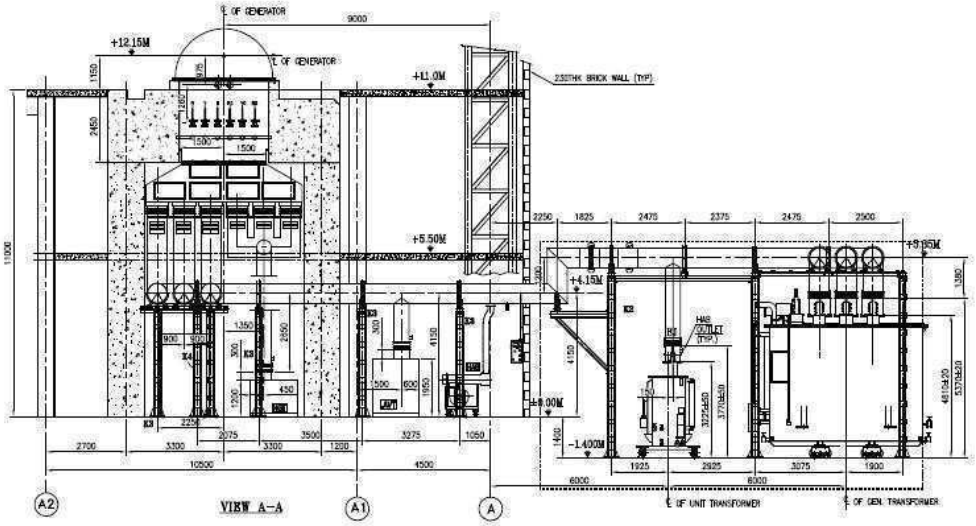
CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

C&S Electric Ltd.
B-1, SITE-IV, SURAJPUR INDL. AREA, KASNA ROAD, GREATER NOIDA, GAUTAM BUDH NAGAR (U.P.)
BUSDUCT DIVISION

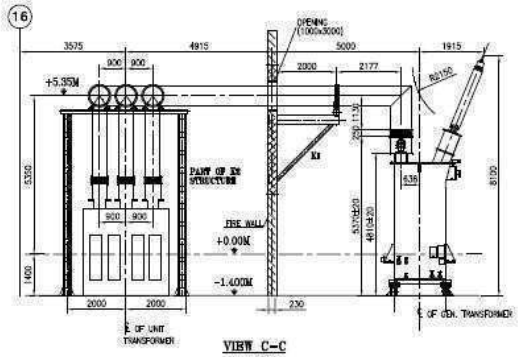
LOI NO.	P.O. NO. C709A01023 DATED-09.11.2009							
DRG TITLE	SUPPORTING STRUCTURE ARRANGEMENT FOR BDWH, 11KV IPBD.							
	J.K.	S.P.	K.J	N.T.S.		DRG. NO.: C-952-1209-11277		
DESCRIPTION	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE 03.08.2011	REV. 00	SH.NO. 38 CONT.39	A3

ALL DIMENSIONS ARE IN mm
UNLESS KOTHERWISE SPECIFIED

Annexure 1



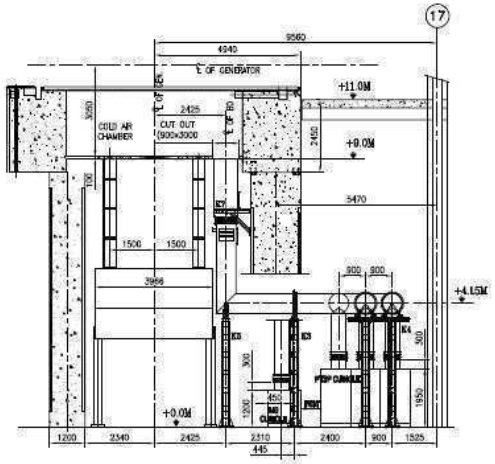
VIEW A–A



VIEW C–C

C&S REF. DRAWINGS:-

1. DRG. NO. C-952-1209-11277 (SHEET NNO. 05 & 06) LAYOUT & FOUNDATION DETAIL FOR 80MW, 11KV IPBD.



VIEW B–B

ALL DIMENSIONS ARE IN mm
UNLESS OTHERWISE SPECIFIED

PROJECT:	2x80 MW STG FOR SHRIRAM OPG GUJARAT
OWNER:	OPG POWER GENERATION PVT LTD.
CLIENT:	Shriram Epc Limited., Chennai (Tamil Nadu)
CONSULTANT:	AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.
CONTRACTOR:	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

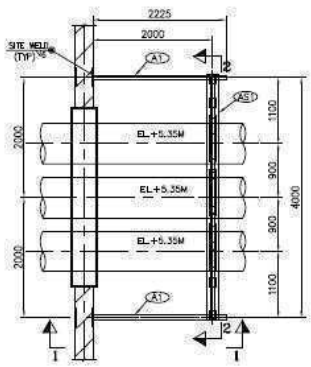
C&S Electric Ltd.
B-1, SITE-IV, SURAJPUR INDL. AREA, KASNA ROAD, GREATER NOIDA, GAUTAM BUDH NAGAR (U.P.)
SUSCNCT DIVISION

LOI NO.	P.O. NO. C709A01023 DATED-09.11.2009						
DRG.TITLE	SUPPORTING STRUCTURE ARRANGEMENT FOR 80MW, 11KV IPBD.						
J.K.	S.P.	K.J.	N.T.S.		DRG. NO. C-952-1209-11277		
DRN. BY	CHD. BY	APPD. BY	SCALE	DATE 03.08.2011	REV. 00	SH.NO. 39 CONT.40	A3

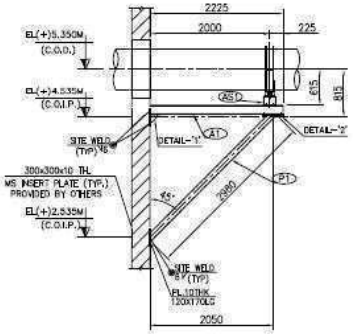
REV. NO.	DESCRIPTION	APPD.	DATE

Annexure 1

TYPE-K1(QTY.:-1NO.)



SECTION 1-1



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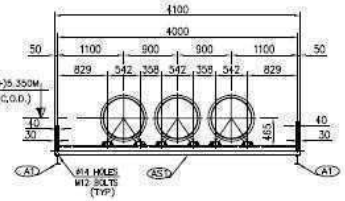
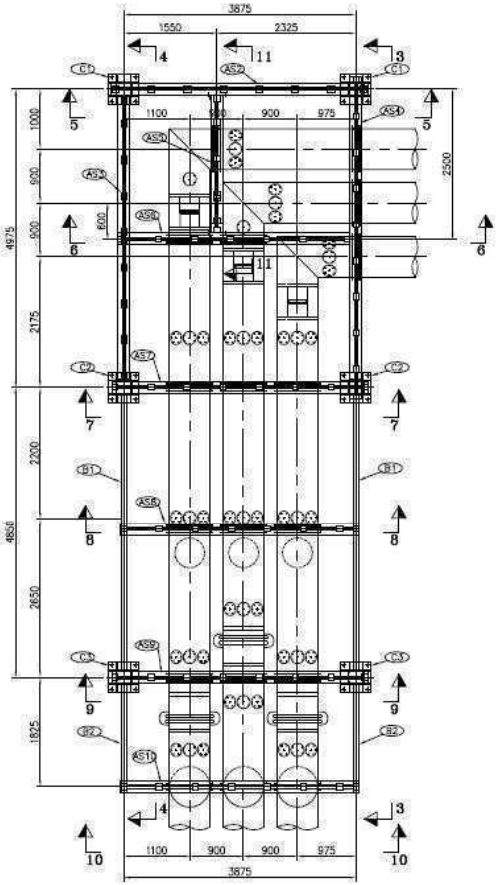
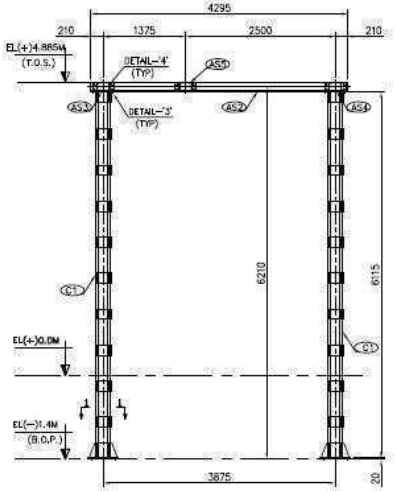


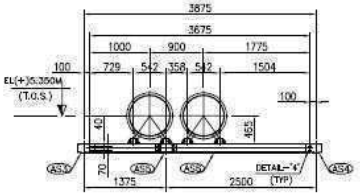
TYPE-K2(QTY.:-1NO.)



SECTION 5-5



SECTION 6-6



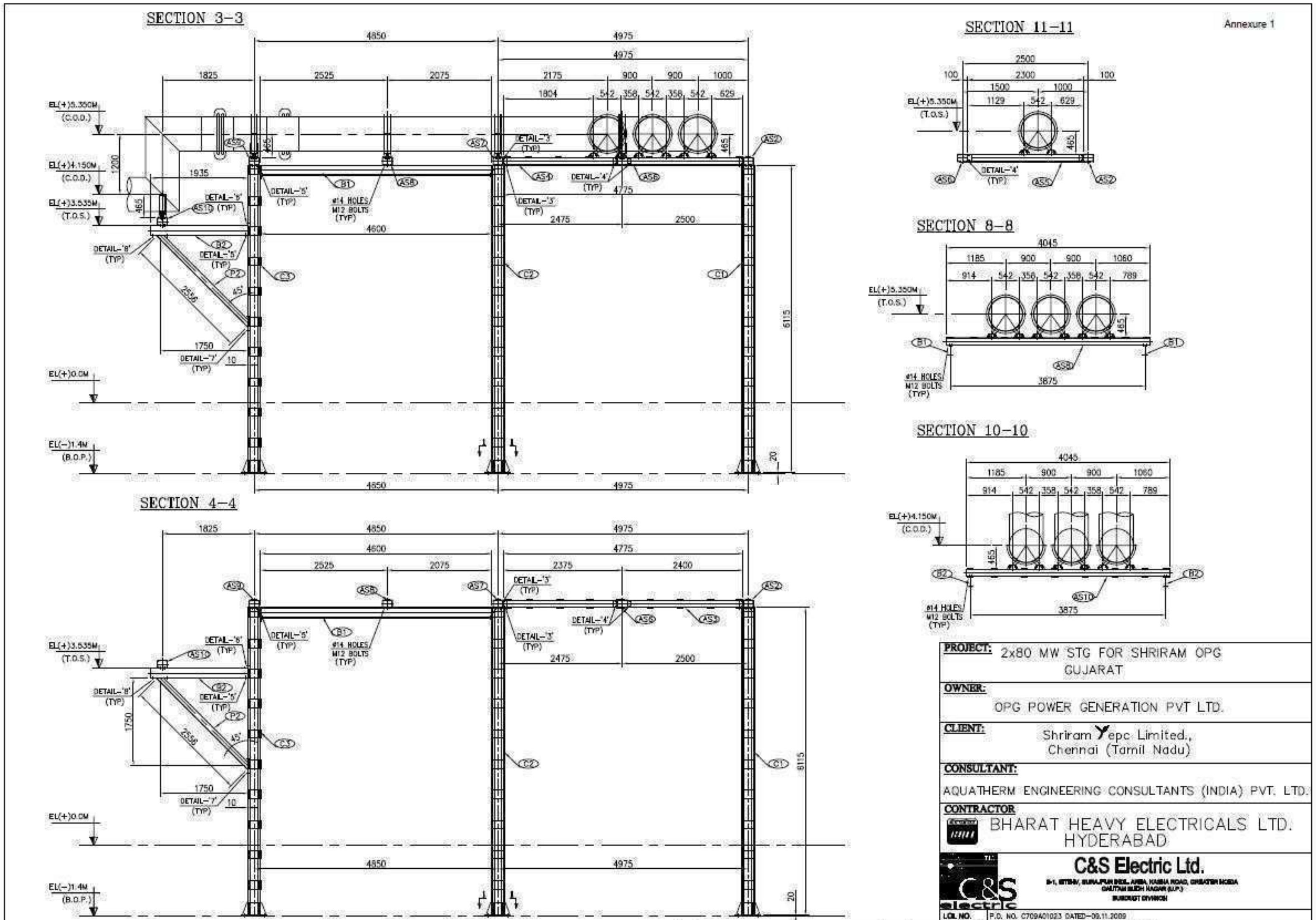
PROJECT:	2x80 MW STG FOR SHRIRAM OPG GUJARAT
OWNER:	OPG POWER GENERATION PVT LTD.
CLIENT:	Shriram Yepc Limited., Chennai (Tamil Nadu)
CONSULTANT:	AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.
CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD
	C&S Electric Ltd.
LOI NO.	P.O. NO. C709A01023 DATED-09.11.2009
DRG.TITLE	STRUCTURE ARRANGEMENT FOR 80MW, 11KV PSS.

NO.	DESCRIPTION	APPD.	DATE	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE	REV.	SH.NO.	CONT.	A3
				JK	SP	KJ	N.T.S.	03.08.2011	00	40	41	

DRG. NO. : C-952-1209-11277

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

Annexure 1



PROJECT:	2x80 MW STG FOR SHRIRAM OPG GUJARAT
OWNER:	OPG POWER GENERATION PVT LTD.
CLIENT:	Shriram epc Limited., Chennai (Tamil Nadu)
CONSULTANT:	AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.
CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

C&S Electric Ltd.

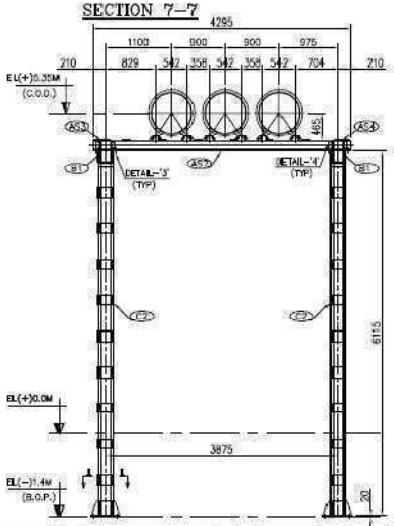
LOI. NO.	P.O. NO. C709A01023 DATED-09.11.2009							
DRG.TITLE	STRUCTURE ARRANGEMENT FOR 80MW, 11KV PBD.							
JK	SP	KJ	N.T.S.		DRG. NO.: C-952-1209-11277			
DRN. BY	CHD. BY	APPD. BY	SCALE	DATE: 03.08.2011	REV. 00	SH.NO.: 41	CONT. 42	A3

SR. NO.	DESCRIPTION	APPD.	DATE

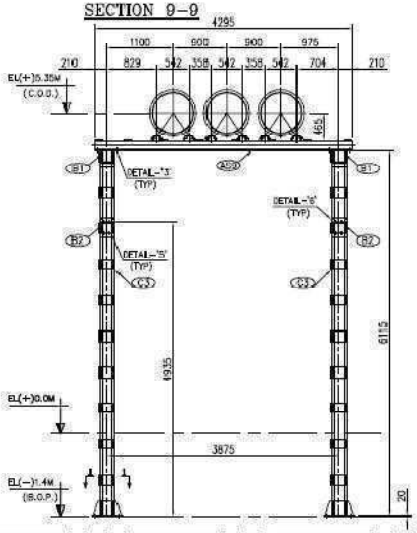
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

Annexure 1

SECTION 7–7



SECTION 9–9



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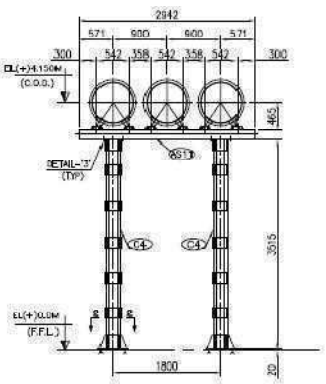

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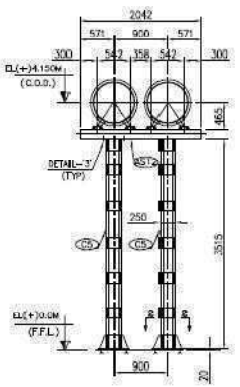

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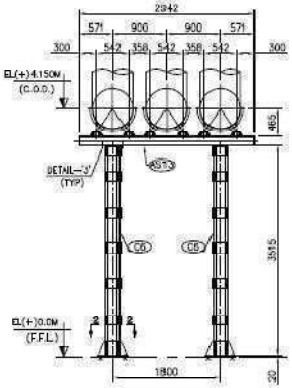


ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

REV.	DESCRIPTION	APPD.	DATE	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE	
				JK	SP	KJ	N.T.S.	03.06.2011	

PROJECT: 2×80 MW STG FOR SHRIRAM OPG GUJARAT

OWNER: OPG POWER GENERATION PVT LTD.

CLIENT: Shriram Epc Limited., Chennai (Tamil Nadu)

CONSULTANT: AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

C&S Electric Ltd.

LOI NO.: P.O. NO. 0709A01023 DATED–09.11.2009

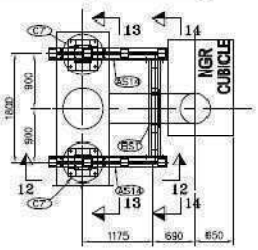
DRG.TITLE.: STRUCTURE ARRANGEMENT FOR 80MW, 11KV PSS.

DRG. NO.: IC–952–1209–11277

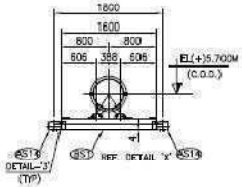
REV. 00 SHEET NO.: 42 CONT. 45 A3

Annexure 1

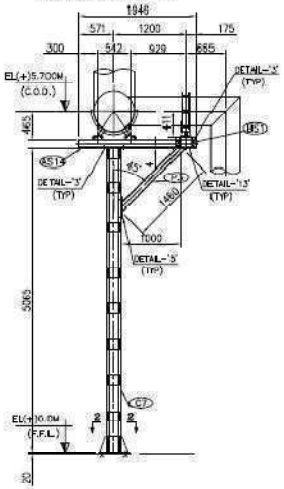
TYPE-K6(QTY.:-1NO.)



SECTION 14-14



SECTION 12-12



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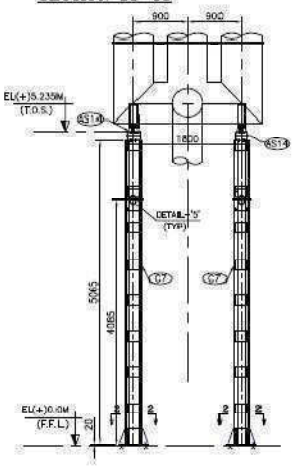

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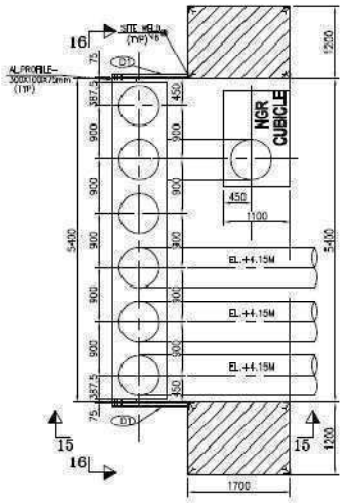
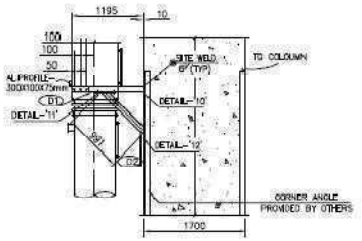
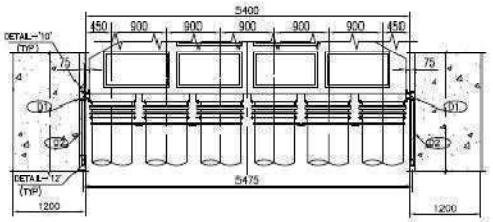


SECTION 15-15



SECTION 16-16

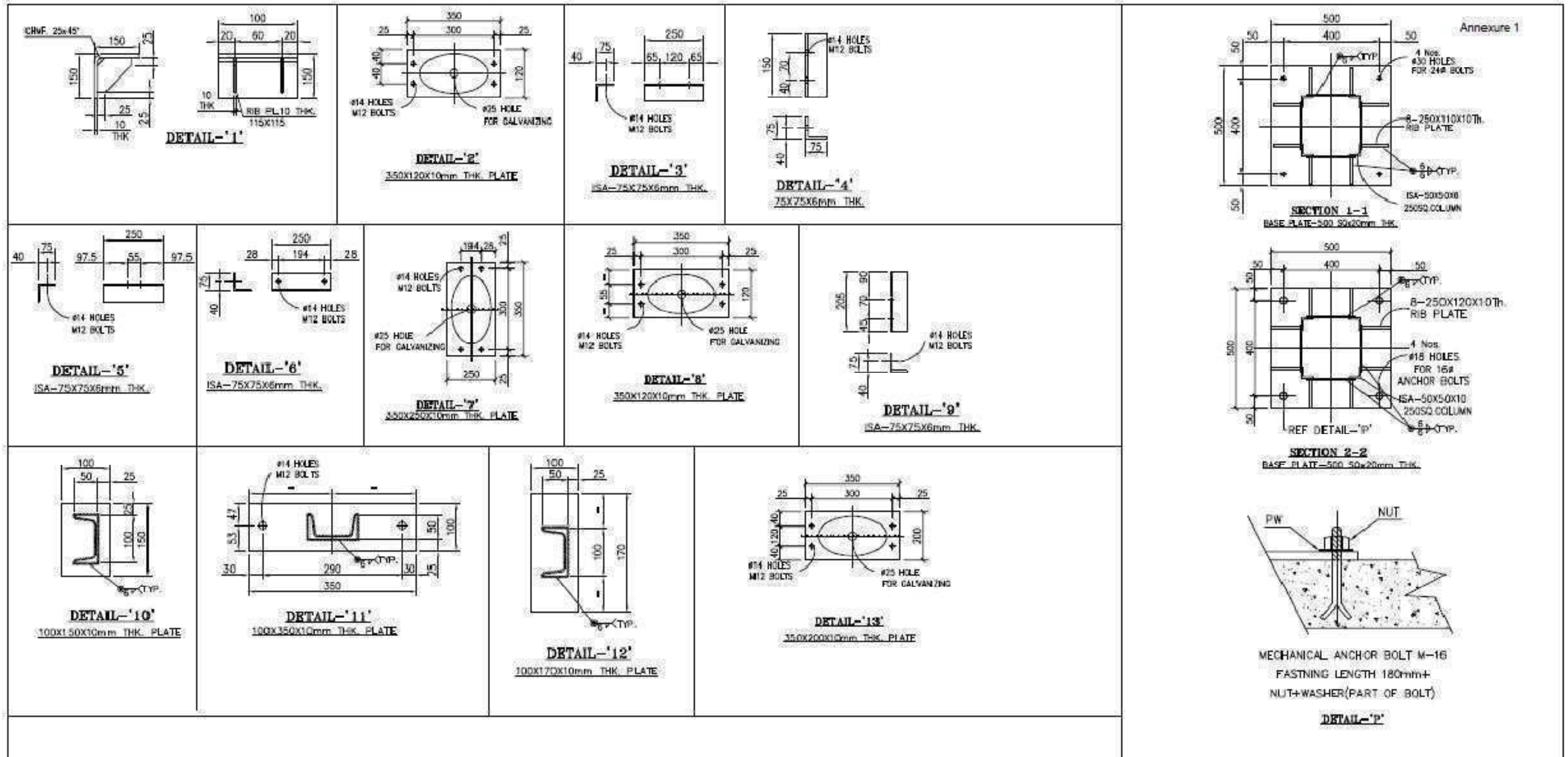


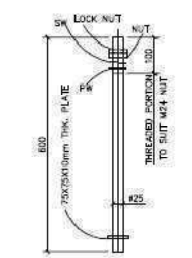
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

PROJECT:	2x80 MW STG FOR SHRIRAM OPG GUJARAT
OWNER:	OPG POWER GENERATION PVT LTD.
CLIENT:	Shriram Yepc Limited., Chennai (Tamil Nadu)
CONSULTANT:	AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.
CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD
	C&S Electric Ltd.
LOI. NO.	P.O. NO. C709A0102.3 DATED-09.11.2009
DRG.TITLE.	STRUCTURE ARRANGEMENT FOR 80MW, 15KV PBG.

REV. NO.	DESCRIPTION	APPD.	DATE	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE	DRG. NO.	REV.	SH.NO.	CONT.	A3
				JK	SP	KJ	N.T.S.	03.08.2011	C-952-1209-11277	00	43	44	

Annexure 1





DETAIL OF FOUNDATION BOLT
(FOUNDATION BOLT TO BE GROUTED 500MM IN SIDE THE RCC)
THE THREADED PORTION OF FOUNDATION BOLT SHALL BE 2m. ELECTRO PLATED AND BALENCE PORTION SHALL BE EPOXY BASED CEMENT PRIMER OR GALVANIZED.

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

PROJECT: 2x80 MW STG FOR SHRIRAM OPG GUJARAT

OWNER: OPG POWER GENERATION PVT LTD.

CLIENT: Shriram epc Limited., Chennai (Tamil Nadu)

CONSULTANT: AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.

CONTRACTOR BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

C&S Electric Ltd.

LOI. NO.	P.O. NO. C709A01023 DATED-09.11.2009
DRG.TITLE	STRUCTURE ARRANGEMENT FOR 80MW, 11KV PBD.

REV. NO.	DESCRIPTION	APPD.	DATE	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE	REV.	DRG. NO.	SH.NO.	CONT.	
				JK	SP	KJ	N.T.S.	03.08.2011	00	C-952-1209-11277	44	45	A3

BILL OF QUANTITY

SL.NO.	ITEM NO	DESCRIPTION	QTY (pcs)	LENGTH (MM)	WEIGHT OF PCS IN KG	TOTAL WEIGHT IN KG
1	K1-AS1	2 ISMC-150 IN 150X200 BOX BEAM	1	4100	147.93	147.93
2	K1-P1	PIPE100NB	2	2980	40.96	81.91
3	K1-A1	ISMB150	2	2225	37.43	74.86
4	K2-C1-C3	4-ISA-50X50X6THK. BOX COLUMN(250X250)	6	6115	213.52	1281.09
5	K2-AS2,AS7 &AS9	2 ISMC-150 IN 150X200 BOX BEAM	3	4295	154.49	463.46
6	K2-AS6	2 ISMC-150 IN 150X200 BOX BEAM	1	3675	136.04	136.04
7	K2-AS5	2 ISMC-150 IN 150X200 BOX BEAM	1	2300	86.45	86.45
8	K2-AS3& AS4	2 ISMC-150 IN 150X200 BOX BEAM	2	4775	174.35	348.70
9	K2-B1	ISMB200	2	4600	116.80	233.61
10	K2-B2	ISMB200	2	1935	52.31	104.62
11	K2-AS8	2 ISMC-150 IN 150X200 BOX BEAM	1	4045	148.13	148.13
12	K2-AS10	2 ISMC-150 IN 150X200 BOX BEAM	1	4045	148.13	148.13
13	K2-P2	PIPE100NB	2	2556	41.09	82.19
14	K3-AS11	2 ISMC-150 IN 150X200 BOX BEAM	4	2942	107.67	430.69
15	K3-C4	4-ISA-50X50X6THK. BOX COLUMN(250X250)	8	3515	144.11	1152.86
16	K4-AS12	2 ISMC-150 IN 150X200 BOX BEAM	1	2042	75.74	75.74
17	K4-C5	4-ISA-50X50X6THK. BOX COLUMN(250X250)	2	3515	144.11	288.21
18	K5-AS13	2 ISMC-150 IN 150X200 BOX BEAM	1	2942	107.67	107.67
19	K5-C6	4-ISA-50X50X6THK. BOX COLUMN(250X250)	2	3515	144.11	288.21
20	K6-AS14	2 ISMC-150 IN 150X200 BOX BEAM	2	1946	72.51	145.02
21	K6-C7	4-ISA-50X50X6THK. BOX COLUMN(250X250)	2	5065	183.31	366.62
22	K6-BS1	2 ISMC-200 IN 150X200 BOX BEAM	1	1600	82.87	82.87
23	K7-D1	ISMC 100	2	1195	22.85	45.70
24	K7-D2	ISMC 100	2	991	20.91	41.82
25	FND BOLT (MS)	M24X600 LONG.+N+LN+PW+SW	24	-	3.50	148.80
26	BOLT (MS)	M12X50B+N+LN+2PW+SW	72	-	0.20	14.40
27	BOLT (MS)	M12X50B+N+LN+TW+PW+SW	180	-	0.20	36.00
28	M12/125 ANCHOR BOLT (MS)	M12X125+NUT+1PW	66	-	0.45	29.70
		TOTAL WEIGHT OF ALL MEMBERS =				6591.43
		@5% WELDING/GALVANISED =				329.571297
		GRAND TOTAL WEIGHT OF ALL MEMBERS				6920.997237
					SAY=7.0 TONS	

LEGEND

SL.NO.	ITEM NO	DESCRIPTION
1	C1 TO C7	4-ISA-50X50X6 THK. BOX COLUMN(250X250) WITH BATTEN PLATE-200x200x6 MM THK. @TOP & BOTTOM & 200x250x6 THK WITH 600 mm c/c SPACING. @ INTERMEDIATE
2	AS1 TO AS14	2 ISMC-150 IN 150X200 BOX BEAM WELDED WITH BATTEN PLATE-120X120X6 MM THK.WITH 700 mm c/c SPACING
3	BS1	2 ISMC-200 IN 200X200 BOX BEAM WELDED WITH BATTEN PLATE-120X120X6 MM THK.WITH 700 mm c/c SPACING
4	D1 & D2	ISMC 100
5	P1 TO P2	PIPE 100NB
6	B1 TO B2	ISMB 200
7	A1	MB150

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

PROJECT:	2x80 MW STG FOR SHRIRAM OPG GUJARAT
OWNER:	OPG POWER GENERATION PVT LTD.
CLIENT:	Shriram Yepc Limited., Chennai (Tamil Nadu)
CONSULTANT:	AQUATHERM ENGINEERING CONSULTANTS (INDIA) PVT. LTD.
CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD
	C&S Electric Ltd. 8-1, SITE-IV, SURAJPUR IND., AREA, KASNA ROAD, GREATER NOIDA GAUTAM BUDDH NAGAR (U.P.) SUBUDT DIVISION
LOI NO.	P.O. NO.: C709A01023 DATED-09.11.2009
DRG.TITLE	STRUCTURE ARRANGEMENT FOR 80MW, 11KV PSS

DESCRIPTION	APPD.	DATE	DRN. BY	CHD. BY	APPD. BY	SCALE	DATE	REV.	SH.NO.	CONT.	A3
			JK	SP	KJ	N.T.S.	03.08.2011	00	45		

DRG. NO. sC-952-1206-11277

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS

INSTRUMENTS HOOKUP DIAGRAMS

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	R.BIJU		19.11.93	
CHD.	G.R.REDDY		18.11.93	—
APPD.	G.R.Reddy		18.11.93	

DEPT. / CODE	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
TCEI / 415		N.T.S	N.A	—	—	—

TITLE	CARD CODE	DRAWING NO.	REV.
INSTRUMENTS HOOKUP DIAGRAMS	—	4-312-00-50126	00

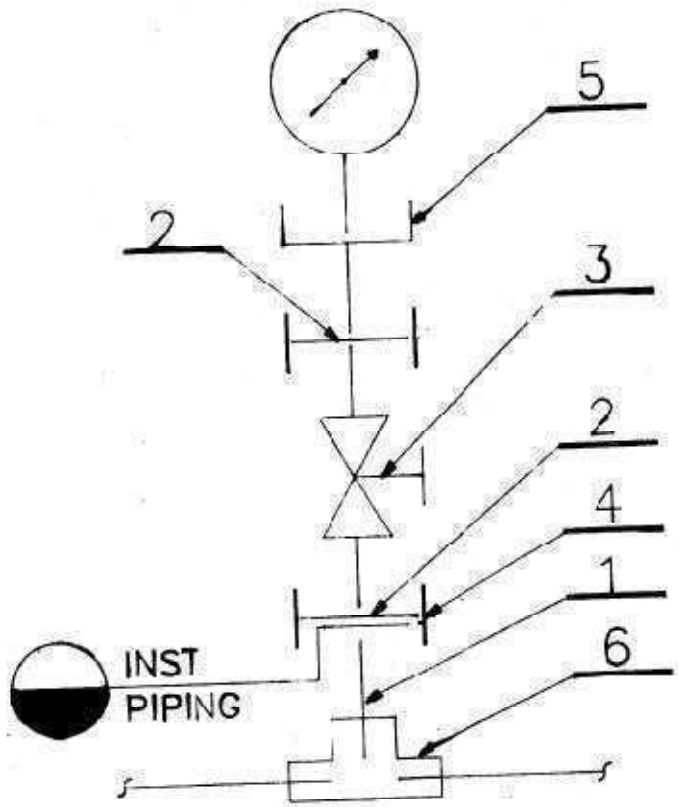
SHEET NO. 1 NO OF SHEETS 44

INVENTORY NO SIGN AND DATE REF. DRG. NO. HOOKUP1.DWG

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTRIBUTION OF PRINTS

Annexure-2



ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

HOOKUP2.DWG

INVENTORY NO. SIGN AND DATE REF. DRG. NO.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	R.BIJU		13.11.93	—
CHD.	G.R.REDDY		18.12.93	
APPD.	G.R.REDDY		18.12.93	

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
TCEJ	C/M/F	N.T.S	NA	—	—	—
CODE 415						

TITLE LOCAL DIRECT MOUNTED PRESSURE GAUGE CONNECTION – JACKING OIL PIPE LINES

CARD CODE —

DRAWING NO. 4-31[illegible]0-50126 REV. 00

SHEET NO. 2 END OF SHEETS 44

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM UNLESS)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTRIBUTION OF PRINTS

INVENTORY NO SIGN AND DATE REF. DRG NO. HOOKUP3.DWG

EXECUTION – I (CARBON STEEL)

POS NO.	DESCRIPTION	DIMENSION	MATERIAL	CODE	QTY
1	EXTENSION (NP 640)	M20 X 1.5 L	IS 1570 C40N	HY7316663022	1
2	FLAT SEALING	ø20	ALUMINIUM	HY7161094828	2
3	PRESSURE GAUGE VALVE (NP 250)	M20 X 1.5	A 105	AA7316402016	1
4	PRESSURE GAUGE COUPLING (NP 640)	M20 X 1.5 L	C40N	HY7316664029	1
5	ADAPTOR	1/2" NPT–F/ M20x1.5– M	A 105	TC9756219017	1
6	SPL. TEE	–	A 105	–	1

EXECUTION – II (STAINLESS STEEL)

POS NO.	DESCRIPTION	DIMENSION	MATERIAL	CODE	QTY
1	EXTENSION (NP 640)	M20 X 1.5 L	STAINLESS STEEL	HY7316663417	1
2	FLAT SEALING	ø20	ALUMINIUM	HY7161094828	2
3	PRESSURE GAUGE VALVE (NP 250)	M20 X 1.5	A182–F316	AA7316402202	1
4	PRESSURE GAUGE COUPLING (NP 640)	M20 X 1.5 L	A182–F316	HY7316664037	1
5	ADAPTOR	1/2" NPT–F/ M20x1.5– M	A182–F321	TC9756219025	1
6	SPL. TEE		A182–F321	–	1

BILL OF MATERIAL FOR SHEET 2

ITEM NO.	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT / QTY

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	R.BIJU		18-11-93	–
CHD.	G.R.REDDY		18-12-93	
APPD.	G.R.REDDY		18-12-93	

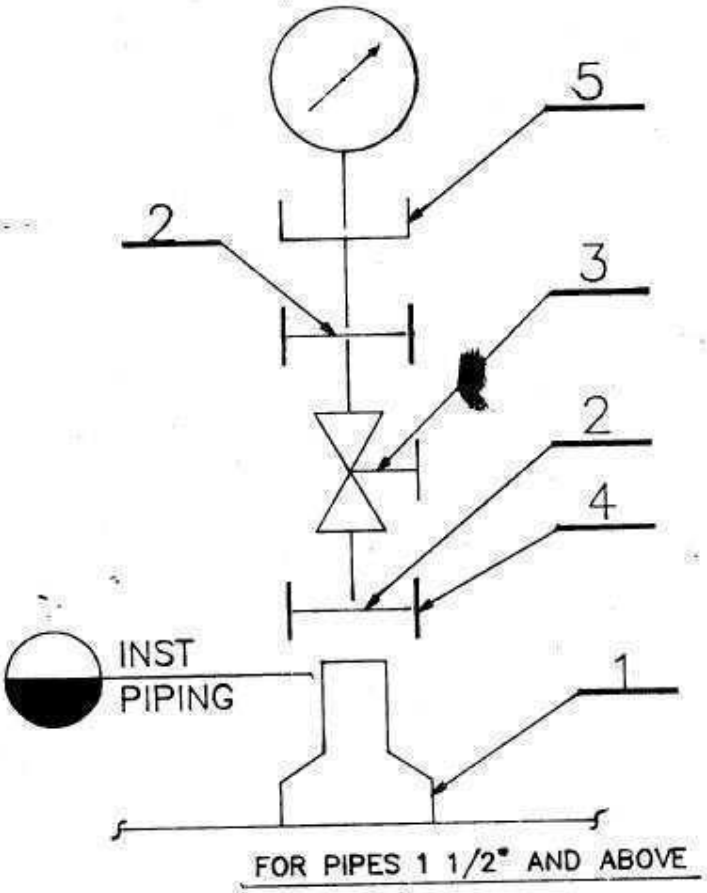
DEPT. / CODE	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
TCEI / 415		N.T.S	NA	–	–	–

TITLE	CARD CODE	DRAWING NO.	REV.
BILL OF MATERIAL FOR SHEET 2	–	4-312-BD-5012-6	00

SHEET NO. 3 NO OF SHEETS 4

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS



FOR PIPES 1 1/2" AND ABOVE

SYMBOL ON P & I DIAGRAM

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18.11.93	—
CHD.	G.R.REDDY		18.11.93	
APPD.	G.R REDDY		18.11.93	

DEPT.	GRADE OF TOL.DIM.		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI	C/M/F		N.T.S	NA	—	—	—
CODE 415							

TITLE LOCAL DIRECT MOUNTED PRESSURE GAUGE CONNECTION OIL, WATER, PROCESS GAS PIPE LINES (FOR 1 1/2" PIPES & ABOVE)

CARD CODE —

DRAWING NO. 4-312-00-50126 REV. 00

SHEET NO. 8 NO OF SHEETS 44

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | HOOKUP8.DWG

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS

EXECUTION – I (CARBON STEEL)

POS NO.	DESCRIPTION	DIMENSION	MATERIAL	CODE	QTY
1	EXTENSION (NP 640)	M20 X 1.5 L	C40N	HY7316663022	1
2	FLAT SEALING	ϕ20	ALLUMINIUM	HY7161094828	2
3	PRESSURE GAUGE VALVE (NP 250)	M20 X 1.5	A 105	AA7316402016	1
4	PRESSURE GAUGE COUPLING (NP 640)	M20 X 1.5	C40N	HY7316664029	1
5	ADAPTOR	1/2"NPT–F/ M20x1.5– M	A 105	TC9756219017	1

EXECUTION – II (STAINLESS STEEL)

POS NO.	DESCRIPTION	DIMENSION	MATERIAL	CODE	QTY
1	EXTENSION (NP 640)	M20 X 1.5 L	A182–F321	TC9756216026	1
2	FLAT SEALING	ϕ20	ALLUMINIUM	HY7161094828	2
3	PRESSURE GAUGE VALVE (NP 250)	M20 X 1.5	A182–F316	AA7316402202	1
4	PRESSURE GAUGE COUPLING (NP 640)	M20 X 1.5	A182–F316	HY7316664037	1
5	ADAPTOR	1/2"NPT–F/ M20x1.5– M	A182–F321	TC9756219025	1

BILL OF MATERIAL FOR SHEET 8

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18.11.93	—
CHD.	G.R.REDDY		18.12.93	
APPD.	G.R.REDDY		18.12.93	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI		N.T.S	NA	—	—	—
CODE 415						

TITLE: BILL OF MATERIAL FOR SHEET 8

CARD CODE: —

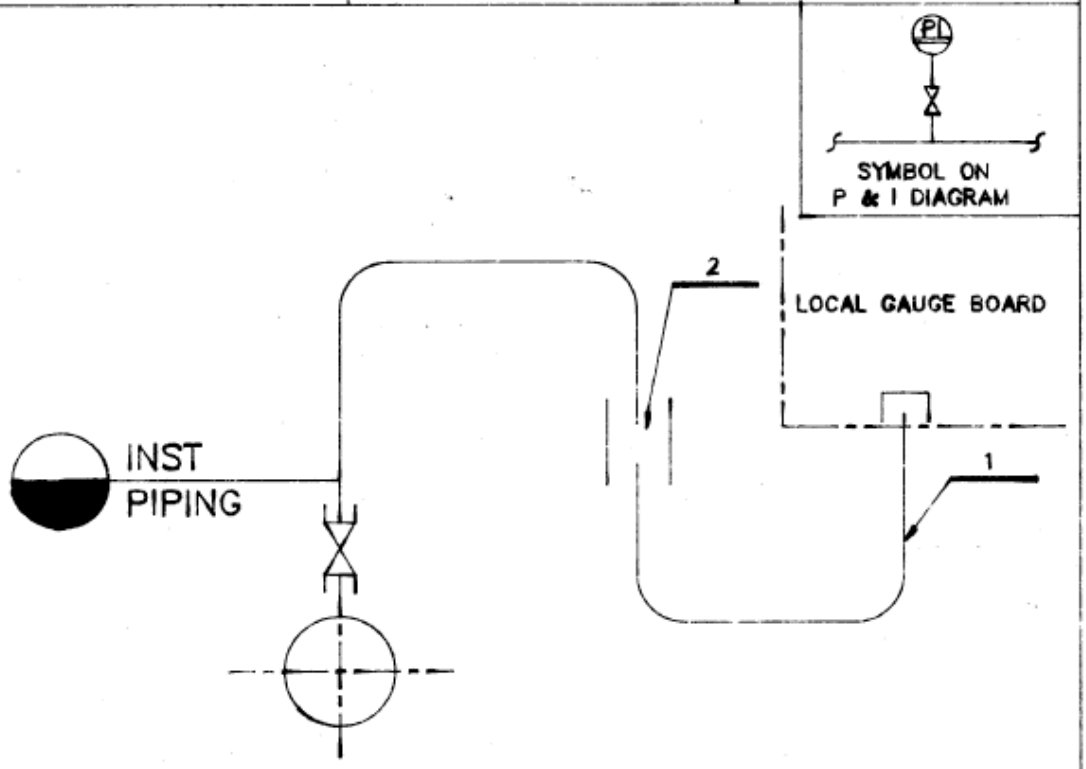
DRAWING NO. 4 312 00 50126 REV. 00

SHEET NO. 8 NO OF SHEETS 14

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. HOOKUP9.DWG

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS



POS NO.	DESCRIPTION	DIMENSION	MATERIAL	CODE	QTY
1	PIPE	1/2" sch 80	SA335 GYP22	AA1069330086	15M
2	COUPLING	1/2"–6000SW	SA182 F22	AA7242520401	2

NOTE: THIS LOOP CAN BE USED FOR TEMPERATURE BETWEEN 415°C & 550 °C

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18.11.93	—
CHD.	G.R.REDDY		18.11.93	
APPD.	G.R REDDY		18-11-93	

DEPT. / CODE	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI / 415		N.T.S	NA	—	—	—

TITLE PRESSURE GAUGE CONNECTION LGB INSTRUMENTS (STEAM, SERVICE) (ANSI RATINGS 2500)

CARD CODE —

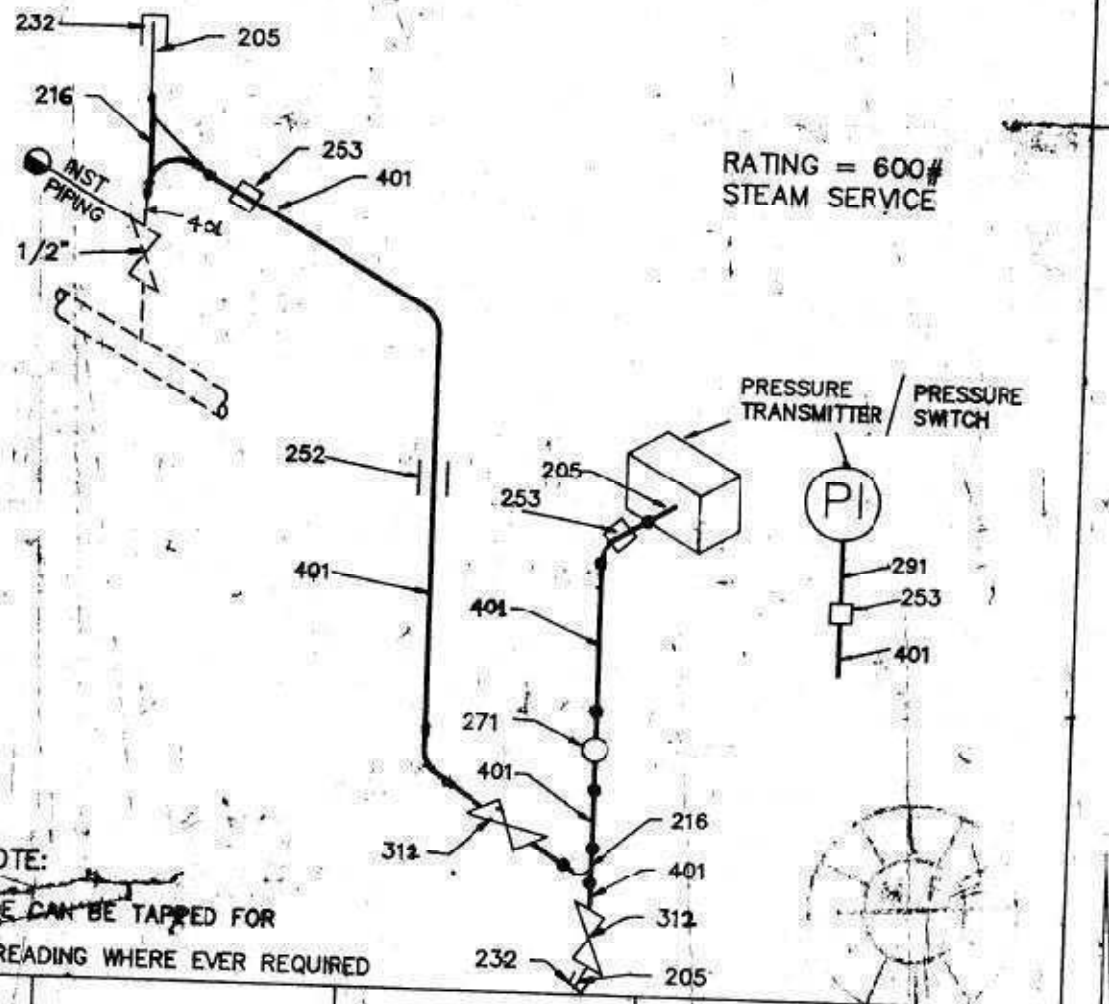
DRAWING NO. 4-312 00-50126 REV. 00

SHEET NO. 14 NO OF SHEETS 44

INVENTORY NO SIGN AND DATE REF. DRG. NO. HOOKUP14.DWG

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTRIBUTION OF PRINTS



NOTE:
PIPE CAN BE TAPPED FOR THREADING WHERE EVER REQUIRED

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	R.BIJU		18-11-93	—
CHD.	G.R.REDDY		18-11-93	
APPD.	G.R.REDDY		10-12-93	

DEPT.	GRADE OF TOL. DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
TCEI	C/M/F	N.T.S	NA	—	—	—
CODE 415						

TITLE: PRESSURE GAUGE CONNECTION (METER BELOW) STEAM SERVICE

CARD CODE: —

DRAWING NO. 4-312-0050126 REV. 0

SHEET NO. 15 NO OF SHEETS

FACTORY NO SIGN AND DATE REF. DRG NO. HOOKUP15.DWG

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
		CHECKED			CHECKED	STATUS OF DRAWING
						DISTURIBUTION OF PRINTS

POS NO.	DESCRIPTION	MATL	QTY	MATERIAL CODE
40½	PIPE DIA 1/2" SCH 80 ø21.3x3.7	A106 B	15M	AA1049355083
252	COUPLING ø 1/2" SW-F	A105	2	AA7242520046
216	T-UNION ø 1/2" SW-F	A105	2	AA7242510040
205	NIPPLE ø 1/2" BW/NPTM	A106GrB	3	HY7242578043
232	CAP ø 1/2" NPT-F	A105	2	HY7242579040
312	GLOBE VALVE ø1/2"SW	A105	2	AA7501508585
271	SYPHON 80S BW ø1/2"BW-M	A105	1	TC9755460018
291	ADAPTOR ø1/2BW-1/2 NPTM (FOR PRESS. GAUGE)	A105	1	TC915541102o
253	DILO COUPLING 1/2"-3000	A105	2	TC9756105038

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTREST OF THE COMPANY

REF. DRG. NO. HOOKUP16.DWG

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU	[signature]	18-11-96	—
CHD.	G.R.REDDY	[signature]	18-02-93	
APPD.	G.R.REDDY	[signature]	18-2-93	

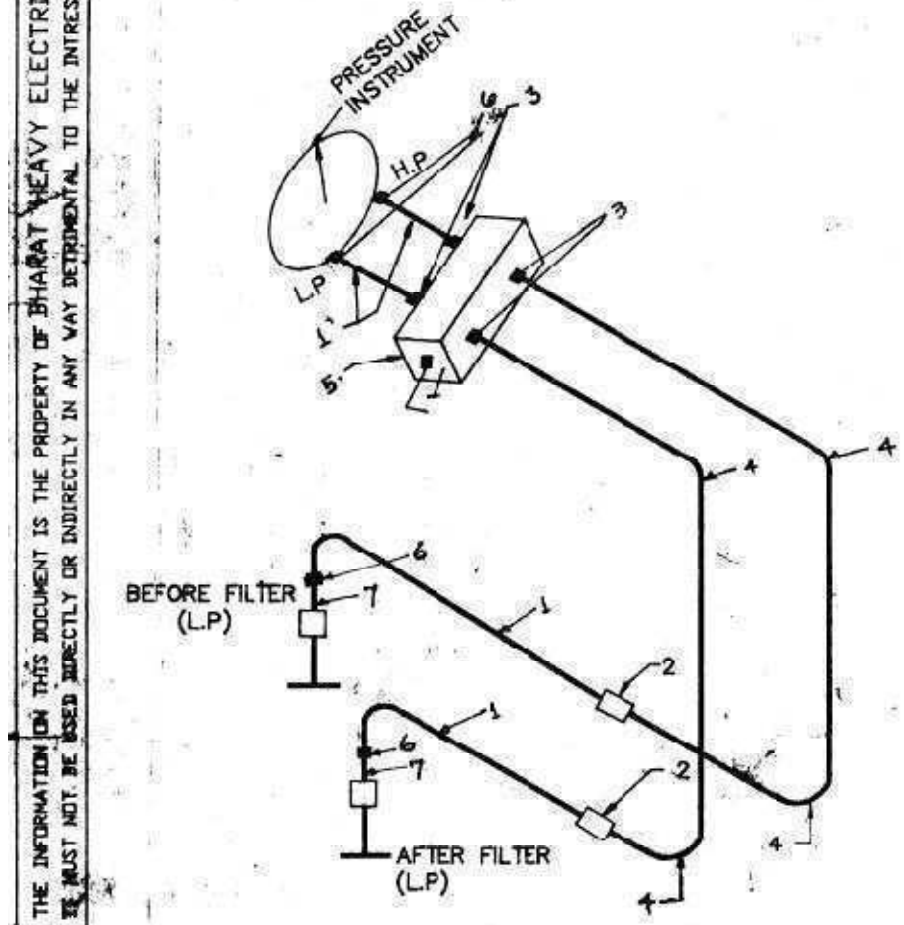
DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCE1 CODE 415	C/M/F	N.T.S	NA	—	—	—

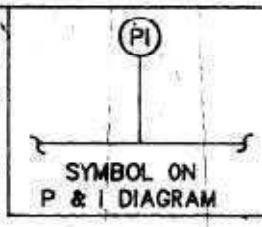
TITLE	CARD CODE	DRAWING NO.	REV.
BILL OF MATERIAL FOR SHT.15	—	4-312-00-50124	00
		SHEET NO. 16 NO OF SHEETS	

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS

REF. DRG NO. HOOKUP23.DWG SIGN AND DATE





ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18-11-93	—
CHD.	G.R.REDDY		18-11-93	
APPD.	G.R.REDDY		18-12-93	

DEPT.	GRADE	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI CODE 415	TOL. C/	N.T.S	NA	—	—	—

TITLE: DIFFERENTIAL PRESSURE INDICATOR (COMMON TAPPING FOR DPS & DPI)

CARD CODE: —

DRAWING NO. 4-312400-50126 REV. 00

SHEET NO. 23 NO OF SHEETS 44

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINTS

Annexure-2

POS NO.	DESCRIPTION	MATL	QTY	MATERIAL CODE
1	SS TUBE OD = 12.7 mm t = 2.1 mm	SS316	16M	HY1071090054
2	STRAIGHT UNION (FRACTIONAL TUBE TO FRACTIONAL TUBE)	SS-810 -6	2	TC9755501207
3	1/2" NPT-M CONNECTOR	SS-810 -1-8	6	TC9755501010
4	MALE ELBOW	SS-810 -2-8	4	TC9755501452
5	6 WAY MANIFOLD 1/2" NPT-F	SS316	1	HY7316561017
6	FENALE CONNECTOR 1/2"NPT-F TO SS TUBE 12.7mm OD	SS316	2	TC9755501118
7	NIPPLE $\phi 1/2"$ BW/NPTM	SS316	2	HY7242578841

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18.11.93	—
CHD.	G.R.REDDY		18-12-93	
APPD.	G.R.REDDY		18-12-93	

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI CODE 415	C/M/F	N.T.S	NA	—	—	—

TITLE BILL OF MATERIAL FOR SHT.23

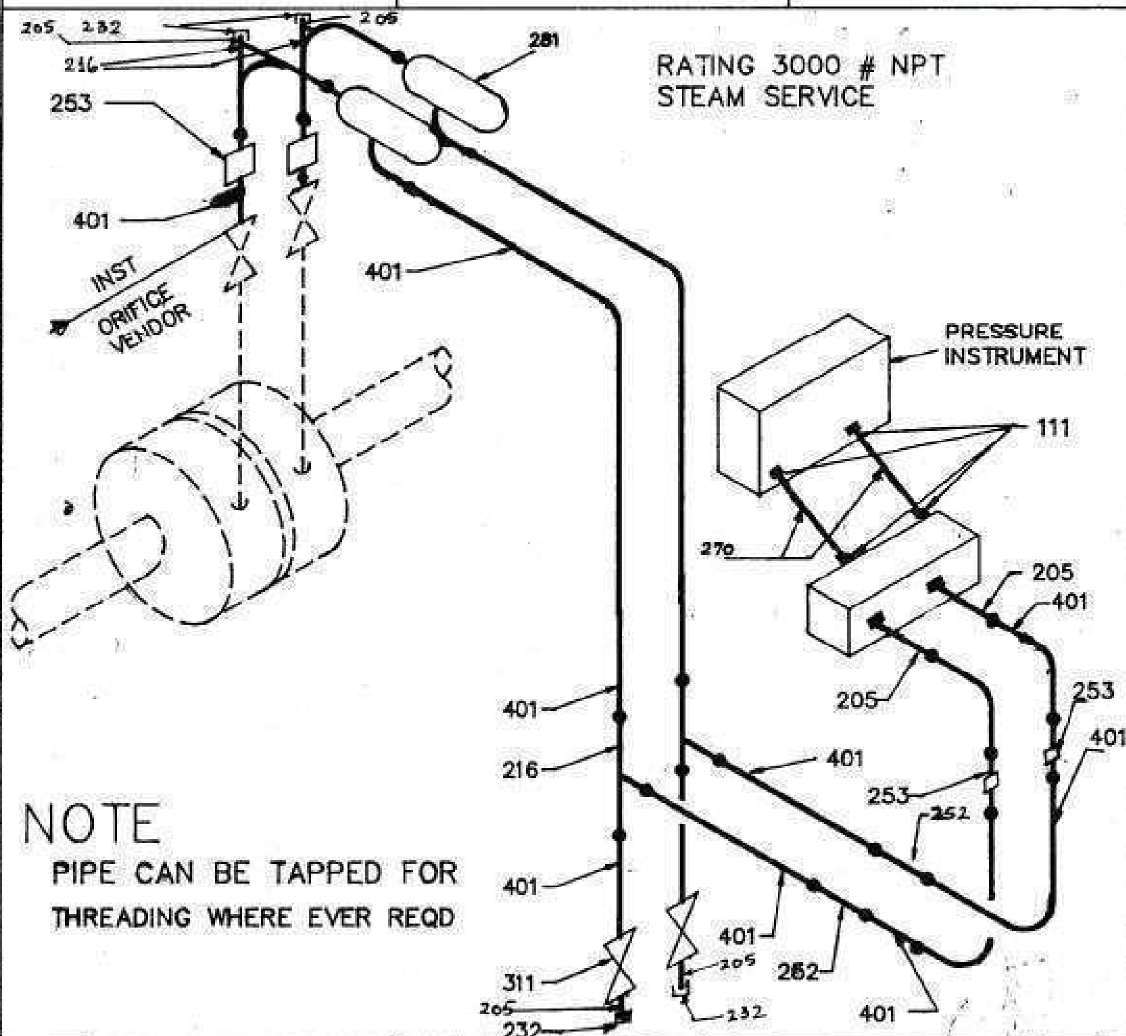
CARD CODE —

DRAWING NO. 4-312-0050126 REV. 00

SHEET NO. 24 NO OF SHEETS 42

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION
		CHECKED			CHECKED	STATUS OF DRAWING
						DISTURIBUTION OF PRINTS
					Annexure-2	



NOTE

PIPE CAN BE TAPPED FOR THREADING WHERE EVER REQD

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT WT. / QTY.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN.	DATE	NO.OF VAR.
	DRN.	R.BIJU	[signature]	18-11-93	
	CHD.	G.R.REDDY	[signature]	18-12-93	—
	APPD.	G.R.REDDY	[signature]	18-12-93	

DEPT. TCEI CODE 415	GRADE OF TOL.DIM. C/M/F	SCALE N.T.S	WEIGHT (KG) NA	REF. TO ASSY DRG. —	ITEM NO. —	NO.OF ITEMS —

TITLE	CARD CODE	DRAWING NO.	REV.
FLOW INSTRUMENT – DPT (METER BELOW) STEAM SERVICE	—	4-312-00-50126	00
		SHEET NO. 29 / NO OF SHEET	

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTRIBUTION OF PRINTS

POS NO.	DESCRIPTION	MATL	QTY	MATERIAL CODE
401	PIPE DIA 1/2" SCH 80 ϕ21.3 x 3.7	SA335 GR P22	15 M	AA1069330086
252	COUPLING ϕ 1/2" SW–F	SA182 F22	4	AA7242520401
216	T–UNION ϕ 1/2" SW–F	SA182 F22	4	AA7242510228
205	NIPPLE ϕ 1/2" BW/NPTM	AS	6	HY7242578647
232	CAP ϕ 1/2" NPT	AS	4	HY7242579228
311	GLOBE VALVE ϕ1/2"SW–F	AS	2	AA7561934586
301	5 WAY MANIFOLD ϕ1/2"NPT–F	SS316	1	HY7316561017
281	CONDENSATE POT ϕ1/2"SW–F	SS316	2	TC9755535012
253	DILO COUPLING ϕ1/2"BW–M	SA182 F22	4	TC9756105046
270	SS TUBE OD-12.7 MM t-2.1MM	SS 316	2M	HY1071090054
111	MALE CONNECTOR ϕ 1/2" NPT-M	SS 316	4	TC9755501010

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT WT. / QTY.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	R.BIJU		18.11.93	—
CHD.	G.R.REDDY		18.11.93	
APPD.	G.R.REDDY		18.11.93	

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
TCEI CODE 415	C/M/F	N.T.S	NA		—	—

TITLE BILL OF MATERIAL FOR SHT.29

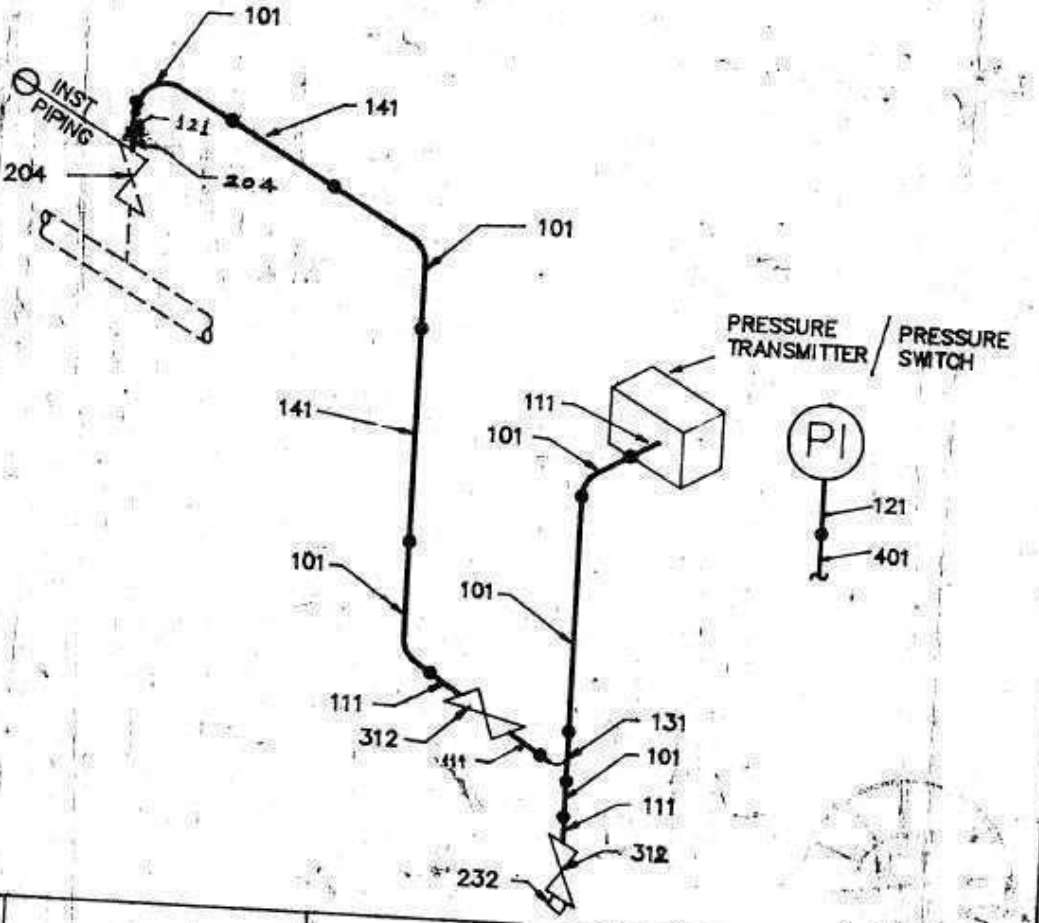
CARD CODE —

DRAWING NO. 4-312-00-50126 REV. 00

SHEET NO. 30 NO OF SHEETS 42

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTRIBUTION OF PRINTS



ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT WT. / QTY.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO OF VAR.
DRN.	R.BIJU		18.11.93	
CHD.	G.R.REDDY		18-11-93	
APPD.	G.R.REDDY		18-11-93	

DEPT. / GRADE OF TOL. DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO OF ITEMS
415	N.T.S	NA		—	—

TITLE PRESSURE INST. CONNECTION (WATER BELOW) GAS/LIQUID/COND./ LUBRICATING OIL/OIL SERVICE

CARD CODE —

DRAWING NO. 4-312[illegible]-60-[illegible]

SHEET NO. 33 NO OF SHEETS [illegible]

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	ADDITIONAL INFORMATION / STATUS OF DRAWING / DISTURIBUTION OF PRINT

POS NO.	DESCRIPTION	MATL	QTY	MATERIAL CODE
101	STAINLESS STEEL TUBE ø12.7 x 2.1	SS 304	15M	HY1071090054
111	MALE CONNECTOR ø1/2" NPT-M	SS 316	4	TC9755501010
121	FEMALE CONNECTOR ϕ 1/2" NPT-F	SS 316	2	TC9755501118
131	T-UNION ø12.7 OD	SS 316	1	TC9755501304
141	STRAIGHT UNION ø12.7 OD	SS 316	2	TC9755501207
204	NIPPLE 1/2" NPT/BW	SS 316	1	HY[illegible]841
232	PLUG ø1/2" NPT-M	SS 316	1	HY7242584280
312	NEEDLE VALVE ø1/2" NPT-F	SS 316	2	TCN731640006

ITEM NO	DESCRIPTION	DRAWING NO.	MATL. CODE / MATL. SPEN.	UNIT Wt. / QTY.

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REF. DRG. NO. HOOKUP34.DWG

INVENTORY NO. SIGN. AND DATE

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE
DRN.	R.BIJU		18.11.98
CHD.	G.R.REDDY		18.11.98
APPD.	G.R.REDDY		18.12.98

NO. OF VAR. —

DEPT. TCEI | CODE 415 | GRADE OF TOL.DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. — | ITEM NO. — | NO. OF ITEMS —

TITLE BILL OF MATERIAL FOR SHT.33

CARD CODE

DRAWING NO. 4-[illegible]-50126 REV.

SHEET NO. 34 NO. OF SHEETS

GENERAL NOTES

Annexure 3

1. TIG WELDING SHALL BE CARRIED OUT AT SITE FOR ALL SMALL PIPES (LESS THAN OR EQUAL TO 2") WITHOUT ANY EXCEPTION (APPLICABLE FOR ALL WELDING JOINTS IN EACH HOOK UP SCHEMES).

2. INSTRUMENT ORIENTATION AT SITE IS SELECTED WITH SUITABLE SPEACE FOR METER READING ACCESSIBILITY AND MAINTENANCE PURPOSE.

3. THE ORIENTATION OF TAPING FROM PROCESS PIPE (VERTICLE/HORIZONTAL) SELECTED IN SUCH WAY THAT PRESSURE/TEMPERATURE CAUCES ARE ACCESSIBLE FOR MAINTENANCE.

4. FOR ALL LINE MOUNTED FLANGED INSTRUMENTS OR WHEREVER FIRST ISOLATION VALVE IS FLANGED – GASKET, STUD BOLTS & NUTS ETC. ARE PROVIDED ALONG WITH PIPING MATERIAL.

5. CONTROL VALVES APPLICABLE FOR ALL SERVICES ARE WITH FLANGED END CONNECTIONS ONLY. FLANGE RATING AND MOC SUPPLIED AS PER BHEL PRACTICE.

6. AIR DISTRIBUTION HEADER ASSEMBLED DEPENDING ON LOCATION & NUMBER OF TAKE OFF POINTS IN THE SITE NEAR THE CONSUMPTION AREA WHICH IS AS PER SITE CONVENIENCE. FURTHER DISTRIBUTION FROM HEADER TO CONTROL VLAVE CARRIED OUT BY 6MM OD x 1MM THK PNEUMATIC SS TUBE.

7. INSTALLATION OF JB/ INST MAINTAINED AT A HEIGHT OF UPTO 1.5M FROM GROUND LEVEL OR FINISHED FLOOR LEVEL. SAME CAN BE FINALISED AT SITE.

8. ROOT VALVES FOR ALL THE INSTRUMENTS ARE SUPPLIED ALONG WITH PIPING MATERIAL. NO OF ROOT VALVES (SINGLE / DOUBLE) FOR LOW/HIGH PRESSURE SERVICES ARE AS PER P & ID'S.

9. IMPULSE LINE ROUTING SHOWN IN THIS DRAWING ARE INDICATIVE. ACTUAL ROUTING SHALL BE DECIDED AT SITE & UNNECESSARY BENDS IN IMPULSE LINE SHALL BE AVOIDED AS FAR AS POSSIBLE.

10. ALL IMPULSE LINES ARE FABRICATED USING PIPES (CS/SS) ASPER MATERIAL OF CONSTRUCTION MENTIONED IN PIPING SPECIFICATION AND END/FINAL CONNECTION TO INSTRUMENT WILL BE USING 1/2" ODx0.065" THK ASTM A269 TP TP 316 (FOR ALL EXCEPT STEAM SERVICES) AND A269 TP 321 N CASE OF GAS SERVICES.

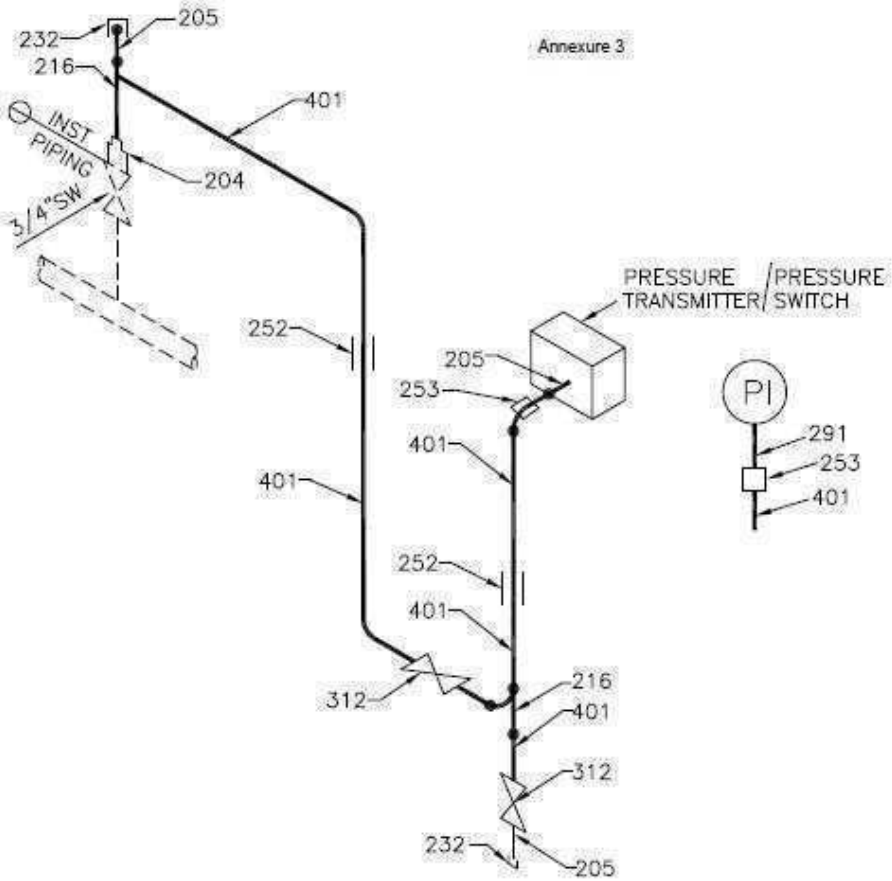
11. INSTRUMENTS LIKE TSV, PSV, TW, TE, FLOW METERS, PRDS, AND DS ETC., DOESN'T HAVE ANY INSTRUMENT HOOK UP SCHEME BECAUSE THEY ARE DIRECTLY FITTED ON PROCESS LINE.

12. THIS DOCUMENT IS FOR PE&SD(C&)–HYD LOOSE SUPPLIED INSTRUMENT ONLY. FOR MECHANICAL SKID ITEMS, INSTRUMENT WITH HOOKUP WILL BE SUPPLIED AS PACKAGE.

भेलबीएचईएल HYDERABAD	STANDARD	TITLE: GENERAL NOTES	DRG.NO.: 4–381–21–02948	
			SHEET NO: 3 OF 5	REV. 00

SCHEME 1

Annexure 3

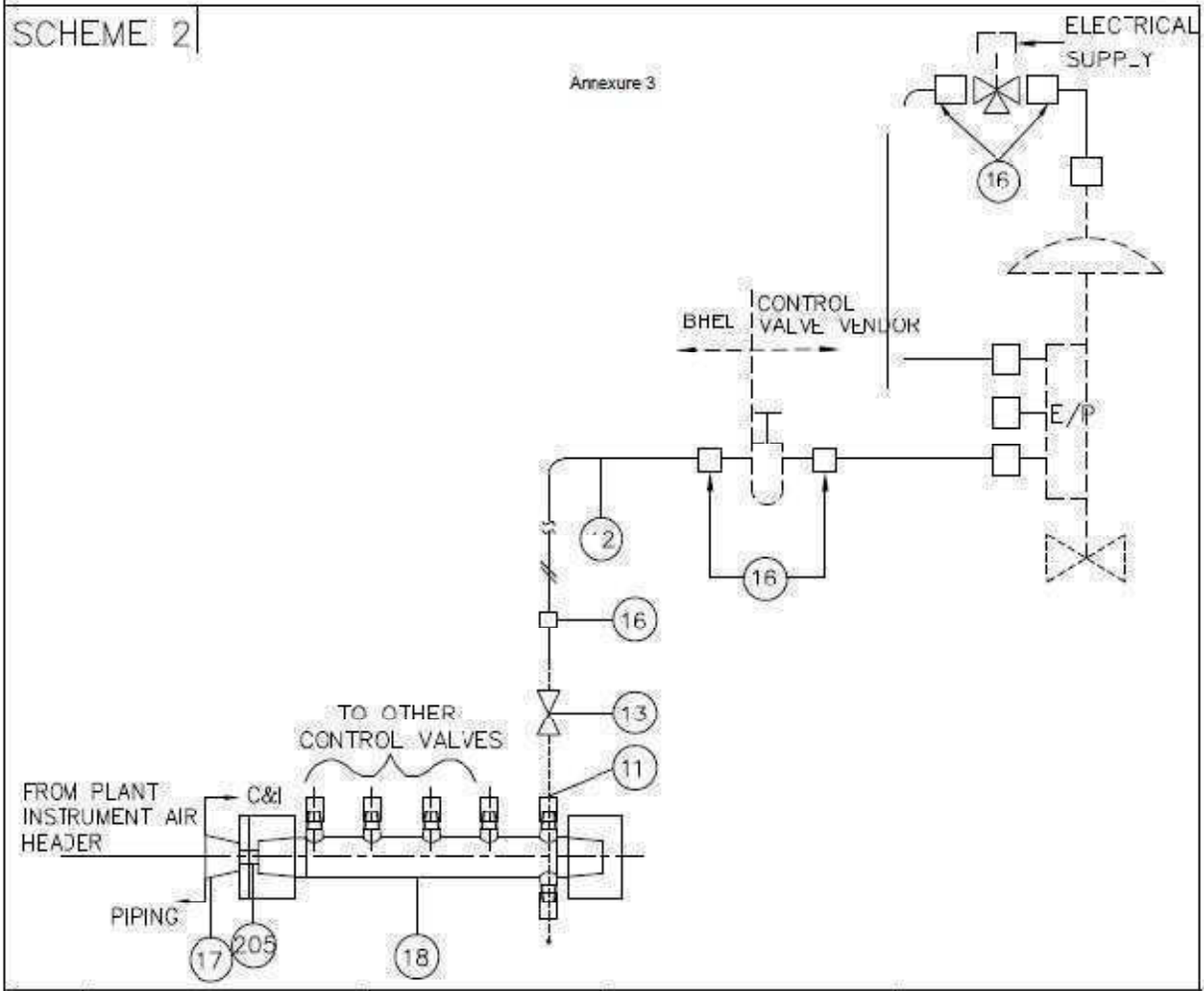


POS NO.	DESCRIPTION	MATERIAL CODE	SITE IDENTIFICATION NO FOR W.O.:1085233100	SITE IDENTIFICATION NO FOR W.O.:1085233200
401	PIPE DIA 1/2" SCH 80 ø21.3x2.8 TP 321	HY1071055623	39616007	39616005
246	ELBOW ø1/2" SW-F SS 316	AA7242501229	39617016	39617016
252	COUPLING ø1/2" SW-F SS 316	AA7242520223	39647017	39647017
216	T-UNION ø1/2" SW-F SS 316	AA7242510228	39617015	39617015
205	NIPPLE ø1/2" BW/NPTM SS 316	HY7242578841	39617014	39617014
204	REDUCER NIPPLE ø3/4"x1/2"BW SS 316	HY7242532442	39617013	39617013
232	CAP ø1/2" NPT-F SS 316	HY7242579228	39617019	39617019
312	GLOBE VALVE ø1/2" SW-M SS 316	AA7501478589	39626003	39626003
291	ADAPTOR 1/2BW 1/2" NPT(F) SS 316	GT9757136018	39626003	39626003
253	DILO COUPLING ø1/2"SW SS 316	TC9756105046	39626003	39626003

HYDERABAD	STANDARD	TITLE: PRESSURE GAUGE, PRESSURE TRANSMITTERS, PRESSURE SWITCH FOR GAS/LIQUID/COND/WATER	DRG.NO.: 4-381-21-02948	
			SHEET NO: 4 OF 5	REV. 00

SCHEME 2

Annexure 3



POS. NO.	ITEM DESCRIPTION AND SIZE	MATERIAL CODE	SITE IDENTIFICATION NO. FOR W.O.:1085233100	SITE IDENTIFICATION NO. FOR W.O.:1085233100
12	ø6mm x 1mm TUBE ASTM A312TP321	HY1071155610	39617007	39617005
13	1/4" NEEDLE VALVE SS316	GT9757125016	39626003	39626003
16	MALE STUD COUPLING 1/4"NPTxø6mm; SS136	TC975558032	39626003	39626003
183	AIR FILTER REGULATOR	PART OF VALVE.	–	–
205	NIPPLE ½",NPTxBW	HY7242578841	39617014	39617014
17	REDUCER NIPPLE 1"x ½"BW	HY7242532450	39617022	39617022
11	FEMALE CONNECTOR ø6mmx¼"NPT	GT9751038057	39626003	39626003
18	AIR DISTRIBUTION POT	TC9755557016	39626003	39626003

BHEL HYDERABAD	STANDARD	TITLE: CONTROL VALVE WITH POSITIONER AND SOV APPLICATIONS	DRG.NO.: 4-381-21-02948	
			SHEET NO: 5 OF 5	REV. 00