

PRICE BID



**TENDER NOTICE NO.
HY/ES/NALCO#5/CIE/13**

**CIE jobs - Erection, Testing, Pre commissioning &
Commissioning of 1X19.5 MW BPTG Set at NALCO
DAMANJODI, ODISHA**

Tender Submission

On or before 31-10-2013, at 11.00 Hrs.

TENDER OPENING

On 31-10-2013 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

Spec. No.201 NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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PROJECT INFORMATION

Installation, Testing & Commissioning of Control, Instrumentation and Electrical Jobs are to be carried for 1X19.5 MW Back Pressure Steam Turbine driven Generator Set at M/S NALCO, Damanjodi, Odisha.

PROJECT DATA

1. Project Authority : M/S National Aluminium Company Ltd.
Damanjodi, Odisha
 2. Project Consultant : Avant Garde
 3. Name of the Project : 19.5 MW BPTG, NALCO, Damanjodi
 4. Location of Site : NALCO, Damanjodi, Odisha
 5. Nearest Railway Station : Damanjodi
 6. Nearest Air Port : Vizag
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SIGNATURE & SEAL OF BIDDER



SCOPE OF WORK

Spec. No.202 NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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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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SCOPE OF WORK

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.

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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, 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.

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- 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.

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- 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 OEM & 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 COMMISSIONING:

- 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/ 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 "Instrument Installation Drawing" Drg. No. 4-381-21-03198 Rev 02.

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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. 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 which shall be provided later. **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

Spec. No.203

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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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 | Dec, 2013 |
| 2. | Commissioning of Turbine | Aug, 2014 |
| 3. | Load run | Sep, 2014 |

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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CIE PRICE BID

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

1.01.0 - LOCAL / FIELD MOUNTED INSTRUMENTS

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|--|------|-------|------------|------------|
| 1.01.01 | PRESSURE GAUGES | NOS | 74.00 | | |
| 1.01.02 | PRESSURE SWITCHES | NOS | 40.00 | | |
| 1.01.03 | PRESSURE TRANSMITTER | NOS | 26.00 | | |
| 1.01.04 | DIFFERENTIAL PRESSURE INDICATORS & SWITCHES | NOS | 6.00 | | |
| 1.01.05 | DIFFERENTIAL PRESSURE TRANSMITTERS | NOS | 6.00 | | |
| 1.01.06 | LEVEL GAUGES | NOS | 6.00 | | |
| 1.01.07 | LEVEL SWITCHES | NOS | 6.00 | | |
| 1.01.08 | LEVELTRANSMITTER | NOS | 3.00 | | |
| 1.01.09 | SPEED MEASURING LOOP | NOS | 6.00 | | |
| 1.01.10 | VIBRATION, AXIAL DISPLACEMENT, VELOCITY PROBES | NOS | 20.00 | | |
| 1.01.11 | TEMPERATURE ELEMENTS (TC) | NOS | 16.00 | | |
| 1.01.12 | TEMPERATURE GAUGES | NOS | 39.00 | | |
| 1.01.13 | TEMPERATURE TRANSMITTERS | NOS | 10.00 | | |
| 1.01.14 | BEARING THERMOELEMENTS | NOS | 25.00 | | |
| 1.01.15 | PROXIMETERS | NOS | 22.00 | | |
| 1.01.16 | THERMOWELLS | NOS | 52.00 | | |
| 1.01.17 | FLOW TRANSMITTERS | NOS | 7.00 | | |
| 1.01.18 | CONTROL VALVES | NOS | 3.00 | | |
| 1.01.19 | DE-SUPERHEATER STATION | NOS | 1.00 | | |
| 1.01.20 | LIMIT SWITCHES | NOS | 5.00 | | |
| 1.01.21 | SOLENOID VALVE | NOS | 7.00 | | |
| TOTAL | | | | | |

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

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CIE PRICE BID

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1.02.00 - PANELS & CUBICLES

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|---|------|-----|------------|------------|
| 1.02.01 | LOCAL GAUGE RACK 2000 (L) X 500 (W) X 2000(H) | NOS | 1 | | |
| 1.02.02 | TURBINE CONTROL PANEL 750 (L) X 1050 (H) X 2400 (W) (WEIGHT= 600 KG) | NOS | 1 | | |
| 1.02.03 | AUTOMATIC VOLTAGE REGULATOR 2450 (L) X 1450 (H) X 2700 (W) (WEIGHT=1600 KG) | NOS | 1 | | |
| 1.02.04 | TURBINE DCS PANELS SET 3200 (L) X 1050 (H) X 2400 (W) (WEIGHT= 2000 KG) | NOS | 1 | | |
| 1.02.05 | HMI SET FOR DCS (WEIGHT=300KG) 1350 (L) X 1050 (H) X 1400 (W) | NOS | 1 | | |
| 1.02.06 | GENERATOR CONTROL PANEL 2000 (L) X 1000 (B) X 2300 (H) | NOS | 2 | | |
| 1.02.07 | GENERATOR RELAY PANEL 1600 (L) X 1000 (B) X 2300 (H) | NOS | 2 | | |
| 1.02.08 | PHASE SIDE TERMINAL BOX 1600 (L) X 1500 (B) X 3250 (H) | NOS | 1 | | |
| 1.02.09 | NEUTRAL SIDE TERMINAL BOX 2000 (L) X 1200 (B) X 2800 (H) | NOS | 1 | | |
| 1.02.10 | SEPARATE TERMINAL BOX AT 11KV SWITCH BOARD - 1600 (L) X 1600 (B) X 2000 (H) | NOS | 1 | | |
| 1.02.11 | TVM CUBICAL 800 (L) X 800 (B) X 1500 (H) | NOS | 1 | | |
| 1.02.12 | GEAR BOX STARTER PANEL 600 (L) X 800 (H) X 250 (D) | NOS | 1 | | |
| 1.02.13 | Generator CO2 flooding System Package for Fire Protection | NOS | 1 | | |
| TOTAL | | | | | |

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

SIGNATURE & SEAL OF BIDDER



CIE PRICE BID

Spec. No.204 NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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1.03.00 - ELECTRICAL PACKAGES.

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|---------|---|-------|-----|------------|------------|
| 1.03.01 | GENERATOR TRANSFORMWER 11.5/11 KV, 25MVA, OLTC, ONAN 8600 (L) X 6800 (D) X 6600 (H) (Weight=60150 KG) | NOS | 1 | | |
| 1.03.02 | LT SITCHGEAR PACKAGE 800 MM WIDTH / PANEL | | | | |
| | TGMCC 17250 (L) X 920/644 (D) X 2430 (H) (Weight=600 kg/panel) | Board | 1 | | |
| | AUX PDB 4120 (L) X 644 (D) X 2430 (H) (Weight=600 kg/panel) | Board | 1 | | |
| | 220V UPS DB 3200 (L) X 644 (D) X 2430 (H) (Weight=400 kg/panel) | Board | 1 | | |
| | 110V DCDB 11400 (L) X 644 (D) X 2430 (H) (Weight=400 kg/panel) | Board | 1 | | |
| | LOAD BREAK SWITCH 400 (L) X 300 (D) X 250 (H) (Weight=15 kg/LBS) | NOS | 23 | | |
| 1.03.03 | 110V DC SYSTEM 2X100% CHARGER & 1X100% VRLA BATTERY | | | | |
| | BATTERY 3059 (L) X 600 (D) X 1539 (H) (Weight=3071 KG) | SET | 1 | | |
| | CHARGER 2400 (L) X 800 (D) X 2000 (H) (Weight=2000 KG) | SET | 1 | | |
| | ISOLATION BOX WALL MOUNTED 600 (L) X 800 (D) X 1000 (H) (Weight=100 KG) | SET | 1 | | |
| | CELL BOOSTER MOVABLE 800 (L) X 800 (D) X 1000 (H) (Weight=200 KG) | SET | 1 | | |
| 1.03.04 | 220 V UPS SYSTEM WITH 2X100% VRLA BATTERY (INVERTER & CHARGER PANEL, INPUT ISOLATION TRANSFORMER, SVR) 2300 (L) X 800 (D) X 2110 (H) (Weight=1000 KG) | | | | |
| | BATTERY BANKS 700 (L) X 706 (D) X 2360 (H) (Weight=1070 KG) | SET | 2 | | |
| | UPS BATTERY FUSE BOX 444 (L) X 207 (D) X 400 (H) (Weight=400 KG) | SET | 1 | | |
| | CELL BOOSTER MOVABLE 800 (L) X 800 (D) X 1000 (H) (Weight=2000 KG) | SET | 2 | | |



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| | | | | | |
|--------------|--|-----|----|--|--|
| 1.03.05 | PB STATIONS | | | | |
| | WP LCS WITH STR, STP, EMG STP PBS 300 (L) X 150 (D) X 500 (H) (Weight=3 KG) | NOS | 5 | | |
| | WP LCS WITH STR, STP, EMG STP PBS, AMM 300 (L) X 150 (D) X 500 (H) (Weight=3 KG) | NOS | 9 | | |
| | WP LCS WITH FWD, RVS, STP, EMG STP PBS 300 (L) X 150 (D) X 500 (H) (Weight=3 KG) | NOS | 15 | | |
| | WP LCS WITH EMG STP PBS, IND LAMP 250 (L) X 150 (D) X 500 (H) (Weight=2 KG) | NOS | 1 | | |
| 1.03.06 | ISOLATION BOX WALL MOUNTED 600 (L) X 800 (D) X 1000 (H) (Weight=100 KG) | NOS | 1 | | |
| 1.03.07 | 3 PHASE INVERTER 1105 (L) X 1500 (D) X 1000 (H) (Weight=500 KG) | NOS | 1 | | |
| TOTAL | | | | | |

- Notes:
1. Suitable adhesives for fixing of insulating mats to be supplied by contractor.
 2. Testing equipment for all control and relay panels should be provided by contractor.
 3. Miscellaneous items like 6 mm chequered plate for covering cutouts in switchgear room, cable tags 2mm thick Al strip, trefoil clamps for 25mm 8SWG, Clamps for multicore cables 25x3 mm Al flats, 3mm dia Nylon Cord, Insulating Rubber Mats etc. required for the sub station supply, erection, testing, commissioning by contractor.
 - 4. Contractor shall arrange required crane services with suitable capacities for placing the heavy items like Transformer, switchgear, panels etc. on their foundations. No extra payment is allowed for this.**

1.04.00 - JUCNTION BOXES & LOCAL CONTROL STATIONS (LCS)

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|--|------|-----|------------|------------|
| 1.04.01 | WEATHER PROOF JUNCTION BOXES 8 INLET / 2 OUTLETS | NOS | 8 | | |
| 1.04.02 | PROXIMETER HOUSINGS | NOS | 13 | | |
| TOTAL | | | | | |

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

SIGNATURE & SEAL OF BIDDER



CIE PRICE BID

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NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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1.05.00 - PROCESS AND PNEUMATIC TUBING & PIPING

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|---|------|--------|------------|------------|
| 1.05.01 | PIPE (SMLS) - 21.3 X 3.73 CS SA106 GR B | MTR | 690.00 | | |
| 1.05.02 | PIPE (SMLS) - 21.3 X 3.73 AS SA335 GR P22 | MTR | 575.00 | | |
| 1.05.03 | SS PIPE 17.1 X 1.8 A312 TP321 | MTR | 12.00 | | |
| 1.05.04 | SS TUBE 12.7 X 2.1 MM | MTR | 730.00 | | |
| 1.05.05 | SS TUBE 21.3 X 3.7 SCH 80 | MTR | 435.00 | | |
| 1.05.06 | SS TUBE 21.3 X 4.8 SCH 160 | MTR | 97.00 | | |
| 1.05.07 | CS PIPE 60.3 X 3.91 | MTR | 35.00 | | |
| 1.05.08 | SS TUBE 6 MM X 1 MM | MTR | 48.00 | | |
| TOTAL | | | | | |

1.06.00 - CABLES (LAYING ,TERMINATION & TESTING)

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|---------|---|------|----------|------------|------------|
| 1.06.1 | 1C X 630 SQ. MM AL XLPE & PVC/FRLS 11KV (UE) 1KA/1SEC | MTR | 4140.00 | | |
| 1.06.2 | 11 KV (UE) 1C X 630 CABLE KIT | NOS | 90.00 | | |
| 1.06.3 | 1C X 120 SQ. MM AL UNAR XLPE/FRLS PVC CABLE | MTR | 460.00 | | |
| 1.06.4 | 1C X 630 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 1150.00 | | |
| 1.06.5 | 3.5C X 35 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 2645.00 | | |
| 1.06.6 | 3.5C X 95 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 575.00 | | |
| 1.06.7 | 3C X 10 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 2300.00 | | |
| 1.06.8 | 3C X 150 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 575.00 | | |
| 1.06.9 | 3C X 16 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 1495.00 | | |
| 1.06.10 | 3C X 2.5 SQ. MM CU HRPVC/FRLS PVC CABLE | MTR | 11500.00 | | |

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

SIGNATURE & SEAL OF BIDDER



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| | | | | | |
|--------------|--|-----|---------|--|--|
| 1.06.11 | 3C X 25 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 575.00 | | |
| 1.06.12 | 3C X 70 SQ. MM AL XLPE/FRLS PVC CABLE | MTR | 575.00 | | |
| 1.06.13 | 1P X 1.5 SQ. MM SIGNAL CABLE | MTR | 1725.00 | | |
| 1.06.14 | 2P X 0.5 SQ. MM SIGNAL CABLE | MTR | 1380.00 | | |
| 1.06.15 | 4P X 0.5 SQ. MM SIGNAL CABLE | MTR | 1150.00 | | |
| 1.06.16 | 4P X 0.5 SQ. MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD | MTR | 7840.00 | | |
| 1.06.17 | 6P X 1.5 SQ. MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD | MTR | 2300.00 | | |
| 1.06.18 | 8P X 0.5 SQ. MM SIGNAL CABLE | MTR | 3450.00 | | |
| 1.06.19 | 12P X 1.5 SQ. MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD | MTR | 1725.00 | | |
| 1.06.20 | 8T X 1.5 SQ MM SIGNAL CABLE INDIVIDUAL & OVERALL SHIELD | MTR | 575.00 | | |
| 1.06.21 | 10T X 0.5 SQ MM CONTROL CABLE | MTR | 1725.00 | | |
| 1.06.22 | 3C X 2.5 SQ MM CONTROL CABLE | MTR | 575.00 | | |
| 1.06.23 | 3C X 4 SQ MM CONTROL CABLE | MTR | 1150.00 | | |
| 1.06.24 | 3C X 6 SQ MM CONTROL CABLE | MTR | 920.00 | | |
| 1.06.25 | 5C X 2.5 SQ MM CONTROL CABLE | MTR | 4485.00 | | |
| 1.06.26 | 7C X 2.5 SQ MM CONTROL CABLE | MTR | 4600.00 | | |
| 1.06.27 | 10C X 2.5 SQ MM CONTROL CABLE | MTR | 6613.00 | | |
| 1.06.28 | 16C X 2.5 SQ MM CONTROL CABLE | MTR | 2070.00 | | |
| 1.06.29 | 1PX 16 AWG THERMOCOUPLEN CABLE | MTR | 230.00 | | |
| 1.06.30 | THERMOCOUPLE EXTN CBL 2/2X0.5MM ² IT-3 | MTR | 920.00 | | |
| TOTAL | | | | | |

- Notes:
1. Cables shall be checked for insulation resistance before and after jointing
 2. The work shall include all clamping, fitting, fixing,, soldering, tapping, compound filling, cable jointing, crimping, shorting and grounding as required for the complete job. All equipment shall be of contractor's procurement under this specification.
 3. The contractor shall put ferrules on all control cable cores in all junction boxes and at all terminations. The ferruling shall be cross ferruling and ferrules shall carry terminal numbers as per drawing. All ferrules shall be colored, plastic & interlocked type.
 4. Spare cores shall also be similarly ferruled, crimped with lug and taped on ends. Spare cores shall be ferruled with individual cable number.

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Spec. No.204

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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1.07.00 - ERECTION OF CABLE TRAYS & CABLE DUCT.

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|--|------|--------|------------|------------|
| 1.07.01 | 600 MM STRAIGHT RUN CABLE TRAY WITH ACCESS & C.P | MTR | 496.00 | | |
| 1.07.02 | 300 MM STRAIGHT RUN CABLE TRAY WITH ACCESS & C.P | MTR | 231.00 | | |
| 1.07.03 | HOR. TEE 600 MM BENDING RAD. & C.P FOR 300LAD. YTYPE | MTR | 16.00 | | |
| 1.07.04 | HOR. TEE 900 MM BENDING RAD. & C.P FOR 600LAD. YTYPE | MTR | 16.00 | | |
| 1.07.05 | HOR. ELBOW 600 MM BENDING RAD. & C.P FOR 300MM | MTR | 19.00 | | |
| 1.07.06 | HOR. ELBOW 900 MM BENDING RAD. & C.P FOR 300MM | MTR | 26.00 | | |
| 1.07.07 | VER. UP 600 MM BENDING RAD. & C.P FOR 300 LAD. TYPE | MTR | 16.00 | | |
| 1.07.08 | VER. DOWN 600 MM BENDING RAD. & C.P FOR 300 LAD. TYPE | MTR | 16.00 | | |
| 1.07.09 | VER. UP 900 MM BENDING RAD. & C.P FOR 600 LAD. TYPE | MTR | 19.00 | | |
| 1.07.10 | VER. DOWN 900 MM BENDING RAD. & C.P FOR 600 LAD. TYPE | MTR | 19.00 | | |
| 1.07.11 | HOR. CROSS 600 MM BENDING RAD. & C.P FOR 300 LAD. TYPE | MTR | 8.00 | | |
| 1.07.12 | 150 MM STRAIGHT RUN PERFORATED CABLE TRAY & ACCESS INCLUDING C.P | MTR | 463.00 | | |
| 1.07.13 | 50 MM STRAIGHT RUN PERFORATED CABLE TRAY & ACCESS INCLUDING C.P | MTR | 463.00 | | |
| TOTAL | | | | | |

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

- Notes:
1. All the pre fabricated ladder, cable trays, accessories are made out of GI sheets.
 2. The supply and application of Red Oxide Zinc Chromate Primer for painting of all Structural Steels (required for cable tray supports) shall be considered in contractor's scope.

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1.08.00 - PLANT EARTHING PROTECTION, FABRICATION, ERECTION OF STRUCTURAL STEEL

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|---------|--------------------------|--------------|---------|------------|------------|
| 1.08.01 | GI STRIP 75 X 10 | MTR | 230.00 | | |
| 1.08.02 | GI STRIP 50 X 6 | MTR | 920.00 | | |
| 1.08.03 | GI STRIP 25 X 3 | MTR | 345.00 | | |
| 1.08.04 | 8 SWG GI WIRE STRANDED | MTR | 575.00 | | |
| 1.08.05 | 40 MM MS ROD | MTR | 632.50 | | |
| 1.08.06 | GI PIPE ELECTRODE | MTR | 17.00 | | |
| 1.08.07 | STRL ST CHANNEL 100 X 50 | MTR | 950.00 | | |
| 1.08.08 | ANGLE 50 X 50 X 6 | MTR | 1560.00 | | |
| 1.08.09 | ANGLE 75 X 75 X 6 | MTR | 7.00 | | |
| 1.08.10 | PLATE 6 MM THICK | KG | 402.00 | | |
| | | TOTAL | | | |

1.09.00 - PLANT ILLUMINATION PACKAGE

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|---------|--|------|-----|------------|------------|
| 1.09.01 | Industrial type general pupose luminaire suitable for 2x28W T5 energy efficient Fluorescent lamps made of stove enamel finish MS sheet steel housing and vitreous enameled white refelector suitable for Surface/Conduit/METSEC/Wall Mounted | NOS | 30 | | |
| 1.09.02 | Integral Industrial High Bay Luminaire with anodized aluminium reflector suitable for 400W MH Integral | NOS | 15 | | |
| 1.09.03 | Integral Industrial Medium Bay Luminaire with anodized aluminium reflector suitable for 250W MH Integral | NOS | 25 | | |

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CIE PRICE BID

Spec. No.204 NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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| | | | | | |
|--------------|--|-----|----|--|--|
| 1.09.04 | Street Light luminaire suitable for 150W MH lamp with cast aluminium housing stove enameled grey outside and white inside, a pair of anodized aluminium reflector and highly transparent clear acrylic sheet cover with hinge and toggle fastening, neoprene gaskets and integrated prewired ballasts etc. | NOS | 5 | | |
| 1.09.05 | 28 W T5 energy efficient Fluorescent Lamp suitable for Item no. 1 | NOS | 70 | | |
| 1.09.06 | 400 W MH Lamp Suitable for Item No. 2 | NOS | 18 | | |
| 1.09.07 | 250 W MH Lamp Suitable for Item No. 3 | NOS | 30 | | |
| 1.09.08 | 150 W MH Lamp Suitable for Item No. 4 | NOS | 7 | | |
| 1.09.09 | 6 way AC Indoor Lighting Panel | NOS | 1 | | |
| 1.09.10 | 12 way AC Indoor Lighting Panel | NOS | 3 | | |
| 1.09.11 | 12 way AC Indoor Lighting Panel with 2 nos outgoing in addition to 20A RCCB will have ATC Switch (20A) with manual override | NOS | 1 | | |
| 1.09.12 | 4 Way 150 x 100 x 100 mm JB Outdoor IP55 Weather proof for lighting package | NOS | 3 | | |
| 1.09.13 | 4 Way 150 x 100 x 100 mm JB Indoor IP44 Weather proof for lighting package | NOS | 75 | | |
| TOTAL | | | | | |

- Notes:
1. Fixtures will be supplied to site in loose parts. Assy. And erection of the same shall be considered in contractor scope.
 2. Accessories of Lightening panel/JB like cable glands, gland plate may be supplied in loose. Contractor shall consider assembling of the same at site

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

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CIE PRICE BID

Spec. No.204

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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1.10.00 - ACCESSORIES / WIRES FOR PLANT ILLUMINATION PACKAGE

| S.NO. | DESCRIPTION | UNIT | QTY | Unit Rates | TOTAL COST |
|--------------|---|------|------|------------|------------|
| 1.10.01 | 200 mm long 120 deg bend 50NB pipe with 2 nos suitable clamp with Hardware | NOS | 6 | | |
| 1.10.02 | Industrial metal clad type 15A receptable along with switch and plug | NOS | 17 | | |
| 1.10.03 | 63A TPN welding receptables with suitable plug (safe area) | NOS | 12 | | |
| 1.10.04 | 20 mm PVC Flexible conduit | MTR | 173 | | |
| 1.10.05 | 6mm dia x 50 mm long anchor bolt with nuts and washers-bolt type | NOS | 46 | | |
| 1.10.06 | 6 mm dia x 50 mm long anchor bolt with nuts and washers - Hook / Ring type | NOS | 58 | | |
| 1.10.07 | S - Hook | NOS | 58 | | |
| 1.10.08 | Cable clamps suitable for 3C X 2.5 Sq mm Al. Armored cable along with its base and hardware | NOS | 460 | | |
| 1.10.09 | Cable clamps suitable for 3C X 2.5 Sq mm Cu. Armored cable along with its base and hardware | NOS | 2875 | | |
| 1.10.10 | 1C X 2.5 Sq. mm PVC flexible wire (Red Colour) | MTR | 173 | | |
| 1.10.11 | 1C X 2.5 Sq. mm PVC flexible wire (Black Colour) | MTR | 173 | | |
| 1.10.12 | 1C X 2.5 Sq. mm PVC flexible wire (Green Colour) | MTR | 173 | | |
| TOTAL | | | | | |

Notes:

1. Pipes & accessories of poles will be supplied to site in loose. Assembling of poles and erection of the same along with civil work / foundation etc. shall be considered.
2. Erection activities like cutting / threading / welding etc. of conduit / pipe / ISMC / IS shall be carried out as per site requirement.
3. Consumables like Rawl plug, check nuts, nuts & bolts, locking wires, insulation tape, sealing compound / plugs, washers etc. which are not covered in the above list but required for successful completion of erection activity of plant illumination shall be considered in contractor scope.

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CIE PRICE BID

Spec. No.204

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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SUMMARY SHEET

| <u>SUMMARY SHEET</u> | | |
|-----------------------------|---|--|
| 1.01.00 | LOCAL / FIELD MOUNTED INSTRUMENT (1.01.01 TO 1.01.21) | |
| 1.02.00 | PANELS & CUBICALS (1.02.01 TO 1.02.13) | |
| 1.03.00 | ELECTRICAL PACKAGES (1.03.01 TO 1.03.07) | |
| 1.04.00 | JUNCTION BOXES & LOCAL CONTROL STATIONS (LCS) (1.04.01 TO 1.04.02) | |
| 1.05.00 | PROCESS & PNEUMATIC TUBING FITTING (1.05.01 TO 1.05.08) | |
| 1.06.00 | CABLES (1.06.01 TO 1.06.30) | |
| 1.07.00 | ERECTION OF CABLES TRAYS & CABLE DUCTS (1.07.01 TO 1.07.13) | |
| 1.08.00 | PLANT EARTHING PROTECTION, FABRICATION, ERECTION OF STRUCTURAL STEEL (1.08.01 TO 1.08.10) | |
| 1.09.00 | PLANT ILLUMINATION PACKAGE (1.09.01 TO 1.09.13) | |
| 1.10.00 | ACCESSORIES / WIRES FOR PLANT ILLUMINATION PACKAGE (1.10.01 TO 1.10.12) | |
| | GRAND TOTAL | |

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

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TERMS OF PAYMENT - SECTION VIII

Spec. No.205

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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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.

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MAN HOUR RATES

Spec. No.205A

NALCO, Damanjodi, Odisha 1x19.5 MW BPTG

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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.

| <u>Sl. No.</u> | <u>DESCRIPTION</u> | <u>MAN HOUR RATE</u> |
|----------------|-------------------------------------|----------------------|
| 1. | SKILLED / SEMI SKILLED / UN SKILLED | Rs. 25/- |

SIGNATURE & SEAL OF BIDDER

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm.

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

| | | | | | | | | |
|------|------|----------|--|----------|----------|--|----------|----------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | REV. | DATE | ALTERED |
| | | CHECKED | 02 | 22.06.13 | CHECKED | 01 | 29.05.13 | CHECKED |
| | | APPROVED | | | APPROVED | | | APPROVED |
| | | | REVISED INLINE WITH LMIL / AVANT GARDE COMMENTS VIDE MAIL DTD.10.06.13. | | | REVISED INLINE WITH LMIL / AVANT GARDE COMMENTS VIDE MAIL DTD.24.05.13. | | |

INSTRUMENT INSTALLATION DRAWINGS



| | | | | |
|------------------|----------|-------------|--------|-----------|
| CATEGORY OF DWG. | APPROVAL | INFORMATION | RECORD | REFERENCE |
|------------------|----------|-------------|--------|-----------|

CUSTOMER: M/s. NATIONAL ALUMINIUM COMPANY LTD.
DAMANJODI, ODISHA

CONSULTANT: AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA

TYPE OF PRODUCT 1 X 19.5 MW BPTG, UNIT-V
PROJECT STEAM-CUM COGENERATION POWER PLANT(SPP)

| | | | | | | |
|--|--|---------|------|-------|----------|----------------------|
| | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | NAME | SIGN. | DATE | NO.OF VAR. 00 |
| | DRN. | ROBINS | --- | do--- | 16.05.13 | |
| | CHD. | PRAKASH | --- | do--- | 16.05.13 | |
| | APPD. | PRAKASH | --- | do--- | 16.05.13 | |

| | | | | | | | |
|-----------|-------------------------------------|--|-----------|----------------|-----------------------|----------|-------------|
| DEPT. PED | UNTOL. DIMS. GR. \varnothing /M/F | | SCALE 1:1 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. | NO.OF ITEMS |
| CODE 450 | | | | | | | |

| | | | |
|---|-----------|-------------------------------|----------------|
| TITLE | CARD CODE | DRAWING NO. 4-381-21-03198 | REV. 02 |
| <u>INSTRUMENT INSTALLATION</u> <u>DRAWINGS</u> | | SHT. No 1 | NO. OF SHT. 13 |

GENERAL NOTES

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 GAUGES 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 IN 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&I)–HYD LOOSE SUPPLIED INSTRUMENT ONLY. FOR MECHANICAL SKID ITEMS, INSTRUMENT WITH HOOKUP WILL BE SUPPLIED AS PACKAGE.



STANDARD

TITLE:

GENERAL NOTES

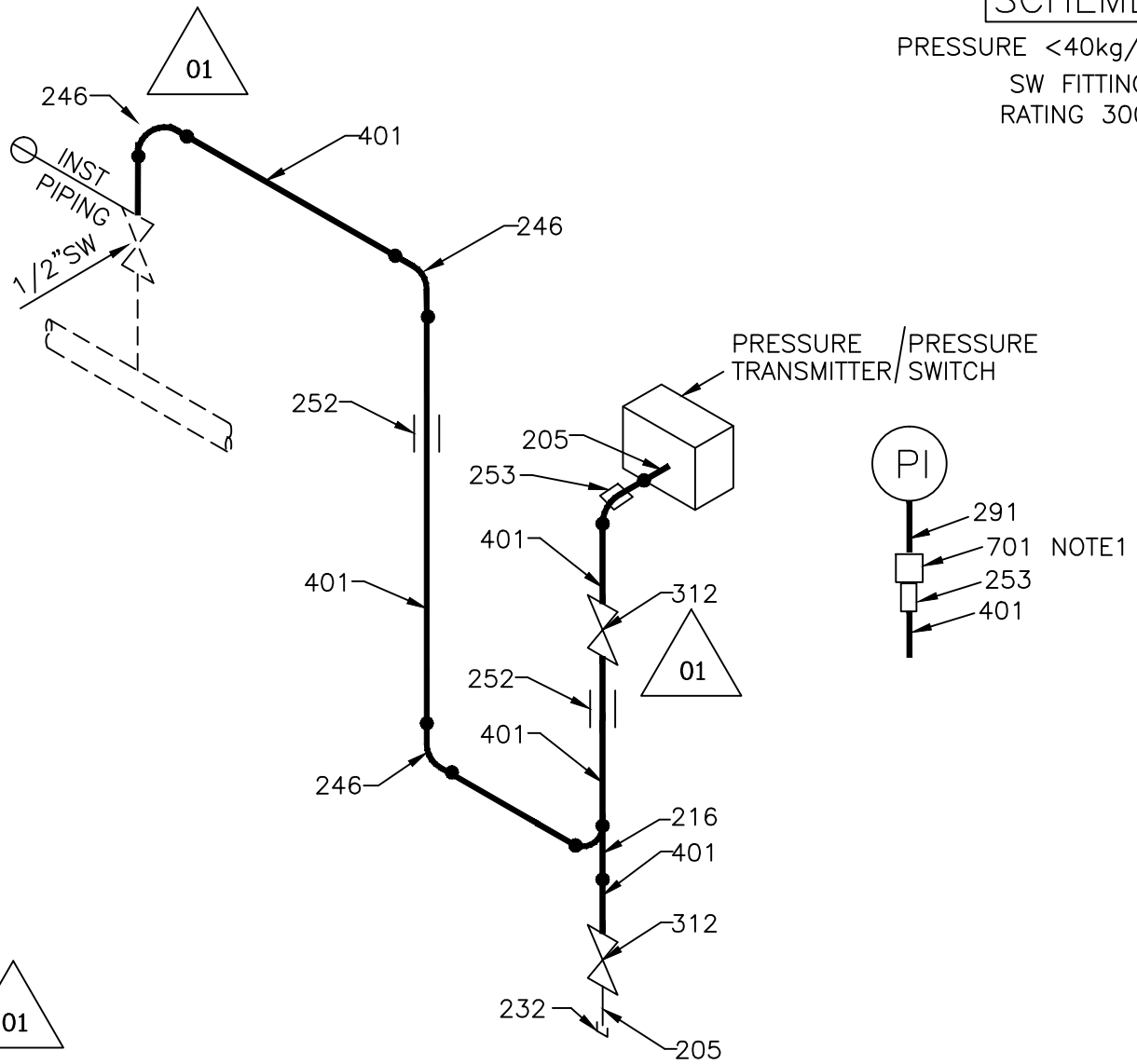
DRG.NO.: 4-381-21-03198

SHEET NO: 3 OF 13

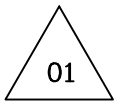
REV.
02

SCHEME 1

PRESSURE <40kg/cm²
SW FITTINGS
RATING 3000#



NOTE:



1. SNUBBER IS USED FOR ONLY CONDENSATE TRANSFER PUMP-A & B FOR DISCHARGE LINE FOR PRESSURE GAUGE. OTHER APPLICATION IS NOT APPLICABLE.

| POS NO. | DESCRIPTION | MATERIAL CODE | SITE IDENTIFICATION |
|---------|---|---------------|---------------------|
| 401 | PIPE DIA 1/2" SCH 80 ϕ 21.3x2.8 TP 321 | HY1071055623 | 39626002 |
| 246 | ELBOW ϕ 1/2" SW-F | AA7242501229 | 39626002 |
| 252 | COUPLING ϕ 1/2" SW-F | AA7242520223 | 39626002 |
| 216 | T-UNION ϕ 1/2" SW-F | AA7242510228 | 39626002 |
| 205 | NIPPLE ϕ 1/2" BW/NPTM | HY7242578841 | 39626002 |
| 232 | CAP ϕ 1/2" NPT-F | HY7242579228 | 39626002 |
| 312 | GLOBE VALVE ϕ 1/2" SW-M | AA7501478589 | 39626002 |
| 291 | ADAPTOR 1/2BW 1/2" NPT(F) | GT9757136018 | 39626002 |
| 253 | DILO COUPLING ϕ 1/2"SW | TC9756105046 | 39626002 |
| 701 | SNUBBER ϕ 1/2"NPT-MX1/2" NPT-F | HY7316667010 | 39626002 |



STANDARD

TITLE:
PRESSURE GAUGE, PRESSURE
TRANSMITTERS, PRESSURE SWITCH
FOR AIR & WATER APPLICATIONS
WITH 3000#

DRG.NO.: 4-381-21-03198

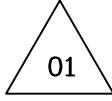
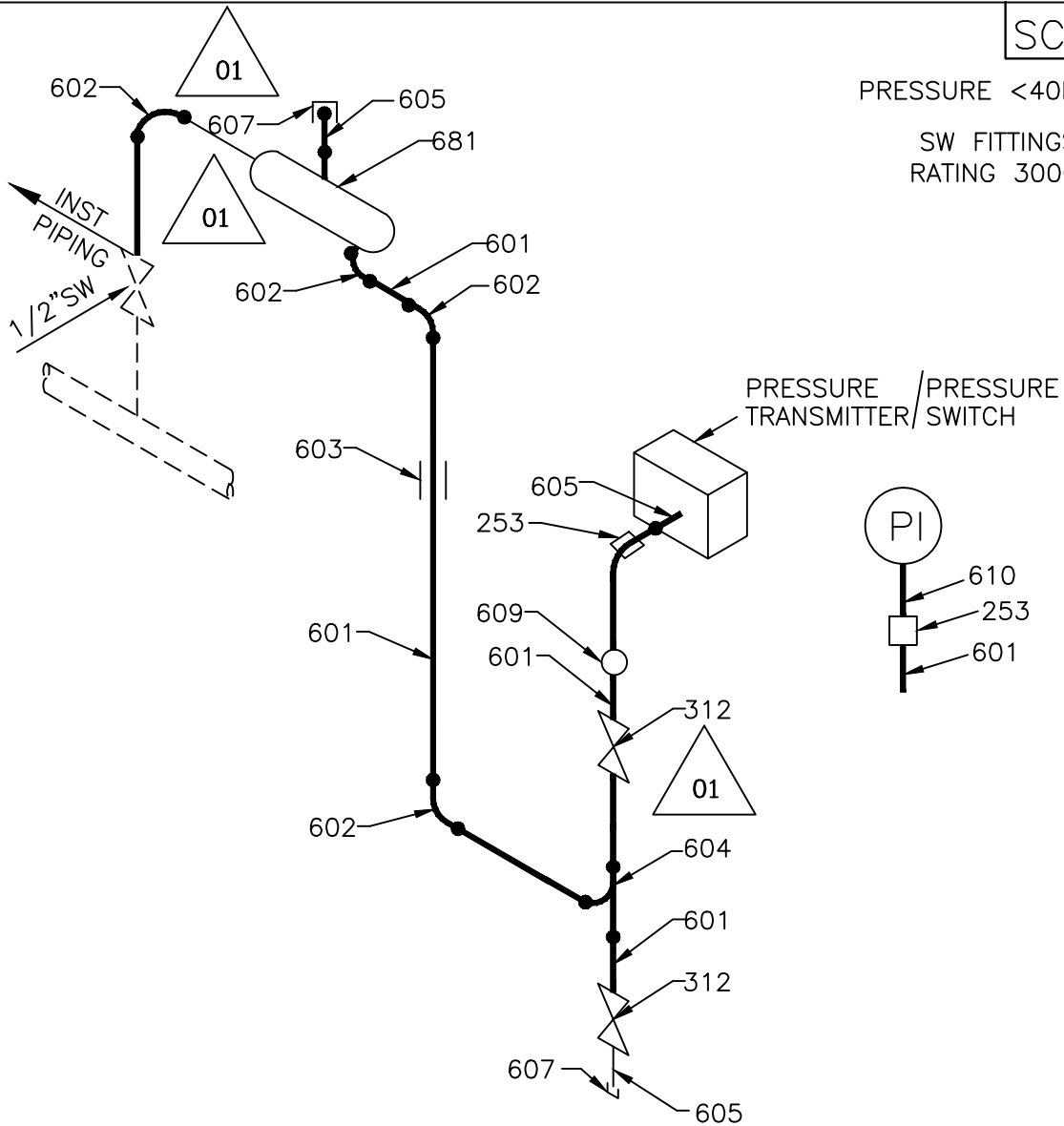
SHEET NO: 4 OF 13

REV.
02

SCHEME 2

PRESSURE <40kg/cm2

SW FITTINGS
RATING 3000#



Note:

1. SYPHON(609) IS USED ONLY FOR PRESSURE GAUGE
2. CONDENSATE POT(681) IS USED ONLY FOR PRESSURE TRANSMITTER.

| POS NO. | DESCRIPTION | MATERIAL CODE | SITE IDENTIFICATION |
|---------|---|---------------|---------------------|
| 601 | PIPE DIA 1/2" SCH 80 ϕ 21.3x2.8 SS | HY1071155623 | 39626002 |
| 602 | ELBOW ϕ 1/2"SW | AA7242501229 | 39626002 |
| 603 | COUPLING ϕ 1/2" SW | AA7242520223 | 39626002 |
| 604 | T-UNION ϕ 1/2" SW-F | AA7242510228 | 39626002 |
| 605 | NIPPLE L=100 ϕ 1/2" NPT/BW | HY7242578841 | 39626002 |
| 607 | CAP ϕ 1/2" NPT-F | HY7242579228 | 39626002 |
| 312 | GLOBE VALVE ϕ 1/2" SW-F | AA7501478589 | 39626002 |
| 609 | SYPHON 80S SW-F ϕ 1/2"SW-F | HY7316201649 | 39626002 |
| 610 | ADAPTOR 1/2" BW / 1/2" NPT(F) | GT9757136018 | 39626002 |
| 253 | DILO COUPLING ϕ 1/2"SW | TC9756105046 | 39626002 |
| 681 | CONDENSATE POT ϕ 1/2"SW-F AS | TC9755535047 | 39626002 |



STANDARD

TITLE:

PRESSURE GAUGE, PRESSURE TRANSMITTERS, PRESSURE SWITCH FOR STEAM APPLICATIONS(3000#)

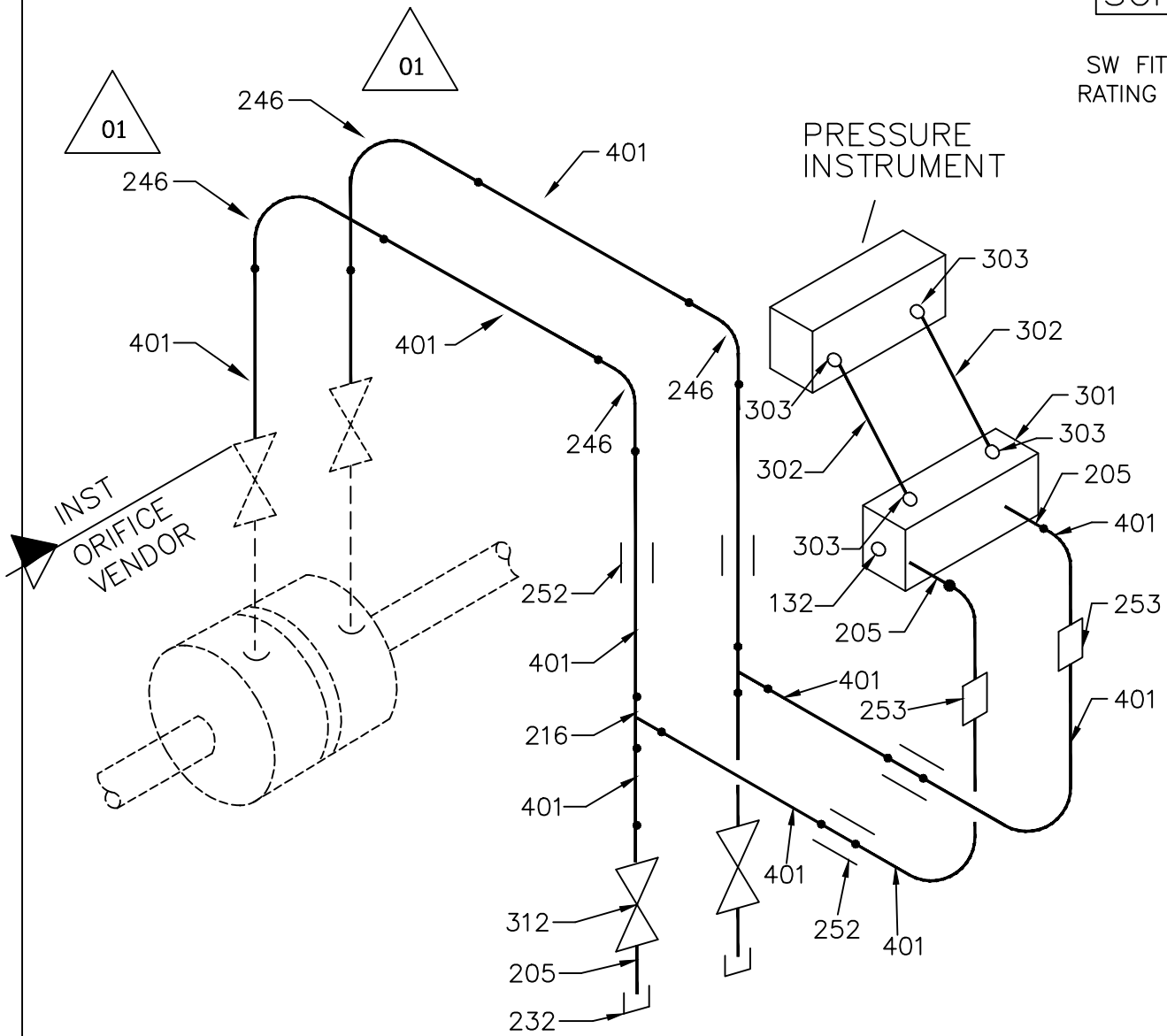
DRG.NO.: 4-381-21-03198

SHEET NO: 5 OF 13

REV. 02

SCHEME 3

SW FITTINGS
RATING 3000#



| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL CODE | SITE IDENTIFICATION |
|---------|---------------------------------------|---------------|---------------------|
| 401 | PIPE DIA 1/2", ϕ 21.3/3.7 TP 321 | HY1071055623 | 39626002 |
| 246 | ELBOW ϕ 1/2"SW-F SS | AA7242501229 | 39626002 |
| 252 | COUPLING ϕ 1/2"SW-F SS | AA7242520223 | 39626002 |
| 216 | T-UNION ϕ 1/2"SW-F SS | AA7242510228 | 39626002 |
| 205 | NIPPLE ϕ 1/2"BW/NPTM SS | HY7242578841 | 39626002 |
| 232 | CAP ϕ 1/2"NPT-M SS | HY7242579228 | 39626002 |
| 312 | GLOBE VALVE ϕ 1/2"SW-M SS | AA7501478589 | 39626002 |
| 301 | 5 WAY MANIFOLD ϕ 1/2"NPT-F SS | HY7316561017 | 39626002 |
| 253 | DILO COUPLING ϕ 1/2"SW SS | TC9756105046 | 39626002 |
| 132 | PLUG 1/2"NPT-M SS | HY7242584280 | 39626002 |
| 302 | TUBE 12.7MM X 2.1MM SS | HY1071090054 | 39626002 |
| 303 | MALE CONNECTOR 1/2" X 1/2"NPT SS | TC9755501010 | 39626002 |



STANDARD

TITLE:
FLOE ORIFICE, FLOW NOZZLE
FLOW VENTURI FOR AIR &
WATER APPLICATIONS(3000#)

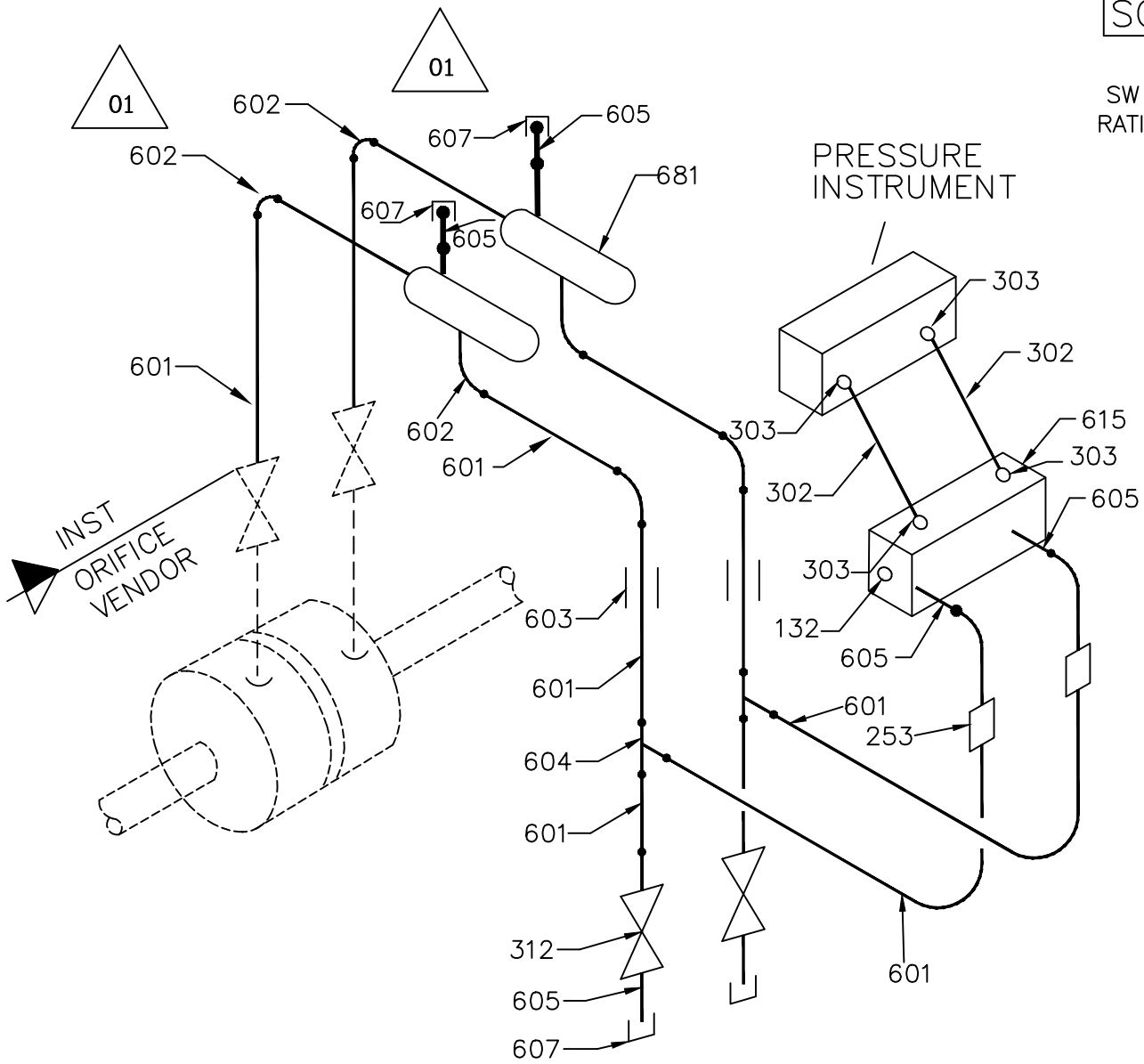
DRG.NO.: 4-381-21-03198

SHEET NO: 6 OF 13

REV.
02

SCHEME 4

SW FITTINGS
RATING 3000#

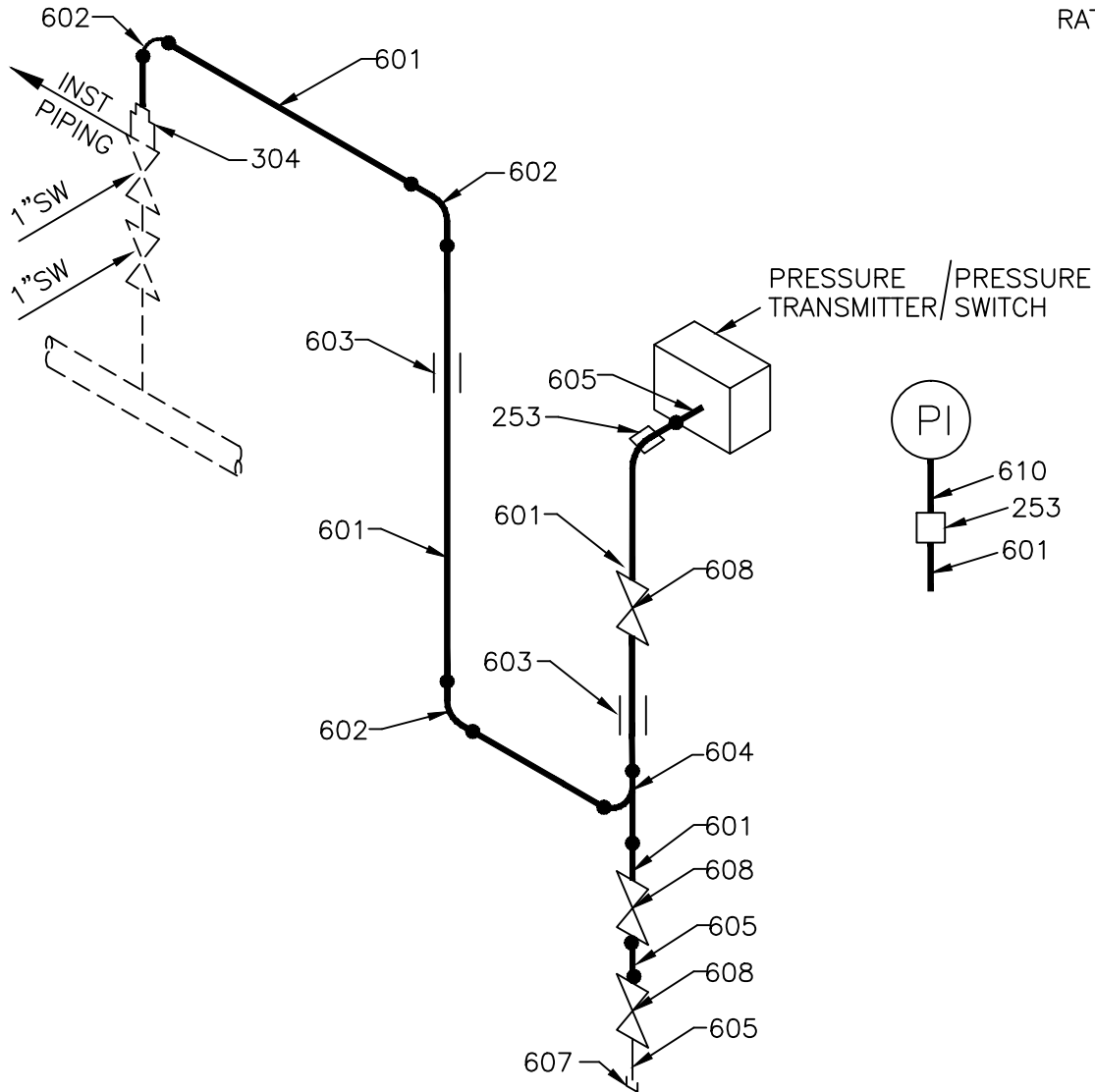


| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL CODE | SITE IDENTIFICATION |
|---------|--|---------------|---------------------|
| 601 | PIPE DIA 1/2" SCH 160 ϕ 21/3X3.7 TP 321 | HY1071055623 | 39626002 |
| 602 | ELBOW ϕ 1/2"SW SS | AA7242501229 | 39626002 |
| 603 | COUPLING ϕ 1/2"SW SS | AA7242520223 | 39626002 |
| 604 | T-UNION ϕ 1/2"SW-F SS | AA7242510228 | 39626002 |
| 605 | NIPPLE L-100 ϕ 1/2"NPT/BW SS | HY7242578841 | 39626002 |
| 607 | CAP ϕ 1/2"NPT-F SS | HY7242579228 | 39626002 |
| 312 | GLOBE VALVE ϕ 1/2"SW-F SS | AA7501478589 | 39626002 |
| 615 | 5 WAY MANIFOLD ϕ 1/2"NPT-F SS | HY7316561017 | 39626002 |
| 681 | CONDENSATE POT ϕ 1/2"SW-F AS | TC9755535047 | 39626002 |
| 253 | DILO COUPLING ϕ 1/2"SW SS | TC9756105046 | 39626002 |
| 132 | PLUG ϕ 1/2"NPT-M SS | HY7242584280 | 39626002 |
| 302 | TUBE 12.7MM X 2.1MM SS | HY1071090054 | 39626002 |
| 303 | MALE CONNECTOR 1/2" X1/2"NPT SS | TC9755501010 | 39626002 |

| | | | |
|--|----------|--|-------------------------|
| | STANDARD | TITLE: | DRG.NO.: 4-381-21-03198 |
| | | FLOW ORIFICE, FLOW NOZZLE FLOW VENTURI FOR STEAM APPLICATIONS(3000#) | SHEET NO: 7 OF 13 |
| | | | REV. 02 |

SCHEME 5A

PRESSURE >40kg/cm²
SW FITTINGS
RATING 6000#

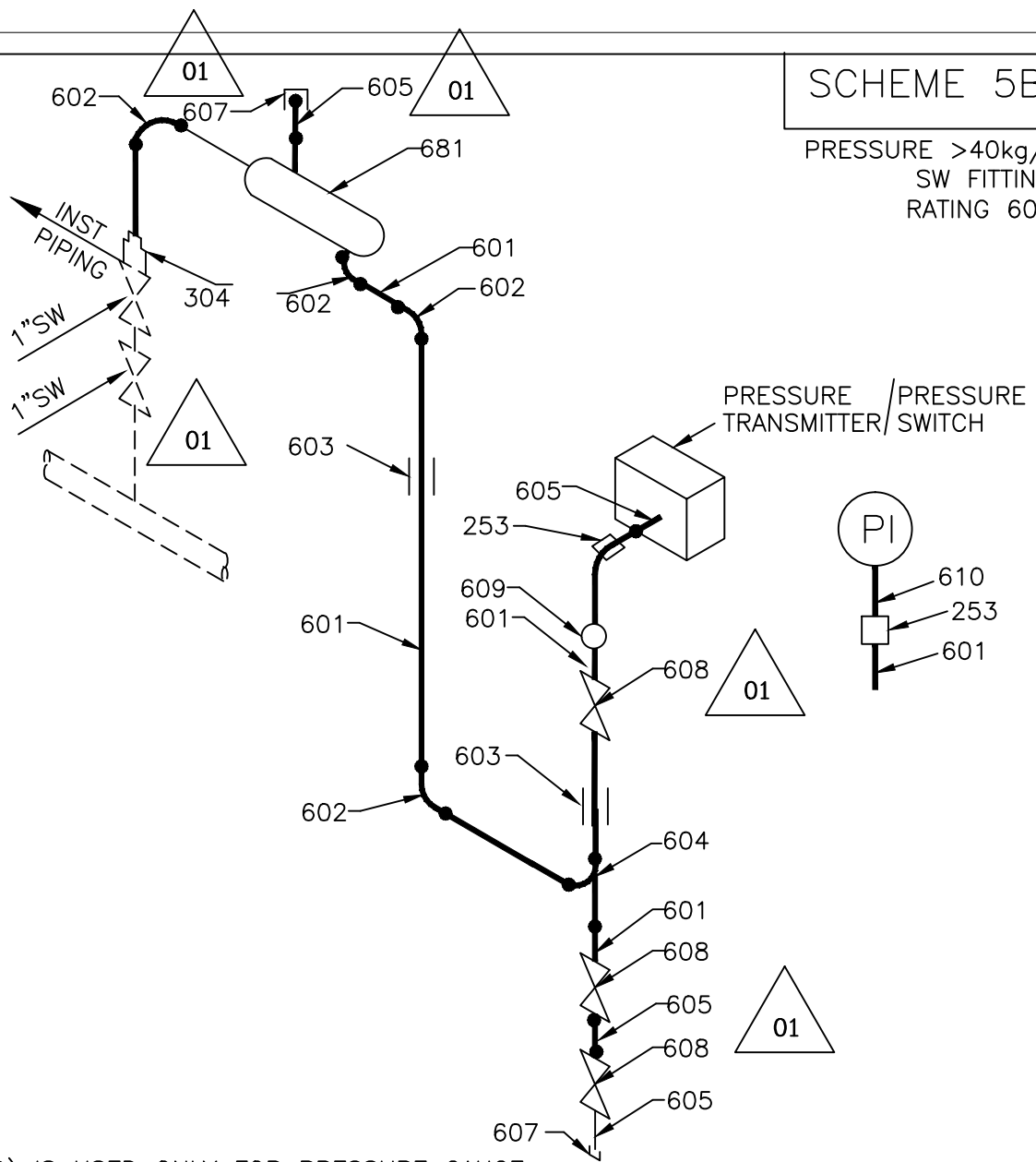


| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL CODE | SITE IDENTIFICATION |
|---------|--|---------------|---------------------|
| 601 | PIPE DIA 1/2" SCH 160 ϕ 21/3X4.8 SS | HY1071155741 | 39626002 |
| 602 | ELBOW ϕ 1/2"SW SS | AA7242501490 | 39626002 |
| 603 | COUPLING ϕ 1/2"SW SS | AA7242520495 | 39626002 |
| 604 | T-UNION ϕ 1/2"SW-F SS | HY7242510228 | 39626002 |
| 605 | NIPPLE L-100 ϕ 1/2"NPT/BW SS | HY7242578850 | 39626002 |
| 304 | REDUCER NIPPLE ϕ 1"BWx1/2"BW SS | HY7242532567 | 39626002 |
| 607 | CAP ϕ 1/2"NPT-F SS | HY7242579228 | 39626002 |
| 608 | GLOBE VALVE ϕ 1/2"SW-F SS | AA7501538581 | 39626002 |
| 610 | ADAPTER 1/2"BW/1/2"NPT F SS | GT9757136018 | 39626002 |
| 253 | COUPLING (DILO) ϕ 1/2"SW SS | TC9756105046 | 39626002 |

| | | | | |
|--|----------|--|-------------------------|---------|
| | STANDARD | TITLE: PRESSURE GAUGE, PRESSURE TRANSMITTERS, PRESSURE SWITCH FOR AIR & WATER APPLICATION WITH 6000# | DRG.NO.: 4-381-21-03198 | |
| | | | SHEET NO: 8 OF 13 | REV. 02 |

SCHEME 5B

PRESSURE >40kg/cm²
SW FITTINGS
RATING 6000#



Note:

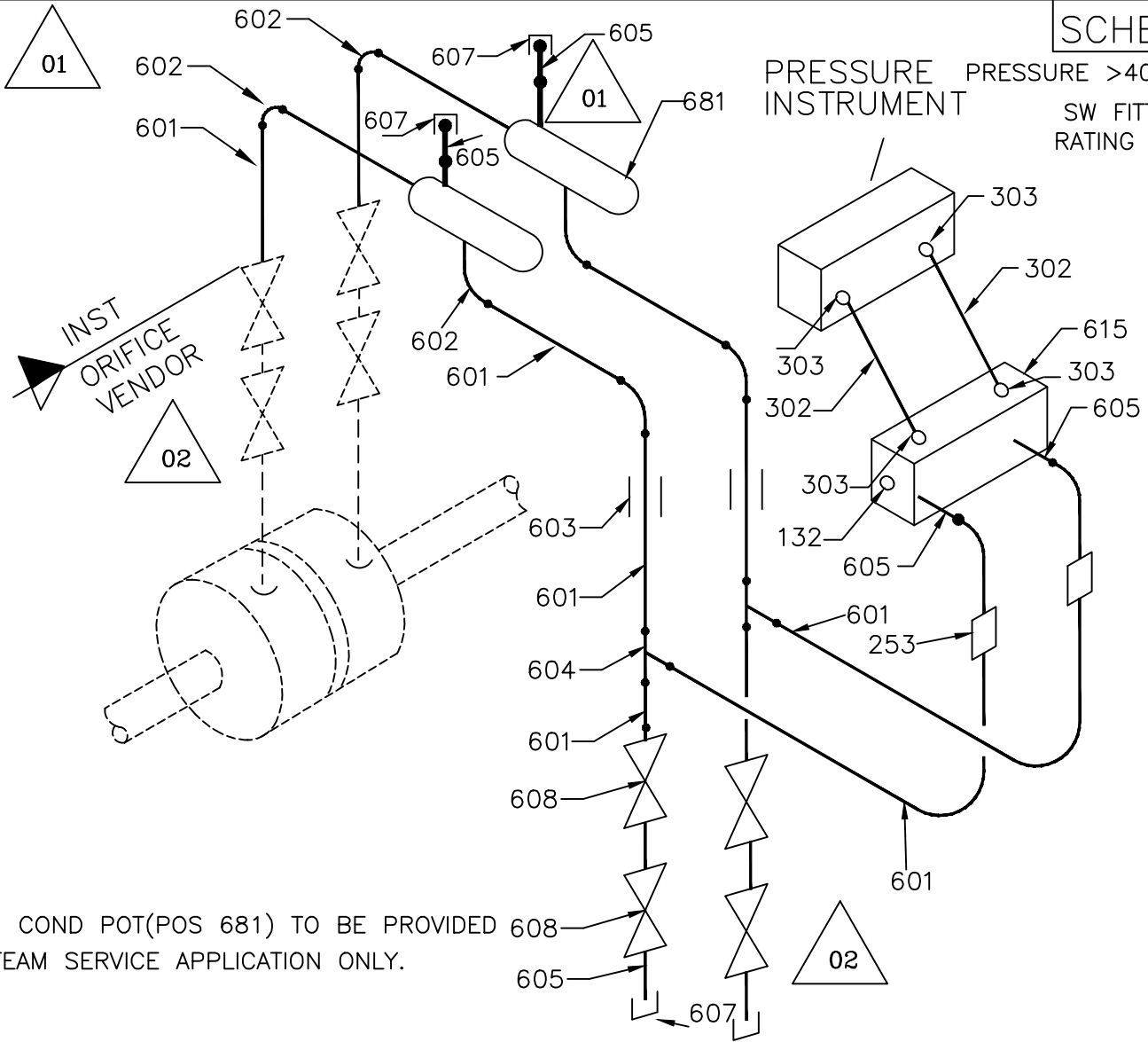
1. SYPHON(609) IS USED ONLY FOR PRESSURE GAUGE
2. CONDENSATE POT(681) IS USED ONLY FOR PRESSURE TRANSMITTER.

| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL CODE | SITE IDENTIFICATION |
|---------|--|---------------|---------------------|
| 601 | PIPE DIA 1/2" SCH 160 ϕ 21/3X4.8 SS | HY1071155741 | 39626002 |
| 602 | ELBOW ϕ 1/2"SW SS | AA7242501490 | 39626002 |
| 603 | COUPLING ϕ 1/2"SW SS | AA7242520495 | 39626002 |
| 604 | T-UNION ϕ 1/2"SW-F SS | HY7242510228 | 39626002 |
| 605 | NIPPLE L-100 ϕ 1/2"NPT/BW SS | HY7242578850 | 39626002 |
| 304 | REDUCER NIPPLE ϕ 1"BWx1/2"BW SS | HY7242532567 | 39626002 |
| 607 | CAP ϕ 1/2"NPT-F SS | HY7242579228 | 39626002 |
| 608 | GLOBE VALVE ϕ 1/2"SW-F SS | AA7501538581 | 39626002 |
| 609 | SYPHON 160S SE-F ϕ 1/2"SW-F SS | HY7316201657 | 39626002 |
| 610 | ADAPTER 1/2"BW/1/2"NPT F SS | GT9757136018 | 39626002 |
| 253 | COUPLING (DILO) ϕ 1/2"SW SS | TC9756105046 | 39626002 |

| | | | |
|--|----------|--|-------------------------|
| | STANDARD | TITLE: PRESSURE GAUGE, PRESSURE TRANSMITTERS, PRESSURE SWITCH FOR STEAM APPLICATION WITH 6000# | DRG.NO.: 4-381-21-03198 |
| | | | SHEET NO: 9 OF 13 |

SCHEME 6

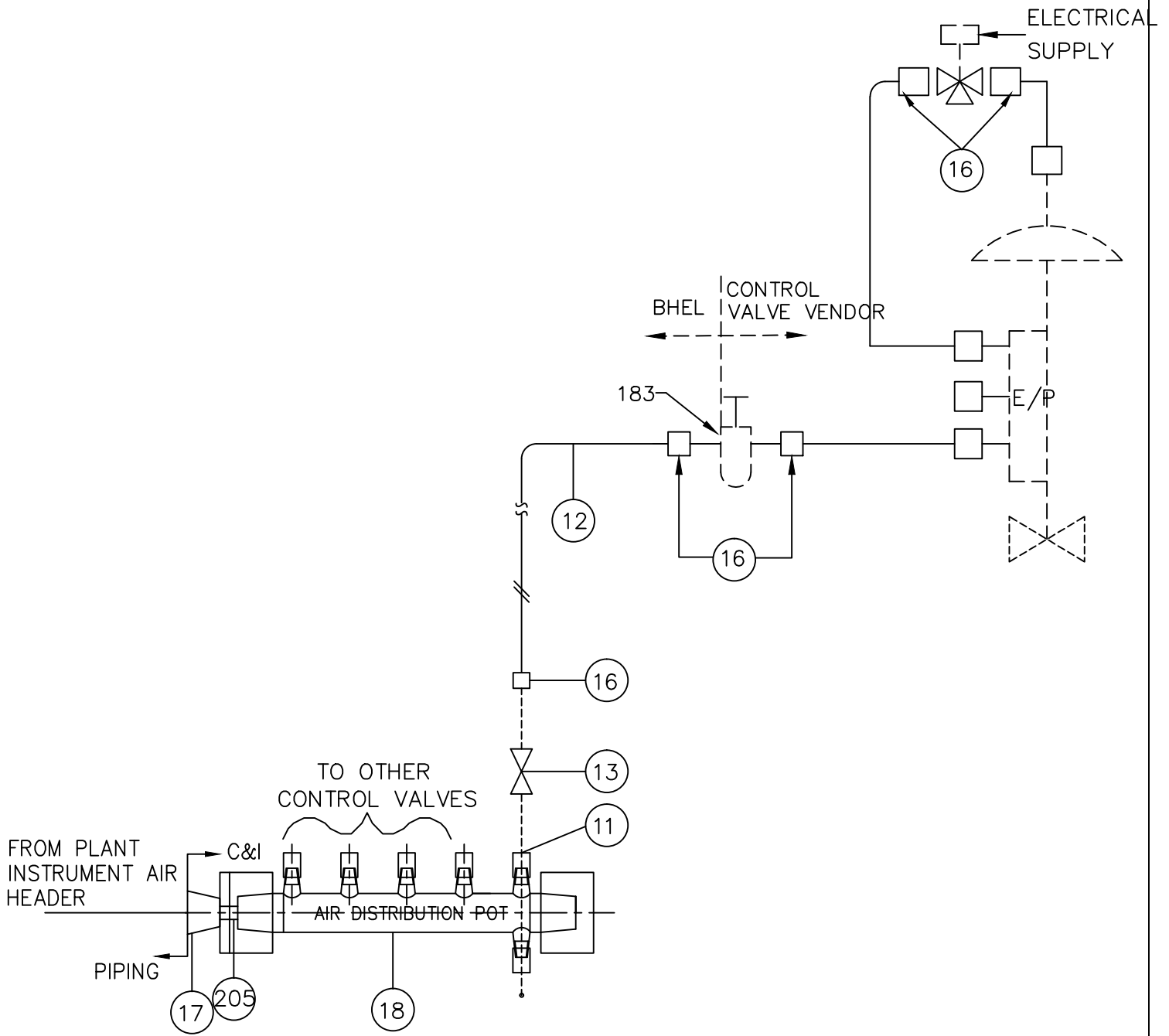
PRESSURE INSTRUMENT
 PRESSURE >40kg/cm²
 SW FITTINGS
 RATING 6000#




NOTE: COND POT(POS 681) TO BE PROVIDED IN STEAM SERVICE APPLICATION ONLY.

| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL CODE | SITE IDENTIFICATION |
|---------|--|---------------|---------------------|
| 601 | PIPE DIA 1/2" SCH 160 ϕ 21.3X4.8 SS | HY1071155741 | 39616002 |
| 602 | ELBOW ϕ 1/2"SW SS | AA7242501490 | 39626002 |
| 603 | COUPLING ϕ 1/2"SW SS | AA7242520495 | 39626002 |
| 604 | T-UNION ϕ 1/2"SW-F SS | HY7242510228 | 39626002 |
| 605 | NIPPLE L-100 ϕ 1/2"NPT/BW SS | HY7242578850 | 39626002 |
| 607 | CAP ϕ 1/2"NPT-F SS | HY7242579228 | 39626002 |
| 608 | GLOBE VALVE ϕ 1/2"SW-F SS | AA7501538581 | 39626002 |
| 615 | 5 WAY MANIFOLD ϕ 1/2"NPT-F SS | HY7316561041 | 39626002 |
| 681 | CONDENSATE POT ϕ 1/2"SW-F AS | TC9755535047 | 39626002 |
| 253 | COUPLING(DILO) ϕ 1/2"SW SS | TC9756105046 | 39626002 |
| 132 | PLUG ϕ 1/2"NPT-M SS | HY7242584280 | 39626002 |
| 302 | TUBE 12.7MM X 2.1MM SS | HY1071090054 | 39626002 |
| 303 | MALE CONNECTOR 1/2" X1/2"NPT SS | TC9755501010 | 39626002 |

| | | | |
|--|----------|---|-------------------------|
| | STANDARD | TITLE: | DRG.NO.: 4-381-21-03198 |
| | | FLOE ORIFICE, FLOW NOZZLE FLOW VENTURI FOR STEAM APPLICATIONS | SHEET NO: 10 OF 13 |
| | | | REV. 02 |



| POS.NO. | ITEM DESCRIPTION AND SIZE | MATERIAL | SITE IDENTIFICATION |
|---------|--------------------------------------|----------------|---------------------|
| 12 | ø6mm x 1mm TUBE; ASTM A312TP321 | HY1071155610 | 39626002 |
| 13 | 1/4" NEEDLE VALVE; SS | GT9757125016 | 39626002 |
| 16 | MALE STUD COUPLING; 1/4"NPTxø6mm; SS | TC975558032 | 39626002 |
| 183 | AIR FILTER REGULATOR | PART OF VALVE. | - |
| 205 | NIPPLE 1/2", NPTxBW | HY7242578841 | 39626002 |
| 17 | REDUCER NIPPLE 1" x 1/2" BW | HY7242532531 | 39626002 |
| 11 | FEMALE CONNECTOR ø6mm x 1/4" NPT | GT9751038057 | 39626002 |
| 18 | AIR DISTRIBUTION POT | TC9755557016 | 39626002 |

| | | | | |
|--|----------|--|-------------------------|--------------------|
|  HYDERABAD | STANDARD | TITLE: CONTROL VALVE WITH POSITIONER AND SOV APPLICATIONS | DRG.NO.: 4-381-21-03198 | |
| | | | | SHEET NO: 12 OF 13 |

| S.No | Tag. No. | Service DESCRIPTION | P&I D No: | Medium | Max. Operating | Max. Operating | Max. Operating | Range | Range | Units | Line No / Equip No: | Type Of Inst. | Instru. | Process connection | Sheet No. |
|------|------------|--|---------------|------------------|----------------|----------------|----------------|-------|-------|--------|------------------------|-----------------------------------|---------|--------------------|----------------|
| | | | | | Press (Kg/cm2) | Temp. (°C) | Flow (TPH) | From | To | | | | | | |
| 1 | PT- 1101 | MAIN STEAM HP HEADER PRESS. | 1-38101-05522 | STEAM | 68 | 485 | 155 | 0 | 100 | Kg/cm2 | 10"-MS-05-1101-43C-1H | Smart electronic pr. Transmitter | PT | 1" SW | Sheet 9 of 13 |
| 2 | PT- 1104 | TURBINE EXT. N3 TO PROCESS MP. HEADER PRESS. | 1-38101-05522 | STEAM | 12 | 365 | 60 | 0 | 16 | Kg/cm2 | 12"-EX-05-1116-21C-1H | Smart electronic pr. Transmitter | PT | 1/2" SW | Sheet 5 of 13 |
| 3 | PT- 1107 | TURBINE EXT. N6 TO PROCESS LP HEADER PRESS. | 1-38101-05522 | STEAM | 7.5 | 380 | 130 | 0 | 16 | Kg/cm2 | 24"-BP-05-1109-21C-1H | Smart electronic pr. Transmitter | PT | 1/2" SW | Sheet 5 of 13 |
| 4 | PT- 1127A | AFTER DS. TO BPTG EXHAUST LINE PRESS. | 1-38101-05522 | STEAM | 7 | 195 | 110 | 0 | 16 | Kg/cm2 | 20"-LPS-05-1122-11C-1H | Smart electronic pr. Transmitter | PT | 1/2" SW | Sheet 5 of 13 |
| 5 | PT- 1127B | AFTER DS. TO BPTG EXHAUST LINE PRESS. | 1-38101-05522 | STEAM | 7 | 195 | 110 | 0 | 16 | Kg/cm2 | 20"-LPS-05-1122-11C-1H | Smart electronic pr. Transmitter | PT | 1/2" SW | Sheet 5 of 13 |
| 6 | PT- 1121A | BFP DISCHARGE HEADER TO DESUPERHEATER PRESS. | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | 160 | Kg/cm2 | 3"-FW-05-1117-51C-1H | Smart electronic pr. Transmitter | PT | 1" SW | Sheet 8 of 13 |
| 7 | PT- 1121B | BFP DISCHARGE HEADER TO DESUPERHEATER PRESS. | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | 160 | Kg/cm2 | 3"-FW-05-1117-51C-1H | Smart electronic pr. Transmitter | PT | 1" SW | Sheet 8 of 13 |
| 8 | PT- 1145 | CONDENSATE TRANSFER PUMP DISCH. PRESS. | 1-38101-05522 | CONDENSATE WATER | 8 | 98.2 | 5 | 0 | 16 | Kg/cm2 | 2"-CL-05-1124-11A-1H | Smart electronic pr. Transmitter | PT | 1/2" SW | Sheet 4 of 13 |
| 9 | PT- 1150 | MAIN STEAM TO DESUPERHEATER CONTROL VLV. IL PRESS. | 1-38101-05522 | STEAM | 68 | 485 | 88.8 | 0 | 100 | Kg/cm2 | 8"-MS-05-1118-43C-1H | Smart electronic pr. Transmitter | PT | 1" SW | Sheet 9 of 13 |
| 10 | FT- 1101 | MAIN STEAM HP HEADER FLOW | 1-38101-05522 | STEAM | 68 | 485 | 155 | 0 | 1.3 | Kg/cm2 | 10"-MS-05-1101-43C-1H | Differential pressure transmitter | DPT | 1/2" SW | Sheet 10 of 13 |
| 11 | FT- 1104 | TURBINE EXT. N3 TO PROCESS MP. HEADER FLOW | 1-38101-05522 | STEAM | 12 | 365 | 60 | 0 | 1.3 | Kg/cm2 | 12"-EX-05-1116-21C-1H | Differential pressure transmitter | DPT | 1/2" SW | Sheet 7 of 13 |
| 12 | FT- 1107 | TURBINE EXT. N6 TO PROCESS LP HEADER FLOW | 1-38101-05522 | STEAM | 7.5 | 380 | 130 | 0 | 1.3 | Kg/cm2 | 24"-BP-05-1109-21C-1H | Differential pressure transmitter | DPT | 1/2" SW | Sheet 7 of 13 |
| 13 | FT- 1150 | MAIN STEAM TO DESUPERHEATER CONTROL VLV. IL FLOW | 1-38101-05522 | STEAM | 68 | 485 | 88.8 | 0 | 1.3 | Kg/cm2 | 8"-MS-05-1118-43C-1H | Differential pressure transmitter | DPT | 1/2" SW | Sheet 10 of 13 |
| 14 | FT- 1151 | BFP DISCH. HEADER TO PCV-1121 INLET SPARY WATER FLOW | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | 1.3 | Kg/cm2 | 3"-FW-05-1117-51C-1H | Differential pressure transmitter | DPT | 1/2" SW | Sheet 11 of 13 |
| 15 | PG- 1146 | TURBINE EXT. N6 TO PROCESS LP HEADER PRESS. | 1-38101-05522 | STEAM | 7.5 | 380 | 130 | 0 | 16 | Kg/cm2 | 24"-BP-05-1109-21C-1H | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 5 of 13 |
| 16 | PG- 1133 | INSTRUMENT AIR HEADER PRESS. | 1-38101-05522 | AIR | 12 | 50 | 6 | 0 | 16 | Kg/cm2 | 1"-IA-05-1126-11E | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 4 of 13 |
| 17 | PG- 1120 | BFP DISCHARGE HEADER TO DESUPERHEATER PRESS. | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | 160 | Kg/cm2 | 3"-FW-05-1117-51C-1H | BOURDON TUBE TYPE | PG | 1" SW | Sheet 8 of 13 |
| 18 | PG- 1129 | AFTER DS. TO BPTG EXHAUST LINE PRESS. | 1-38101-05522 | STEAM | 7 | 195 | 110 | 0 | 16 | Kg/cm2 | 20"-LPS-05-1122-11C-1H | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 5 of 13 |
| 19 | PG- 1135 | GLAND STEAM CONDENSER PRESS. | 1-38101-05522 | CONDENSATE | 8 | 98.2 | 5 | 0 | 16 | Kg/cm2 | ON TANK | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 4 of 13 |
| 20 | PG- 1136 | GLAND STEAM CONDENSER AIR+STEAM PRESS. | 1-38101-05522 | CONDENSATE | 8 | 98.2 | 5 | 0 | 16 | Kg/cm2 | GSC - S3 LINE | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 4 of 13 |
| 21 | PG- 1142 | CONDENSATE TRANSFER PUMP-A DISCH. PRESS. | 1-38101-05522 | CONDENSATE | 8 | 98.2 | 5 | 0 | 16 | Kg/cm2 | 2"-CL-05-1124-11A-1H | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 4 of 13 |
| 22 | PG- 1144 | CONDENSATE TRANSFER PUMP-B DISCH. PRESS. | 1-38101-05522 | CONDENSATE | 8 | 98.2 | 5 | 0 | 16 | Kg/cm2 | 2"-CL-05-1124-11A-1H | BOURDON TUBE TYPE | PG | 1/2" SW | Sheet 4 of 13 |
| 23 | DPG- 1148 | CONDENSATE TRANSFER PUMP-A SUC. DIFF. PRESS. | 1-38101-05522 | CONDENSATE | 0.95 | 98.2 | 5 | 0 | 500 | MMWC | 2"-CL-05-1123-11A-1H | Differential pressure Gauge | DPG | 1/2" SW | Sheet 6 of 13 |
| 24 | DPG- 1149 | CONDENSATE TRANSFER PUMP-B SUC. DIFF. PRESS. | 1-38101-05522 | CONDENSATE | 0.95 | 98.2 | 5 | 0 | 500 | MMWC | 2"-CL-05-1123-11A-1H | Differential pressure Gauge | DPG | 1/2" SW | Sheet 6 of 13 |
| 25 | PCV- 1127A | MAIN STEAM TO DESUPERHEATER CONTROL VLV | 1-38101-05522 | STEAM | 68 | 485 | 88.8 | 0 | NA | NA | 8"-MS-05-1118-43C-1H | Pressure Control Valve | PCV | NA | Sheet 12 of 13 |
| 26 | TCV- 1123 | BFP DISCH. HEADER TO DS-01 SPARY WATER TEMP. CV | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | NA | NA | 3"-FW-05-1117-51C-1H | Temperature Control Valve | TCV | NA | Sheet 12 of 13 |
| 27 | PCV- 1121 | BFP DISCH. HEADER TO DS-01 SPARY WATER PRESS. CV | 1-38101-05522 | FEED WATER | 90 | 130 | 21.2 | 0 | NA | NA | 3"-FW-05-1117-51C-1H | Pressure Control Valve | PCV | NA | Sheet 12 of 13 |
| 28 | FT- 4601 | AUX. COOLING WATER RETURN FLOW | 1-38101-05527 | COOLING WATER | 4.2 | 35 | 375m3/hr | 0 | 1.3 | Kg/cm2 | 10"-ACWS-05-4601-11D | Differential pressure transmitter | DPT | 1/2" NPT | Sheet 6 of 13 |
| 29 | PG- 4604 | GENERATOR AIR COOLER INLET CW PRESS. | 1-38101-05527 | COOLING WATER | 4.2 | 35 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4603-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 30 | PG- 4605 | L.O. COOLERS INLET CW PRESS. | 1-38101-05527 | COOLING WATER | 4.2 | 35 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4606-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 31 | PG- 4607 | L.O. COOLERS INLET CW PRESS. | 1-38101-05527 | COOLING WATER | 4.2 | 35 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4607-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 32 | PG- 4609 | GLAND STEAM CONDENSER INLET CW PRESS. | 1-38101-05527 | COOLING WATER | 4.2 | 35 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4605-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 33 | PG- 4613 | GENERATOR AIR COOLER OUTLET CW PRESS. | 1-38101-05527 | COOLING WATER | 3 | 45 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4611-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 34 | PG- 4615 | L.O. COOLERS OUTLET CW PRESS. | 1-38101-05527 | COOLING WATER | 3 | 45 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4609-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 35 | PG- 4617 | L.O. COOLERS OUTLET CW PRESS. | 1-38101-05527 | COOLING WATER | 3 | 45 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4610-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |
| 36 | PG- 4618 | GLAND STEAM CONDENSER OUTLET CW PRESS. | 1-38101-05527 | COOLING WATER | 3 | 45 | 375m3/hr | 0 | 10 | Kg/cm2 | 6"-ACWS-05-4608-11D | BOURDON TUBE TYPE | PG | 1/2"SW | Sheet 4 of 13 |