BHAGYANAGAR GAS LIMITED

(A JOINT VENTURE OF HPCL & GAIL)

BID DOCUMENT FOR

PROCUREMENT OF 400 SCMH ELECTRIC MOTOR DRIVEN ONLINE CNG COMPOSITE/ INTEGRATED DISPENSING UNIT (CCDU) WITH 5 YEARS OF CAMC INCLUDING WARRANTY PERIOD ON NPV BASIS

UNDER OPEN DOMESTIC

COMPETITIVE BIDDING

e- tender

Bid Document No.: BGL/662/2025-26

VOLUME-II of II

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1.0 INTRODUCTION

Bhagyanagar Gas Limited(BGL), (hereinafter referred as Owner), has been authorised by PNGRB for setting up infrastructure and operation of City Gas Distribution Network in Hyderabad, Vijayawada and Kakinada GAs. Natural gas will be transported to residential, commercial, industrial (PNG) and automobile consumers (CNG) in the city.

BGL is now inviting tenders on Competitive Bidding basis for procurement of "ELECTRIC MOTOR DRIVEN ONLINE COMPOSITE CNG DISPENSING UNIT (COMPRESSOR + CASCADE + DISPENSER) OF 400 SCMH CAPACITY" for this project.

The present document covers the technical specifications for the tender.

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2.0 TECHNICAL SPECIFICATIONS

The technical specifications for this present tender enquiry are as listed in Material Requisition.

Project : City Gas Distribution Project of M/s. Bhagyanagar Gas Limited

Subject : **Electric Motor Driven Online CNG Composite Dispensing Unit - Capacity 400 SCMH**

A. DESCRIPTION OF GOODS AND/OR SERVICES

Item	Quantity	Description	Identification Number
1.	**Total - 01 No** **For Hyderabad GA- 01 No**	**400 SCMH Electric Motor Driven Online CNG Composite Dispensing unit:** • Design, Engineering, Manufacture, Shop testing, loading, unloading , transportation and supply of Electric motor driven integrated **CNG Composite Dispensing Unit (Compressor + Cascade + Dispenser) with Compressor capacity of 400 SCMH, 450 WL CNG Cascades, Dual hose Car cum Auto Dispensers with both sides NGV nozzles with NZS adopters** complete with all items such as air compressor, Co2 flooding and other accessories including erection and commissioning spares, acoustic enclosures etc. Final/Complete Scope shall be as per technical specifications. . Services for Erection, Testing, and Commissioning and performance acceptance testing of compressor as defined in Scope of work. • Scope also includes Comprehensive Maintenance for each compressor during warranty for 01 year and further four years after warranty period. • Final/Complete Scope shall be as per technical specifications. Capacity: 400 SCMH	

B. REMARKS / COMMENTS

1.0 VENDOR'S SCOPE

In Contractor's scope of work is included the equipment with all internals and accessories shown on the data sheets, specifications and all unmentioned parts necessary for a satisfactory operation and testing, except those which are indicated to be out of the Contractor's supply.

2.0 INSPECTION

The bidder shall appoint Third Party Inspection Agency for carrying out the inspection at bidder's works as per approved ITP/QAP/QCT and TPIA charges shall be borne by the bidder.

As per Recommended vendor list.

3.0 APPLICABLE DOCUMENTS

Applicable documents are listed in hereafter under Section C of this MR, complemented with general specifications, guidelines and / or standards, as listed in LIST OF REFERENCED DOCUMENTS as a part of specification.

In the event of any conflict occurring in applying the referenced documents, the order of precedence shall be:

1 – Particular Technical Specification

2 – Attachments

4.0 VENDOR'S DOCUMENTS

4.1 Submittal of Calculation Note:

Design calculations will be well explained for demonstration of compliance to specified code(s) and standard(s). Limitation to a listing of input data and series of results is not acceptable. The applied formulations, sections, subsections, figures, subfigures from code(s) and/or standard(s) will be indicated at calculation steps to permit straight verification.

4.2 Vendor's Documents and Drawings

- All vendor documents and drawings shall be numbered according to Engineer's in-charge specification.
- All drawings shall use SI units.
- All graphical symbols to be recognized to industry standard.
- All text to be clearly legible when the drawing is reduced to A3 size.
- All drawings and calculations shall be checked, approved and signed by a competent and authorized person employed by the Contractor.
- Drawings to be issued bound in A3 size. In addition, the planning drawing to be issued in A1 for submission to the planning authority.
- Quality & design dossier (Drawing to be on A3 format) for review.
- All drawings shall be issued in Auto CAD (if required) & PDF formats.
- Installation, Commissioning, Operation & Maintenance manuals for CNG compressor package.

C. LIST OF ATTACHMENTS

The table here below lists the documents which are integral part of this Material Requisition. The applicable revision index of each document is mentioned in the column below the current Material Requisition revision index.	**Material Requisition revision**							
When the Material Requisition revision index is "A" or "1", all listed documents are attached. For other Material Requisition revision index, only modified or new documents are attached.	0	01						
Documents	**Revision of documents**							
Particular Technical Specification (PTS) - CNG Composite Dispensing Unit	0							
SECTION I- TECHNICAL SPECIFICATION FOR CNG COMPRESSOR, PRESSURE (14-19 bar)								
SECTION II-TECHNICAL SPECIFICATION FOR CASCADE								
SECTION – III: TECHNICAL SPECIFICATION FOR CNG CAR DISPENSER								

PTS –ELECTRIC MOTOR DRIVEN ONLINE COMPOSITE CNG DISPENSING UNIT (COMPRESSOR + CASCADE + DISPENSER) OF 400 SCMH CAPACITY

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1.0 GENERAL

Bhagyanagar Gas Limited, (hereinafter referred as Owner/Client) is responsible for distribution of Natural Gas for household, commercial & Industrial sectors including setting up CNG refueling Stations for vehicles etc.

2.0 SCOPE

2.1 This specification along with applicable codes as referred describe the minimum requirements for Design, Engineering, Manufacturing, Assembly, Inspection, Testing, Packaging, Supply, transportation, Erection & Commissioning including Performance Acceptance Test at site along with comprehensive AMC during One year warranty period and subsequent 4 (Four) year period including supply of all spares and consumable items for **"400 SCMH ELECTRIC MOTOR DRIVEN ONLINE COMPOSITE CNG DISPENSING UNIT PACKAGES (COMPRESSOR + CASCADE + DISPENSER)"** as required for dispensing CNG to vehicles at various locations in allotted GA as per this technical specification and applicable codes as referred. Various parts of this specification shall be read in conjunction with each other and in case where the different parts of this specification differ, the more stringent requirement shall govern.

2.2 The CCDU packages shall be identical in all technical respects. Various parts of these specifications shall be read in conjunction with each other and in case where the different parts of this specification differ the more stringent requirement shall govern.

2.3 Any additional work / equipment or technical requirement not mentioned in the specification but required to make the offered system complete in accordance with the specification and for safe and proper operation, shall be deemed to be included in the scope of work by the Bidder.

2.4 Packages have to be installed at the CNG outlets of OWNER and Oil and Marketing Company (OMC) retail Outlets located in allotted GA as per the instructions of Engineer in charge to increase the pressure of natural gas for dispensing in vehicles.

2.5 Bidder shall also be responsible for supply, erection, commissioning and field trial run, Noise level test and package performance test of all packages at sites. The field trial run of the compressor will be for minimum of 4 hours and the package should be kept under observation for 72 hours for stable operation and no major breakdown in which satisfactory performance of the package together with all accessories auxiliaries and controls shall be established for satisfactory performance for specified operating conditions. In case of any defect, discrepancies under specified site conditions, Supplier shall first rectify the same and repeat the field trial run.

2.6 It will be the endeavor of all the parties to get the performance acceptance test (PAT) at site conducted within a period of 30 days from the start of commercial operation of a particular package. The bidder has to keep the package operational round the clock and all the expenditures including spares and consumables, oil etc. to make the compressors operational shall have to be borne by the bidder. The power required to run the compressors will be provided by OWNER/ OMC. The contractor shall always maintain the packages in sound mechanical condition. The contractor shall rectify the defects notified by OWNER immediately and should submit all the history log sheets and spares availability status along with the report in the format mutually agreed between OWNER and the bidder.

2.7 The bidder shall depute adequate numbers of qualified, experienced and competent persons and supervisors for smooth maintenance of the compressors. In case of any breakdown, the maintenance staffs have to be available round the clock daily (i.e. 24X7) throughout the year. The response time of maintenance staff at site is 30min. i.e. before 30min ma

2.8 Periodic inspections of Safety Valves, Transmitters, Pressure vessel gauge and any other equipment as per statutory norms of State Factory Rules. SMPV and Gas Cylinder Rules shall have to be carried out by the bidder at his own cost during the period of maintenance by the bidder. The inspections have to be carried out by competent persons as per advice of Engineer-in-Charge and certificates have to be submitted to OWNER.

2.9 The bidder has to maintain an office at site with all necessary facility and keep his services personnel ready to attend problems any time of the day. Name and mobile phone number of in-charge of the services team has to be provided to Engineer-in-Charge / his representatives.

2.10 The bidder shall allow weekly rest and restrict daily working hours of his workmen as per relevant Act/Law/and Rule made there under. However, no work shall be left incomplete/ in dismantled condition on any holiday/weekly rest. Technician provided shall have minimum qualification of ITI. The bidder in person or his authorized representative shall be available on regular basis to interact with Engineer –in-charge.

2.11 The bidder has to keep his services personnel ready to attend problems any time of the day. Name and mobile phone number of in-charge of the services team has to be provided to Engineer-in-Charge / his representatives.

2.12 The work force deployed by the bidder for the maintenance services at site shall be of sound relevant technical professional expertise which is otherwise also essential from the safety point of view of the personnel of the contractor as well as for the installation.

2.13 All personnel of the bidder entering on work premises shall be properly and neatly dressed while working on premises of the company including work sites.

2.14 Bidder shall maintain proper record of his working employee's attendance and payment made to them.

2.15 The bidder's representative/supervisor shall report on regular basis to the Shift-in-charge at OWNER control rooms for day to day working.

2.16 All the safety rules and regulations prevailing and applicable from time to time at the installations as directed by OWNER will be strictly adhered to by the Contractor and his workforce.

2.17 The bidder shall plan schedule maintenance in consultation and prior permission of Engineer in-charge or his representatives.

2.18 The bidder shall be responsible for the discipline and good behavior of all his personnel deployed to carry out the services. In case of any complaint received against any of his employee, he shall arrange to replace such persons within 24 hrs of notice issued by the Engineer-in-charge. The decision of the Engineer-in-charge in this matter shall be final and binding on the Contractor.

2.19 The bidder shall arrange to supply/renew identity cards to his workforce at his own cost. The contractor's personnel shall be required to carry their respective identity cards while on duty and produce on demand. Without valid identity cards, they will not be allowed to enter into the CNG station.

2.20 Engineer-in-charge shall have authority to issue instructions to the Contractor from time to time during the contract period necessary for the purpose of proper and safe execution of the contract and the Contractor shall carry out and bound by the same. In case of non-fulfilment of any obligations under the contract and /or non-execution of any instruction issued by Engineer-in-charge as per terms and conditions of the contract, Engineer-in-charge shall have power to withhold payment for an amount equivalent to the amount to be spent for execution the obligations/instructions issued by him. The decision of engineer-in-charge in this regard will be final and binding to the Contractor.

2.21 Receipt at site, storage in warehouse as per manufacturer's recommendation and safety and security from theft and breakage during transportation, handling including security guard at site.

2.22 Submission of drawings & documents.

2.23 Erection, Comprehensive maintenance and all others relevant manuals for compressor & its accessories, priority panel, electrical motor & all instrumentation.

2.24 GENERAL

2.24.1 The contractor must follow the MAINTENANCE REQUIREMENT as stated below but not limited to and ensure to provide trouble free services as defined in the bid documents.

A. ACCOMMODATION/ TRANSPORTATION/ MEDICAL

The contractor shall make his own arrangement for the accommodation of his personnel at respective locations and subsequent transportation arrangement for them from their place of residence to work place or any other place as required and owner shall have no obligation in this respect.

B. DISCIPLINE

The contractor shall be responsible for the discipline and good behavior of all his personnel deployed in the services contracted out and should any complaint be received against any of his employee, he shall arrange to replace such persons within 24 hours of notice issued by the Engineer-in-Charge. The decision of the Engineer –in-Charge in this matter shall be final and binding on the contractor.

C. GATEPASS / IDENTITY CARD

The contract shall arrange to supply / renew identity card to his workforce at his own cost, if so required by OWNER for security or for any other reasons. Those contractor's personnel shall be required to carry their respective identity cards while on duty and produce on demand. Without valid identity cards, they will not be allowed to enter into the CNG station.

D. RIGHT TO GET SERVICES CARRIED OUT THROUGH OTHER AGENCIES

Nothing contained herein shall restrict OWNER from accepting similar service from other agencies, at its discretion and at the risk and cost of the contractor, if the contractor fails to provide the said services any time.

The maintenance services shall be provided the round the clock basis as required.

E. OWNER will notify the start date for Comprehensive Maintenance services

After the successful completion of test run & commissioning, system taking over certificate shall be issued by the owner.

2.25 Maintenance of CCDU packages

i. The contractor shall deploy adequate number of technicians / supervisors / Engineers / helpers as well as tools, spares, consumables and equipment for smooth and proper maintenance of the Packages supplied in terms of the contract. In case required to meet operational requirements, the contractor shall augment the same as per direction of Engineer–in-Charge. Contractor to submit a detailed organogram with key person details before starting maintenance of the package.

ii. The contractor is required to carry out all services as mentioned in the Scope of Services and Schedule of Rates on all the 365 days including Sunday and all Holiday & around the clock. contractor has to carryout the maintenance during the non-peak hours / night hours as per instructions of EIC.

iii. The contractor shall follow Central/State guidelines for labour laws, rules and regulations. However, no work shall be left incomplete/unattended on any holiday/weekly rest. Technician/operators provided shall have minimum qualification of ITI. Contract in person or his authorized representative shall provide the services on daily basis to interact with Engineer-in-charge and deployed workman.

iv. The work force deployed by the contractor for maintenance service of Compressors, shall be of sound relevant technical professional expertise which is otherwise also essential from the safety point of view of the personnel of the contractor as well as for the installation.

v. Contractor must ensure the safety of man and machine all the times. Damages of equipment due to

negligence will be recovered as per the decision of Engineer-in-Charge, which will be final.

vi. Regarding work completion, the decision of the Engineer-in-Charge will be final and binding.

vii. The contractor shall make his own arrangements to provide all facilities like boarding and transport etc. to his workmen.

viii. All personnel of the contractor entering on work premises shall be properly and neatly dressed and shall wear uniform, badges while working on premises of the Owner including work sites.

ix. Contractor shall maintain proper record of his working employee's attendance and payment made to them.

x. All the safety rules and regulations prevailing and applicable from time to time at the installations as directed by OWNER will be strictly adhered to by the contractor.

xi. It will be the responsibility of the contractor to pay as per the minimum wages of the appropriate government applicable under the Minimum Wage Act 1948.

xii. The contractor shall establish a complaint registration system to operate for 24 hours, seven days a week where complaint regarding non-performance of the package in terms of the contract can be lodged. Further, the contractor shall deploy adequate number of technicians/ supervisors / engineers at various site offices in consultation with Engineer-in-Charge to provide trouble free maintenance of the Compressors.

xiii. The successful bidder shall indemnify the Owner from any claim of the contract labour.

xiv. The successful bidder shall comply to all the rules regarding PF, ESI etc. as stated in the tender document.

xv. All the jobs mentioned under scope of services shall be carried out as per sound engineering practices, work procedure documentation, recommendation of the manufacturer and as per the guidelines/direction of engineer-in-charge of authorized representative.

xvi. Summary of breakdown hour's station wise with analysis shall be submitted on a fortnightly basis both in hard and soft form as per OWNER format.

xvii. The contractor has to submit the following documents on monthly basis along with the bill:

- Preventative maintenance compliance report for that month along with the detailed service report.
- Details of the compressor breakdown, summary of break down hours for that month and the cumulative break down hours along with breakdown response time.
- Compressor parameter log book for the month, extracted from PLC.
- Certificate to be given by the bidder stating that they have complied with all the labour regulations and are following the minimum wages act.

xviii. All spares, consumables, lubricating oil, coolant required for carrying out preventive / any type of maintenance shall be in the scope of supplier during the contract period. The spares shall be supplied by the vendor during the complete contract period.

xix. All tools, tackles and fixtures required for carrying out the above maintenance of the package shall be in scope of the bidder. The scope will also include handling equipment's like crane, forklift, chain pulley block, etc. required during any maintenances activity.

xx. Any correspondence required to be made with the principal company or OEM or various offices shall be made by the bidder or bidder's agent. All arrangements like phone, fax, computer, Internet etc required for above correspondences shall be arranged by the bidder at his own cost.

xxi. The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly.

The bidder shall provide the detailed preventative maintenance schedule along with

a) Estimated down time required for each type of maintenance schedule.

b) List of spares and their quantities required for each type of maintenance schedule per compressor.

c) Type and number of man days required for each type of maintenance schedule per compressor.

xxii. The bidder shall plan such maintenances during non-peak hours/ night hours preferably and in consultancy with the Engineer In Charge (EIC) of OWNER. Any maintenance that needs to be taken up shall be well planned in advance with due approval of the EIC.

xxiii. The bidder shall use only OEM's certified spares during maintenances. All spares shall be kept in sealed OEM stamped packages. The packages shall be opened in front of OWNER representative during maintenance. In case, the schedule maintenance of the OEM manual recommends to check and replace parts like valve spring, valve plates, piston rings etc. after certain time interval, same shall replaced or used further only on approval from the OWNER's representative. However any untoward consequences for non-replacement of such parts shall be the responsibility of the bidder and spares, repair required to put back the unit into operation will be to bidders account.

xxiv. All routine and periodic checks / inspections required to be done as per OEM recommendation shall be done by the bidder. Instruments required for above inspection like Vernier calliper, micrometre screw gauge, fill gauges, bore gauge etc shall be in scope of the bidder and these instruments shall be calibrated every year.

xxv. All parts replaced by the bidder during the above contract period shall be disposed off periodically with permission from OWNER.

xxvi. The contractor shall submit a copy of the daily / weekly / fortnightly / monthly / bimonthly / quarterly and yearly performance report to the EIC in both soft and hard form. All stationary including the printed material such as compressor parameter log book, complaint log book, service report, break down summary report etc. shall be in scope of the bidder.

xxvii. All the maintenance / inspection job carried out by the bidder shall be recorded in a service report and the report of the same shall be jointly signed by OWNER representative and submitted immediately after carrying out the maintenance. Service report format shall be approved by OWNER.

xxviii. The EIC will be final authority to take decision with regards to maintenance or replacement of parts or any disagreement between the bidder and OWNER, during the execution of the contract.

xxix. The bidder shall carryout calibration of gas detectors and flame detectors every six months or earlier as per requirement or instruction of EIC of OWNER. Also yearly calibration of all instruments such as pressure gauges, transmitters, switches, mass flow meters etc shall be in the scope of the bidder. In addition to the above all safety relief valves shall also be tested and calibrated every year.

xxx. Calibration shall be done from government-approved laboratories and shall be carried out at least 15 days prior to the calibration due date.

xxxi. The bidder shall keep 1 set of safety relief valves in spare for the purpose of calibration.

xxxii. The bidder shall carry out retesting of pressure vessels periodically i.e. every year or earlier as per Gas Cylinder rules 2016 / Static & Mobile Pressure Vessels Rules.

3.0 CODES AND STANDARDS

3.1 The design, construction, manufacture, supply, testing & other general requirements of the compressor package equipment shall be strictly in accordance with the data sheets, applicable API codes, and shall

comply fully with relevant National/ International standards, Indian Electricity Act, Indian Electricity rules, regulations of Insurance Association of India and Factories Act while carrying out work as per this specification.

3.2 Any modification suggested by statutory bodies either during drawing approval or during inspection, if any, shall be carried out by the bidder without any additional cost and delivery implications.

i. The following National & International Codes & Standards of Latest editions shall be applicable.

- PNGRB Guidelines for Safety / T4S guidelines applicable for CGD
- OISD 142:
- IS 5572
- OISD 179, NFPA-52: 2006, NFP-496, NFPA-68, NFPA-70 or equivalent
- NFPA – 37
- NFPA – 12- CO2 Flooding system
- IS: 325/ IEC or International standards. – Standards for electric Motor
- IS: 6382
- Applicable ANSI, ASTM, NEC, NEMA code
- API – 618/API 11 P
- EURO EAN NORM P.E.D., Italian NOR M D.P.R. 47/55
- EURO EAN NORM P.E.D , D.M. 24.5.02 - D.M. 2 8 .6.02
- D.M 2 4.11.84 parte prima - sez. II° , D.M . 24.5.02 - D.M. 28.6.02, DIN 2413, S AE J 514
- EURO EAN NOR MS, CEI N 60079- 0/CEI EN 60079-14/ CEI, EN 60204-1/ CEI EN 60439-1, ATEX STANDARD
- API – 661 : Specifications for Air cooled exchangers
- ASME Section – VIII Div. – 1/2 Design codes for pressure vessels.
- Gas Cylinder Rules 2016.
- Standard Specifications of Bureau of Indian Standards (BIS).
- Specifications/Recommendations of IEC.
- Indian Electricity Rules.
- Indian Explosives Act.
- State Factory Rules
- TEMA – C - Water cooled heat exchangers
- ASME / ANSI – B-31.3 Code for Process Piping

- DIN 2413-This standard covers the design of steel bends and bent pipes of circular cross section used in pressure pipelines.
- SAE J 514-Standard for CNG hydraulic tube fittings and O-ring
- CEI EN 60079-10-Classification of area for explosive gas atmosphere
- CEI EN 60079-14-Design, selection, and installation of electrical systems for areas with potentially explosive atmosphere.
- CEI, EN 60204-1-Standard for safety of machinery — Electrical equipment of machine
- CEI EN 60439-1-Standard for safety of electrical equipment
- ATEX-Standard for describing electrical equipment and workspace is allowed in an explosive atmosphere.

Above mentioned codes are applicable as precedence to technical specifications. Vendor to refer codes that are applicable in arrangement to their standard design.

4.0PRECEDENCE

In case of any conflict among the various documents of this requisition the following preferential order shall govern:

1. Data sheets/drawings
2. Technical Specification
3. International standards/codes as applicable
4. Indian Standards / codes as applicable

Compliance with these specifications shall not relieve the bidder of the responsibility of furnishing equipment and accessories of proper design, material and workmanship to meet the specified operating conditions.

No deviations to the technical requirements and to the scope of supply specified in this enquiry document shall be accepted and offers not in compliance to the same shall be rejected. In case a deviation is required due to inherent design of the equipment offered, the bidder shall list all such deviations at one place giving reasons thereon.

Bidder shall necessarily furnish the following along with the bid, without which the offer shall be considered incomplete:

(1) Proven Track Record Formats duly filled in along with general reference list shall be submitted for the earlier supplied packages as per the BEC requirements.

(2) Checklist duly filled in with regards to scope of supply

(3) Completely filled in Data Sheets as per tender

(4) Deviations if any to this Technical Specification-NA

(5) Tentative Lay out/key plan/General Arrangement Drawing indicating size of skids, center distance between skids and space required along with maintenance requirements

(6) (a) Utilities requirements (b) Electrical Load summary

(7) Catalogues of Composite CNG dispensing Unit package, motor, instrumentation & controls etc.

5.0PROCESS PARAMETERS

Complete Integrated CNG Compressor package shall be suitable to work under the following climatic conditions:

The climatic conditions to be considered for selection, design and derating of equipment shall be as indicated below:

- Amb. temp min/max0C : -20°C / 55°C
- Design wet bulb temp (WBT), 0C : 27°C
- Design relative humidity % : 90
  - Altitude above MSL, M : As per site
  - Wind velocities km/hr (max) : 160
  - Typical Gas Composition Range

Component	Design case mole. %
Methane	94
Ethane	1.2
Propane	1
i-Butane	0.4
n- Butane	0.00
i- Pentane	0.00
n- Pentane	0.00
Carbon Dioxide	1.8
Carbon Monoxide	00
Nitrogen	1.6
SUM	100

NOTE:

- Oxygen: Not more than 0.5% mole.
- Total non-hydrocarbon: Not more than 2.0 mole%
- Total Sulphur including H2S: Not more than 100 ppm by weight.
- Expected H2S content not more than 4 ppm by volume
- Water content: Less than 112 kg/MMSCM specific gravity
- Mass density (kg/Sm3) : 0.736
  Molar mass (kg/Kmol) : 17.3551

6.0SCOPE OF SUPPLY FOR EACH COMPOSITE CNG DISPENSING UNIT PACKAGE

The scope of work/services to be provided by the bidder shall be inclusive of but not limited to:

- Design, Engineering, Manufacturing, Assembly, Inspection, Testing, FAT, surface preparation and Painting, Packaging and forwarding, Insurance, customer clearances, Supply, handling and unloading, Erection &

Commissioning including Performance Acceptance Test at site along with comprehensive AMC including supply of all spares and consumable items along with associated electrical, instrumentation etc. as per bid document.

- Combined unit with compressor + cascade + dispenser.

  • 400 SCMH online compressor package. (Detail specification REFER SECTION-I).

- Three banks 450 Water Litre (minimum) capacity Cascade for 400 SCMH. (Detail specification REFER SECTION-II)
- Dual hose CNG Car/Auto Dispenser with NGV nozzles along with NZS adopters (1 no.) (Detail specification REFER SECTION-III).
- All interconnections between compressor, cascade and dispenser upto the battery limit shall be in the scope of bidder.
- Bidder need to submit copy of valid approval from PESO for offered integrated CNG Composite unit (Compressor + Cascade + Dispenser) along with the bid.
- 3 nos. mass flow meters to measure the Natural Gas consumption i.e 1 no. at packages inlet, 1 no. at dispenser left arm and 1 no. dispenser right arm All are Coriolis type mass flow meter. The flowmeters should be enabled with MODBUS/RS 485 communications. 1 No Thermal Mass flow meter to measure Vent Loss.
- PLC based control panel with HMI. PLC based control system with HMI 10” touch screen display. PLC shall be provided with mounting rack, CPU, Input output cards, Power supply card, communication card. PLC CPU shall be redundant (1W+1S) with auto switch over without manual intervene. Both CPU shall be connected with High-speed ling for bump less change over between primary and secondary CPU. This shall not affect compressor operation. Failure alarm of CPU shall be provided in HMI. A dedicated modbus (RS 485) slave communication port shall be provided for Remote terminal unit (RTU) interface. Port connection shall be two pin connector or RJ 45, Additionally, separate TCP/IP communication ports shall be provided for GPRS modem for communication with SCADA system.
- PLC shall be mounted in EX proof enclosure. Cabinet specification with Statutory certificate shall be submitted during engineering stage for approval.
- Instrumentation and control system as specified on data sheets including Local panel, Console/Local gauge boards, PLC. All the transmitters shall be Ex proof or intrinsically safe. PESO certificates shall be submitted.
- Pressure Transmitter and Temperature Transmitters shall be used for CNG Gas application with 4-20 mA output signals to PLC. The units of measurement for flow shall be Kg/hr, for pressure shall be Kg/cm2 (g) or and for temperature shall be degree C. Pressure and temperature switches are not acceptable.
- Block & bleed valves/Two valve SS316 Manifold to be provided for Pressure gauges and pressure Transmitters.
- Common structural steel skid for the compressor- Motor combination and for all auxiliary systems including cascade, dispenser, priority panel, control panel etc. with One number IR type point gas detectors, one number Flame detector UV type inside the enclosure.
- Vendor shall submit documents during engineering stage for review & approval to client/consultant. Document are specification /data sheet with statutory approval certificate, W&M certificate, PESO certificate of all the instruments as per P&ID, instrument index, input output list, power consumption calculation, cause & effect cables specification, cable schedule with termination details, operation & control philosophy, and PLC specification & architecture.

- 5 no. Emergency stop button (push type) along with one hooter in office/customer interface room. Emergency stop button shall be provided at below locations. Hazardous area push buttons shall be mounted in ex proof enclosure with break glass & hammer. Push button shall be push to lock type. Unlock will be done by operator after ensuing the safe & normal situation.

a. Outside compressor enclosure

b. Field

c. Control room/office room

- Explosive proof and WP IP 65 Hooter with acknowledge push buttons at outside the enclosure shall be provided for alarm and trip.
- Explosive proof door limit switch at each side of door. Door open alarm shall be provided.
- Air-cooled heat exchanger for inter stage and discharge gas.
- 6 line (3 bank) Priority Panel at Compressor Discharge.
- Earthing of Electrical items eg. Motor and instrumentation items shall be done separately.
- Discharge flow rate of vent gas by SRV shall be mentioned and marked properly on SRV. API 520 confirmation for design of SRV to be confirmed with proper documentation and report.
- Compressor shall be provided atleast the following clear and permanent markings readily accessible and easy to read in the installed position; namely: -

a) Manufacturer's name;

b) Model;

c) Serial No. or month and year of manufacture

d) Certificate of approval no.;

e) Rated capacity (cubic meter per hour);

f) Operating speed (RPM);

g) Required driving power (in kW);

h) Maximum and minimum supply pressures;

i) Maximum outlet pressure; and

j) Certification for Natural Gas use.

k) Client's Name and LOGO

l) Consultant's Name and LOGO

- Standard Operating Procedure, Do’s and Don’t for compressor operation to be installed on packages (in Hindi and English both)
- Proper tagging to be given on all instruments such as PG, PT, TT, TG, MFM, GD, FD, SRV etc.

- Calibration certificate and calibration Tags to be provided for all instruments such as PG, PT, TG, TT, Flow meter, GD, FD, SRV etc.
- All SRV to be supplied with locking arrangement, same shall be ensured at plant and site.
- BGL Intends to operate the CCDU compressor package without operator ensuring package remains in good condition. Therefore, the bidder is required to supply CCDU compressor package that are capable of autonomous operation without the need for operator intervention and bidder has to provide the login ID's and its access to run and monitor the machine remotely.
- Although operations of CCDU is not the scope of bidder, however, All Client operators shall be trained for complete operations, safety features of the packages. Operator training certificate against training shall be provided for operations and other critical features of the packages. Daily checklist to be followed by operators is attached as Annexure-XV. No separate cost shall be paid for this, bidder to consider optimum time for training schedule. If required BGL will inform the contractor to operate the CCDU and payment shall be made as per applicable SOR rates.
- BGL reserves the right to deploy or remove the operational services. However, it is the sole responsibility of bidders to maintain the CCDU compressor package in good condition.
- If Piping/Tubing Connection from CO2 Cylinders-TO –Compressor and Air compressor-TO-Compressor is falling in the operational walkway, same needs to be provided with suitable safety cross-over.
- CO2 flooding system shall be online with operation of the compressor i.e. necessary arrangement to be given for checking health condition of CO2 cylinders through HMI.
- Identification marks for CO2 Flooding system (Tag Number of cylinder) in the field shall match the IDs marks in HMI.
- Drain Connection from the Air Tank shall be connected to the nearest drain
- In case cascade is placed above the package then same shall be having working space, safety grills and ladder (with handrails) arrangement for doing various maintenance activities. The bidder shall also provide 2 nos. staircase/ladders with handrails (in line with the gas cylinder rules) for safe climbing on the top of the canopy. Ladders shall be provided on opposite sides. The bidder shall ensure that adequate space (minimum 2 feet i.e. around 600 MM width) walkway all around including in front side of cascades (i.e valve mounting side) is available for carrying out routine checking/ Maintenance.

  Design of canopy shall be suitable for Seismic zone IV. Also, please indicate design loads (vertical and horizontal) to be considered for foundation design in your drawings.
- 2 way/ 3 way valves with full flow ball valve for priority line.
- All interconnecting oil, gas, water, air piping within the compressor package, including priority panel, cascade & dispenser & interconnecting tubing.
- Impulse and pneumatic piping/Tubing for all valves, fittings as specified & required for mounting the instruments.
- Junction boxes as required for interfacing to compressor package mounted control panel.
- NRV at final discharge.
- Structural supports within the Integrated CNG Compressor package for all piping, instruments etc.
- One no. relief valve at each stage discharge and Blow Down Vessel.

- Y- type strainers, valves, sight flow indicators, check valves, auto & manual drain traps etc. as required for various auxiliary systems i.e. frame lube oil, cylinder lubrication system, cooling water systems etc. according to manufacturer safe design.
- Coupling/V-belts/pulleys.
- Common CO2 extinguishing system consisting of two cylinders, piping, valves and control systems as per details given in this specification.
- Compressor Inlet and outlet manual and automatic isolating valves for maintenance & emergency.
- Complete Erection, Testing & Commissioning of integrated compressor packages.
- Field Performance test at site
- Supply of all essential spares for erection & commissioning spares.
- An oil drain pot outside of the package shall be provided to collect all drains from packing, distance pieces, processes etc. The capacity of the drain pot should not be more than 2.5 Litres.
- Air cooled lubricated/Non-Lubricated compressor with suction/discharge volume bottles (dampers) for each stage (separators) with manual drains and automatic drain system, lube oil system, closed circuit cooling water system (console type)/Air cooled according to manufacturer safe design.
- Priority refuelling system inside of the package.
- Drive belt, if used shall be anti-static fire retardant type.
- Suction pressure reduction valves with shut off valves, Y type strainer and Duplex suction filters with filtration level upto 5 Micron to be provided as per process parameters given in tender document. In case duplex filters are placed outside then all piping shall be in bidder's scope.
- Two stage filtration at discharge so as to limit oil carryover is to be provided.
- Wires mesh type guard for heat exchanger fan.
- Erection, Maintenance and all others relevant manuals for integrated compressor package & its accessories, priority panel, electrical motor & all field instruments, dispenser, storage cascade etc. for easy operation & trouble shooting.
- Annual comprehensive maintenance services for a period of 1 year during the warranty period and 4 (Four) years after the warranty period, including supply of all spares and consumable items.
- Training to Owner's Employees on the operation of unit for daily working including regular checks, troubleshooting etc. (at site or works as per owner's permission)
- Cables

a) Main incoming Power cable from owners Power Distribution Board (PDB) to main control panel of the compressor through heavy duty GI conduit or trenches, all interconnecting cables in compressor package, including complete erection accessories like double compression cable gland, ex proof gland in hazardous area, cable tags, lugs etc. as required.

b) Electrical/Control Cables required for providing connectivity to Co2 system and emergency switch.

c) Supply, laying, glanding, lugging, ferruling, clamping, terminal of Instrumentation cable (signal, control, communication, ethernet & Power) from instrument to junction box/PLC inside enclosure, PGD, flame detectors to PLC, PLC to HMI. Emergency push button outside compressor enclosure to PLC.

d) Supply of signals and power cable from Emergency push button (field and control room) to Compressor PLC and RS 485 port cable of Compressor PLC to Client's RTU. Vendor shall provide all the RS 485 configuration details to RTU vendors/client/consultant required for configuration. Vendor shall also provide their support during configuration.

Note -FRLS (Fire resistant low smoke) cables shall be used for gas detectors, flame detectors and emergency push buttons.

Cables to be supplied as per tender conditions, Average length per site shall be considered as 80 Meters however actual length will be varied from site to site (i.e. maybe 50 to 100 meters). Hence cable shall be provided as per required length for each site. Laying of Cables shall be scope of bidder. Cable scope to be submitted for approval.

Note -FRLS (Fire resistant low smoke) cables shall be used for gas detectors, flame & multisensory detectors and emergency push buttons.

- Supply of all cables required for commissioning of the CCDU compressor package is in the scope of bidder only. No cables shall be supplied by the client.

- Supply of Communication Cables, cable glands, termination of cable and cable laying from RS 485 port of dispenser & Compressor PLC (in Integrated package) to junction box is in Vendor's scope. Supply of standard make, WP IP 42 junction boxes, terminal blocks and installation of junction box shall be is in Vendor's scope. Junction box shall have 8 inputs cables entry points (side) and two outgoing entry points including spare (bottom), cable entry from top is not accepted, size of junction box to be decided by vendor. All the spare entry shall be plugged properly. Vendor shall be responsible to provide all the signals at the junction box which will be connected to RTU in future. During installation & commissioning of dispenser same will be checked by CLIENT's Engineer.

- Communication cable is single pair (1Px 1.5mm2), multi strand, armoured cable with HR PVC insulation and PVC st2 inner and outer sheath. Tentative cable length from each dispenser & Compressor to junction box is approx. 50 meters, however vendor shall provide cable length as per requirement.

- Vendor must share junction box termination details with CLIENT.

- All Instruments & electrical equipment shall be supplied with double compression type of cable glands tested & certified to be used in hazardous area classified as Zone-I.

- Appropriately plugged drain valves of the filter outside the dispenser housing with suitable arrangement to collect the drained oil to facilitate the operator to drain the oil on regular basis without requiring to open the lock of the dispenser cabinet. The layout of tubing and other component should be such that it gives unhindered access to all parts and maintenance becomes easy.

- CLIENT's Logo and name to be displayed on dispenser side, in CLIENT approved colour scheme. CLIENT's Logo and name shall be painted on stainless steel panel with an appropriate coloured background or alternatively, vendor shall provide self-adhesive PE film sheet with CLIENT's Logo and name. The artwork shall be of three colours. The colours, Logo size and name size shall be informed to successful bidder during detailed engineering.

- On-Site Training to CLIENT personnel (Three days each for three separate groups).

- Training to CLIENT personnel at vendors shop (10 personnel for three working days). The travelling, boarding & lodging of CLIENT's Engineers shall be borne by CLIENT. The training module shall cover the equipment construction features, Comprehensive maintenance procedures, practical hands on experience on assembling, dismantling. etc.
- Integrated Compressor package shall be suitable for outdoor installation without roof / shed.
- Maximum footprint of Integrated compressor frame Package shall not exceed 8.0 Sq Mtr. Maximum with integration of all accessories.

7.0 EXCLUSIONS

The following are excluded from the scope of the bidder:

- All civil works and foundation will be done by client , however the bidder shall furnish all the relevant data for foundation requirements i.e., drawings , drawings of any pedestal if required.
-

8.0 BATTERY LIMITS

- Supplier shall arrange its own ups supply for testing, installation and commissioning compressor control circuitry. UPS of adequate rating along with battery backup to be part of vendor's scope.
- All customer interface connections (i.e. Gas inlet & gas outlet) shall be brought out to the package edge.
- As and where specified on the data sheets all vents (i.e. Relief valve, distance piece, packing and starting air) shall be manifolded and terminated at skid edge outside the enclosure and vented to safe height at package roof (3 m).
- All drains from different process equipments, distance piece and packing shall be manifolded and terminated as single point for customer interface duly flanged with isolation valve. Drains should be through a common header and discharge to be allowed in a pit to avoid spillage around Integrated CNG Compressor package.

9.0 UTILITIES

- Any auxiliary motor above 10 hp shall be provided with star delta/ soft starter (three phase controlled) type starter. Single phase motor will be not acceptable above 1 hp rating.
- Bidder shall make his own provision for Instrument air if required with an electric motor driven air compressor with a suitably sized receiver & Refrigerant/Heatless type air drier system. Air Compressor motor should be 415 V squirrel cage motor DOL / star delta starter having overload protection, single phase preventer.
- Drain should be through a common header and discharge to be allowed in pot outside the package (capacity not more than 2.5 litres) to avoid spillage around the Integrated CNG Compressor package.
- All electrical and instrumentation terminals shall be as specified.
- Purchaser shall provide 415 V, 3Ph, 50Hz, 4 wire electric power for compressor motor drive at a single point in the electrical room.
- contractor shall provide the 230V, 50Hz, 1Ph UPS, 3 wire for LCP at single point in the electrical room.
- The offered compressor packages shall be equipped with PLC-based control systems integrated with Internet of Things (IoT) functionality. The bidder shall ensure complete IoT enablement to facilitate real-time data monitoring, diagnostics, alerts, and performance tracking via a cloud-based platform. All necessary hardware, software, licenses, SIM cards/data connectivity, and configuration for seamless IoT operation shall be included in the bidder's scope of supply
- BGL intends to operate the CCDU compressor packages without any onsite operator. Accordingly, the bidder shall supply compressor packages capable of fully autonomous operation, ensuring reliable and uninterrupted performance. The system should include all necessary components and features to operate independently. The bidder shall also provide remote access credentials (login IDs and access rights) for BGL to monitor and control the package remotely if required.

SECTION – I:

TECHNICAL SPECIFICATIONFOR CNG COMPRESSOR - PRESSURE (14-19 BAR)

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1.0 GENERAL DESCRIPTION

The Integrated CNG Compressor package is to be installed at CNG station.. The gas composition is as detailed above.

Package capacity shall be 400 Sm3/h at suction pressure range 14 - 19 kg/cm2(g) with performance/guaranteed at 16 kg/cm2(g) with discharge pressure 255 kg/cm2(g) with 6-line (3 Banks) priority panel electric motor as detailed in scope of work and technical specification.

A. GENERAL DATA

1.1	Compressor type	
1.1.1	Oil lubricated	Oil lubricated/Non Lubricated reciprocating type
1.2	Type of cooling	Gas cooling and cylinder cooling should be by air only.
1.3	No. of compression stages	03
1.4	Cylinders	Horizontal Balanced Opposed design with lined cylinder/ trunk piston Design. Vertical Compressor block design is not acceptable
1.5	Maximum intake temperature	35° C
1.6	Compressor package BKW at Specified flow including all losses such as mechanical, leakage, transmission & power absorbed by compressor driven and other electric driven auxiliaries.	To be indicated in KW Detailed break up to be given as per Annexure –I
1.7	Maximum motor power	To be indicated with 10 % margin over BKW as per Annexure – I
1.8	Drive mode	V- belts/Direct coupled. Direct drive (from prime mover to compressor) is preferred over belt driven. Power Transmission should be thro' flexible coupling.

B. COMPRESSOR PERFORMANCE DATA

2.1	Gas pressure at compressor inlet	Refer below Section 2.5	
2.2	Compressor Discharge Pressure	255 Kg/Cm^2 g at 52 deg. C (Max)	
		Compressor Discharge temperature 52ºC (After cooler) with ambient air temperature of 47.5ºC and gas inlet temperature of 35ºC (max.).	
2.3	Compressor speed	To be indicated by bidder.	
2.4	Ambient Conditions		
2.4.1	Ambient temperature	-20 ^{0}C to 55 ºC.	
2.4.2	Maximum relative humidity	90 %	
2.5	Required guaranteed capacities of electric motor driven compressor packages at rated suction pressure and discharge pressure as mentioned below:		
	Rated Suction pressure at which guaranteed flow is required, and at 35 deg. C (MAX), in Kg/Cm^2 g.	Rated Discharge pressure in Kg/Cm^2 g and at 52 ºC (MAX.)	Average Guaranteed capacity at rated suction and discharge pressure in Sm3/hr (SCMH)
	16	**255**	**400**

Hereinafter the rated suction pressure, where guaranteed flow is required, will be referred as Rated Suction Pressure, which means 16 Kg/Cm^{2}g for 400 SCMH compressors. Suction pressures will be measured at inlet flange of the Integrated CNG Compressor package. Bidder has to ensure that compressors are designed such that the desired flow is achieved (without any negative tolerance) at Rated Suction Pressure.

Note:

a) Guaranteed average flow is 400 SCMH at 16 Kg/CM2

b) No advantage shall be given in case bidder offers compressor with flows higher than as detailed above for various types.

c) Graph for specification power consumption against flow rate to be provided

d) Bidders offer shall be based on firm and final compressor model on which basis the offer shall be evaluated and no alternate compressor model or change of model, after submission of bid shall be entertained / considered. This is very important and all bidders shall take full cognizance of this matter before submitting the bid.

e) Bidder to indicate the capacity and absorbed power of the offered compressors at various suction conditions starting from 14 Kg/Cm2 g to 19 Kg/Cm2 g (Temperature 40 deg C max.) and 255 Kg/Cm2g and 52 deg. C (max) discharge condition.

f) Performance curves and tables i.e. Flow versus suction pressure and temperature and power curves i.e. absorbed power versus suction pressure and temperature at specified discharge conditions shall be furnished. In addition to above, flow capacity and absorbed power values for suction conditions from 14 Kg/Cm2 g to 19 Kg/Cm2 g in steps of 0.5 Kg/Cm2 shall also be given in tabular form. The graph shall be plotted at various suction pressures ranging from 14 Kg/Cm2g to 19 Kg/Cm2g and at various suction temperatures ranging from 20o to 40o C. Similarly, the graphs shall be plotted at various discharge pressures ranging from 200 Kg/Cm2g to 255 Kg/Cm2g, however at 52 deg. C (max) discharge conditions.

g) Bidder to note that the compressor package required shall be suitable for operating at a suction pressure from 14 Kg/Cm2g to 19 Kg/Cm2g at 35 deg. C. Reduction of suction pressure by means of pressure regulating valve (PRV) is to be achieved which is to be supplied by the bidder. Gas inlet pressure regulator should be of 300# class rating with inlet pressure range of 10 kg/cm2 to 49 kg/cm2 with an outlet discharge range of 10 Kg/Cm2 g to 30 Kg/Cm2 g adjustable, However working discharge pressure range of the same pressure shall be 14 Kg/Cm2 (g) to 19 Kg/Cm2 (g).

Bidder to note that negative tolerance on the guaranteed capacity will not be acceptable. Also no advantage shall be given for positive tolerance of the capacity.

2.0 SAFETY

a) All controls shall operate in a fail-safe mode i.e. failure of any control shall not lead to running of equipment in unsafe mode.

b) The hazardous area classification Class-I, Division I, Group D as per NEC or Zone I, Group II A/ II B as per IS/ IEC. Certificate from recognized agency to the effect that equipment supplied and/or installed conform to above area classification. All Devices shall meet the requirement for the specified area classification in which they are installed, including instrumentation leads.

c) All exposed rotating parts shall be provided with adequate guards of non-sparking type.

d) Driver belt if used shall be of anti-static and fire resistant type.

e) Piping shall be arranged in a manner so as to provide clear headroom and accessibility within the package. Adequate clearances shall be provided for all the engineered components.

f) Each package ENCLOSURE shall have One no. (1) LEL detectors with display (IR Type) and one no. (1) Ultra Violet (UV) fire detectors inside the enclosure.to cover the enclosure effectively as already spelt in the scope of supply.

g) All material used in the package shall be flame retardant.

h) Relief valves shall be provided at suction and discharge and each inter stages of compressor with setting as per cl.7.20.4 of API-11P with R.V. venting as per cl. 7.20.4 of API-11P.All vented to common relief valve header.

2.1 Carbon Dioxide (CO2) Flooding System

a) CO2 flooding system should be installed for the protection of CNG compressor by automatic actuation system. The package should be protected by automatic operated CO2 flooding system designed as per NFPA-12.

b) CO2 flooding system will consist of 2 nos. brand new CO2 cylinders of 45 Kg capacity. One cylinder will act as main & other as stand by, which shall have identical arrangement and connected to the system. The cylinders should be placed in a shed raised above ground level to protect from weather and direct sunrays as per Gas Cylinder Rules, 2016. Cylinders shall be fitted with automatic actuated Valves, Solenoid valves.

Cylinder should be ISI marked as per IS: 7285 and PESO approved.

c) The System shall be designed to operate on 24 V DC supply. FRLS (Fire resistant low smoke) cables shall be used for the wiring of the system.

d) Interlock of CO2 Flooding system with compressor shall be provided

e) Compressor shall trip on detection of gas at preset level.

f) Compressor shall trip on detection of flame at preset level and automatic discharge of CO2 gas shall take place from the main cylinder simultaneously.

g) Compressor shall not start if the CO2 Flooding System is faulty, not working, SWITCHED OFF etc. The compressor shall be able to start only when the CO2 Flooding System is in healthy working condition.

h) Maintenance Override Switch shall be provided to keep the system off during maintenance.

i) Selector switch shall be provided to put Main/Stand by Cylinder in line at the turn of a switch as per requirement.

j) Alarm panel for CO2 Flooding System shall be integral with the main compressor panel. Necessary displays as system ON, OFF, FAULT, RESET, Gas/ Flame indication, Remote actuation of solenoid valve, distinguished hooter etc., shall be provided for CO2 flooding system.

k) CO2 Cylinders shall be provided outside the package at a safe place where it is not exposed to fire in case of fire in the compressor. Facility shall be made to operate the system both manually from remote with the help of a switch/ call point and with help of pull down lever on cylinders.

l) Suitable online weight (CO2) monitoring or healthy indication of each CO2 bank shall be provided on PLC and HMI to ascertain the health of the CO2 flooding system.

m) All installation shall be compatible for hazardous area Class 1, Division 1, Group-D for Methane Gas.

n) The system designed by the supplier shall be duly approved by CLIENT.

o) Technical specifications, Comprehensive Maintenance Manual, PESO Certificate, Approval/ Manufacturing certificates for cylinders and cylinder valves, gas detectors, flame detectors, solenoid valves etc. shall be furnished by the supplier along with system. Software and hardware, calibration procedure shall be provided by the supplier along with the supply sufficient enough to handle the system independently. Necessary tools (1 set) shall be provided with the system.

p) System shall be offered for testing to CLIENT by the supplier after commissioning at site by creating actual Gas leak and Gas fire situations and actual discharge of CO2 Gas from the Cylinders. This shall form a part of performance test and thereby acceptance of the package. The cylinders have to be refilled by the vendor at no extra cost to CLIENT after performance test. If the system fails during testing, subsequent testing and refilling would be at vendor's cost.

q) Warning and Operating instructions to be displayed at equipment as per the statutory/ safety regulations.

r) Piping of CO2 flooding system shall be seamless high pressure pipe of Schedule 40 of 50 mm dia of appropriate length with a minimum safe distance of 4 Meter from CNG Compressor, The fittings like elbows, Tees, Union, sockets should be of same schedule and capacity for installation in a high pressure system as per NFPA-12.

s) Flameproof online weighing system, complete frame with shed and all accessories should be of good quality, weighing scale should be of reputed make.

t) Specifications:

Non Return Valve for CO2 High Pressure Hose:

As per BIS specifications Operating Media: CO2

Body Material: Brass, BIS: 319 Ball: SS 316

Pin: SS 316

Seal: Teflon (PTFE) Working Pr.: 60Bars

Test Pressure: 90 Bars for 1 min Weight: 70gm

Outlet Size: ¾ BSP at manifold end

Inlet Size: ½" BSP at CO2 Discharge Hose end Temp. Range: -29° C to 66° C

Hose Adopter:

As per BIS specifications Operating Media: CO2

Body Material: Mainly Brass Test Pressure: 250 Bar

Max. Working Load: 150 Bar Temp. Range: -29° C to 66° C Discharge Nozzle:

As per BIS specifications Operating Media: CO2

Body Material: Leaded Tin Bronze as per BIS: 318:1981 Design Nozzle Pr.: Not less than 20.6 kgf/cm2 at 27° C Test Pressure: 140 kgf/cm2

Marking for Code No. (on the basis of equivalent single orifice dia.): As per BIS: 6382:1982 Temp. Range: -29° C to 66° C

High Pressure Hoses:

As per BIS 7285:1974

Operating Media: CO2

Hose Type: Double wire breaded (perforated) rubber covered Min. Bursting Pr.: 420 kgf/ cm2 at 54° C

Length: 40 cm Cross-section: ½"

End Connection: ½" BSP (F) xW21.614 TPI End Fittings: Brass

Temp. Range: -29° C to 66° C

2.2 **Following warning and caution signage shall be marked on the housing/package:**

"No Smoking"

Caution notice "This Machine may automatically start at any time".

"Flammable Gas"

3.0 BASIC DESIGN OF COMPRESSOR

3.1 Following specification is intended to give the bidder the technical and operating conditions the compressor must fulfil.

3.2 The bidder shall meet all applicable statutory codes, national law and local regulation for safety and environment protection.

3.3 The design shall conform to API 618 / API 11P, 2nd edition / other relevant reputed international standards/Gas application design (bidders to indicate).

3.4 Cylinders of compressor should be horizontal balanced/ trunk piston design. Compressor shall utilize preferably separate suction and discharge valves. Valve should be of preferably plate or spring type (non- metallic type) developed specifically for Natural gas.

3.5 Near Zero Gas Loss compressor package design is envisaged– Bidder to provide confirmation from compressor block manufacturer towards Discharge of Process Gas into the environment while in operations and in idling condition. Compressor should be design in such a way that no gas venting is done in case of emergency shutdown due to power cut etc.

3.6 State of the art technology shall be applied to the piston ring to ensure reliability and oil control with polymer rings fitted to the final stage according to manufacturer safe design. The bidder to indicate the life of piston rings of all stages in terms of running hours.

3.7 Each pressurized component of the compressor package shall be subjected to hydraulic proving test and the final assembly shall be performance tested and certified.

3.8 The inter stage and final stage cooler tube material shall be carbon steel. Bidder to submit cooler sizing calculation for review.

3.9 All gas piping shall be designed, fabricated and tested in accordance with ANSI B 31.3.

3.10 The relief valve sizing shall be in accordance to IBR, ASME code for boiler & pressure vessel and API RP-

520. The relief valve and associated piping shall be sized for full block discharge.

3.11 Compressor maximum vibrations of cylinders shall not exceed 10 mm/sec. unfiltered peak velocity. Maximum vibration level installed compressor frame shall not exceed an unfiltered peak velocity of 5 mm/sec or 200 micron unfiltered peak to peak vibration whichever is less. The bidder shall provide for all structural support within the package so that these levels can be achieved or Vibrations should be limited according to manufacturer safe design.

3.12 In case of lubricated/Non Lubricated cylinder & packing design, single plunger per point force feed mechanical lubricator shall provide lubrication to compressor cylinders. Lubricators with double ball check valve shall be provided at each lubricator point. Digital no flow timer shall be provided to stop the compressor in case of loss of cylinder lubrication.

3.13 The bidder along with the offer shall furnish the recommended lubricating oil type, grades & specification along with their quantity and frequency of change. The recommended oil shall be compatible with gaskets, O-ring, seals, packing, lubricator parts and other parts coming into contact.

3.14 Coolant tank must be provided with proper opening for flush/ clean of the tank, so that coolant level trip system works properly. Switch position should be such that sludge doesn't deposit on float sensor. Material of coolant make up tank should be SS304.

3.15 Gauge panel with physical gauges for temperature and pressure shall be provided and should be visible from outside of the package. LCD display as an extension of PLC display is not acceptable.

3.0 Proper oil draining system for the package is required. Packager should provide proper pocket system in package

structure for draining coolant/ oil from inside the package. Package base frame block must be interconnected & slope must be provided.

3.1 Level trips of oil & coolant must be provided with wire open alarm according to manufacturer safe design.

3.2 Package inlet flow meter should have isolation valve in upstream and NRV/Valve at downstream of flow meter. Flow meters which are on piping should be connected with flexible hoses and should have proper clamping support to avoid vibration so that correct reading are observed.

3.3 All cables entries should be from bottom/side in the FLP boxes (local control panel). There should be no cabling from the bottom of the package. All the cables should be routed from the side or top for easy trouble shooting.

3.4 All instruments and their cables should be at appropriate distances from the exhaust line/hot parts.

3.5 Status of all field instruments viz. switches should be displayed on PLC.

3.6 Direction of flow should be marked on the pipe line and nomenclature of all vessel (e.g. 1st stage discharge dampener etc.) should be written on them. Cross head inspection windows should be transparent for easy of inspection during running. Set values should be prominently marked on the gauges.

3.7 Offered package shall be complete with compressor, electric motor, piping, cooling system, suction and discharge filters, priority fill system, control panel safety and control devices and other accessories required for automatic and safe operation of the system. The supply shall include all interconnecting piping/tubing/cables. Cooling system shall be of closed circuit type.

3.8 The compressor package control system shall be designed for unattended safe operation in automatic mode and shall unload, start, load, stop safely. The compressor shall start in auto in case high bank storage pressure falls below 200 barg and stop once the pressure in all three banks of storage cascade reaches 250 barg.

3.9 Integrated 6 line (3 bank) priority fill system to be provided. The priority fill system shall ensure filling as per following sequence:

- High bank of Dispenser.
- Medium bank of Dispenser
- Low bank of Dispenser
- High bank of storage cascade.
- Medium bank of storage cascade
- Low bank of storage cascade

Note* The priority fill system shall ensure that in any case CNG vehicle shall be given first priority. Compressor shall be designed to ensure flow capacity as follows:

No	uction Pressure	low Capacity
	Online compressor: Flow capacity as on-line integrated compressor at suction pressure of 16 kg/cm^2. discharge pr. 255 kg/cm^2	00 sm3/hr

Maximum BKW = As per bidders design

Motor Rating = To be indicated by the Bidder

Maximum power requirement including the accessories to be indicated by the bidder and shall be minimum for the requested performance.

Noise level shall not exceed 75 +3dBA at 1m from the compressor package enclosure.

Framework shall be mounted on a suitable skid type base, external-lifting lugs shall be provided at each corner. Duplex Suction filter, air compressor & UPS (if applicable) & CO2 flooding system can be placed separately (outside of the canopy) and Electrical control panel can be placed in remote safe area for optimisation of the foot print size. However, rest all items i.e. flow meters, priority panel, cascade, dispenser, junction boxes & PLC Control panel etc. should be enclosed / mounted on the same frame & maximum footprint of that compressor frame Package shall be limited to 8.0 m2. These package dimensions & integration of all accessories is essence of this tender & hence any deviation in these values & integration will not be accepted.

3.26 The compressor package control system shall be so designed that the first item to go into alarm condition shall "Lock out" to indicate the cause of the trip though the cause of the trip may have disappeared. The lock out condition shall be manually reset.

3.27 The compressor shall be vented into BDV before restarting in order to avoid overload to the main drive. In any case venting of gas to atmosphere is not allowed. There is need to have a blow down vessel so that gas is vented to vessel. The size of the BDV should be the sufficient to allow main drive to start. BDV volume to be designed in such a way that gas accumulated in the process should not be vented out in any case of main power supply failure /stopping/ emergency push of package. Calculation for BDV volume shall be considering 20% higher than calculated volume and it should be calculated on higher range (50 bar) of the operating pressure (16 bar to 50 bar). Bidder shall submit calculation for same at the time of designing/drawing approval to client. BDV should be preferably placed on top of package and if placed inside package, it should be in vertical position.

3.28 **Prime mover (Electric Motor)**

The motor shall be flame proof/ explosion proof and confirm to IS: 2148 suitable for zone 1 group II area as per IS/IEC. The Motor shall be of standard frame size as per IS/IEC and rated for continuous duty with high efficiency and shall be designed for star-delta starting. The Motor shall be provided with class 'F' insulation, however, temperature rise shall be limited to the temperature specified for class 'B' insulation as per IS and shall be suitable for voltage variation of 415V+ 10%. The bidder shall indicate the guaranteed total power requirement in KW. The motor rating shall be 110% of the greatest BKW required by the compressor.

Electrical panel for motor starter (Soft starter etc) to be provided with both induced draught and forced draught ventilation

3.29 **Motor Specification (To be provided separately for 400 SCMH)**

Electric Motor

a) Type of drive Totally Enclose Fan Cooled (TEFC) high efficiency as per IEEMA standard-19-2000

b) Protection Flame proof & weather proof enclosure

c) Insulation Class F with class B temperature rise

d) Mounting Horizontal Foot Mounting

e) Specification standard By Bidder

f)Supply Voltage(assumed) 415(+/-) 10% volt, 3 phases,50(+/-) 5%Hz

g) Synchronous speed By bidder

h) Motor rating By Bidder

i) Motor Efficiency By Bidder

j) Power factor By Bidder

k) Speed of motor By Bidder

l) Nos. of hot & Cold starts of motor 2 hot and 3 cold starts per hour

m) Coupling Type By Bidder

n) Torque speed cure By Bidder

o) Starting torque

Speed, thermal withstand curve load, current speed curve, Efficiency power factor vs load curve by Bidder Motor Accessories

a) Compressor grooved flywheel (if any)

b) Motor grooved drive pulley (if any)

c) Drive VEE belts (if any)

d) Flexible coupling for direct drive

e) Drive guard

f)Adjustable motor slide rails for belts tensioning to be used (if any)

Note:

1) Motor shall be three phase, AC, asynchronous, flameproof, high efficiency (IE2 or better, as per IEC60034-30), Ex'd' rated, continuous duty, service factor 1.1, on IEC standard type. Designing shall be done on basis of 47.5 degrees package ambient temperature. Motor shall be suitable for soft starter . Service factor shall not play any role in finalizing the rating of motor.

2) Main Motor Starter: Soft-starter

3) Considering all de-rating factors as applicable, rating of soft starter (at 50 degree Celsius) shall match or be greater than the selected main motor rating.

4) Soft starter panel, LCP or any other power/ control panel need to be appropriately forced cooled to maintain the temperature favorable for switch gear employed in panel.

5) Soft starter for motors should be three phase controlled type

6) Appropriate cable (wrt: size, material, and shielding) to be used for soft starter drive.

7) Cables used inside the package must be FRLS type. Sufficient distance to be maintain b/w cables and gas/oil tubings inside the package

8) Routing of soft starter and power cable shall be separated from control supply/ instrument cables.

9) Successful Bidders shall take prior approval of the Make for the items not covered above for which complete technical credentials of the proposed vendors shall be required to be submitted for evaluation by Purchaser/ Consultant

10) Some of the items indicate only Indian makes. Successful foreign bidders may take prior approval of any other make also for which complete technical credentials of the proposed vendors shall be required to be submitted for evaluation by Purchaser/ Consultant.

3.30 Cooling system

Each compressor package shall be complete with its own cooling system. The cooler shall be air-cooled heat exchanger. The gas temperature after after-cooler shall not exceed 52 degree

Special attention to be given while designing the gas cooler considering the local conditions. Bidders shall ensure that final delivered gas temperature is less than 520C.

Direction of flow should be marked on the pipe line and nomenclature of all vessels (e.g. 1st stage discharge dampener etc.) should be written on them. Cross head inspection windows if applicable should be transparent for ease of inspection during running. Set values should be prominently marked on the gauges.

Packages design should be such that its vent should not go upward (package vent in vertical direction not required) i.e opening of package vent should be in horizontal directional with duct arrangement.

3.31 Oil Filter

The ingress of oil into CNG adversely effects vehicle emission and storage system. Only lubricated/Non Lubricated cylinder compressors are allowed and vendor shall supply oil separators after cooler at each stage with automatic drain. The maximum permissible oil content in CNG is 5 PPM.

Vendor to supply a proven, maintenance free oil removal system after after–cooler to remove oil from compressed gas. The offered oil mist removal system shall restrict the oil to less than 5PPM in discharge of compressor.

3.32 Gas recovery system

If required, the Vendor shall provide gas recovery system with gas recovery vessel. The gas recovery vessel shall be provided with pressure relief valve and necessary instrumentation to avoid cold flaring of gas. Gas recovery vessel shall be ASME/IBR code designed.

3.33 Piping & Appurtenances

The materials for gas piping shall be seamless carbon steel of ASTM A-106 Grade B. The piping / tubing at the outlet of the compressor and of priority fill system shall be of seamless stainless steel of proper pressure rating and specifications as under:

SS TUBING SPECIFICATIONS:

- Seamless SS Tubing
- Material of construction Stainless Steel 316L
- Tube hardness shall be less than 80 RB
- Sizes : Metric system (inch)
- Max Working Pressure : 326 barg

SS FITTINGS & VALVES SPECIFICATIONS:

- Material of construction Stainless Steel 316
- Sizes : Metric/SI
- Standard : ASTM/ ASME/ DIM
- End connections : Single or Double ferrule Compression type / NPT
- Max Working Pressure : 326 barg
- PSV Vent Line to be extended above the package to safe height.

3.34 **Electrical System**

- All electrical equipment of compressor package shall be installed in accordance with NFPA 70, NEC for Class 1, Division 1, Group D, and IS 5571 and shall have approval of a recognized certifying authority.
- CLIENT shall provide 415+ 10% volts, 3 phase and 50+ 3% Hz electrical connection at CNG station electrical panel only. Vendor shall distribute electrical power to all equipment and control system by providing cables and suitable switch-gear distribution panel.
- The electrical power supply distribution panel, switch gear panel and starter shall be in flame proof construction. Certificate from recognized agency to the effect that equipment supplied and or installed conform to above area classification. All devices shall meet the requirement for the specified area classification in which they are installed, including instrumentation leads.
- Heavy duty on-load phase changeover should be provided for H.E motor.

- Semiconductor fuses to be provided, where applicable.
- All illumination fittings should be single phase AC supply based.
- All wire/ cable to be used in compressor and panel shall be of copper conductor and FRLS type through proper cable tray conduit etc.
- Compressor Motor and hence soft starter should always start on NO-LOAD for all start method (AUTO or MANUAL mode), selected for operation of compressor, no matter whatever may be the last stopping mode of the compressor viz, programmed or un-programmed. Loading in motor in no manner shall be more than the value as defined by motor manufacturer in motor characteristic curves.
- Sufficient space to be provided for Motor JB for cable glanding work.
- Suitable arrangement to be provided for easy extraction of motor from package
- Multifunction meter to be provided for metering of package total energy and other parameters (viz; KVAH, KWH, Voltage, current, PF, Frequency, MDI (KVA), MD (KWH) inside the panel and output display shall be on HMI screen.
- Bidder to ensure that spares and service support of all switchgears, soft starter, instruments, or meter etc used in package/ panel, shall be available in Indian market.
- Overall power factor of the whole package should not be less than 0.99. vendor have to make arrangement inside the panel to maintain power factor at 0.99 or more by providing through means of SVG(static var generator) / capacitors etc. If required, separate APFC panel to be provided.
- Motor feeder shall be provided with energy meter, MCCB with single phase presenter , contactors (AC-3 Duty), bi-metal relay switch fuse unit, earth leakage relays & voltmeter, push buttons, (for start/stop/trip/ etc. Ammeters should be part of PLC HMI. Stop push buttons shall be lockable and have stay put except in case of critical devices such as lube oil pumps etc.

3.35 **Earthing System**

The design & installation of earthing system shall be as per IS 3043 or equivalent international specification. One or more no of earth plates with provision of inter connection to main earth grid shall be provided. All hardware used for earthing system shall be hot dip galvanized or zinc passivated.

All cables shall be terminated at equipment by means of double compression type compression glands and shall be flame proof cable glands if located in hazardous area

3.36 Phase sequence preventer (Current based) shall be provided. Phase changeover to be provided for motors controlled through soft starter. Dedicated earth fault/leakage sensing relay to be provided inside the panel for electrical safety

3.37 Vibration

Compressor maximum vibration of cylinders shall not exceed 10 mm/sec unfiltered peak velocity. Maximum vibration level of installed compressor frame shall not exceed an unfiltered peak velocity of 5mm/sec or 200 micron

unfiltered peak-to-peak vibration whichever is less. The bidder shall provide for all structural support within the package so that these levels can be achieved or vibrations should be limited according to manufacturer safe design. Local flameproof enclosure inside compressor to have provision of extra holes along with dead end plug to accommodate control cables for any future modification.

4.0 **INSTRUMENTATION & CONTROLS**

4.1 All the Instruments and Control Shall Be Suitable for Area Class I, Group D, Division1

4.2 All package mounted transmitters & temperature elements, flow transmitter shall be intrinsic safe as per IEC 79-11 and solenoid valves, switches and related junction boxes shall be flame proof 'd' as per IEC 79-1. Other special equipment / instrument, where intrinsic safety is not feasible or available, shall be flame proof/ explosion proof as per IEC 79-1.

4.3 PG shall be Direct-mounting type having element of bourdon tube and dial size of 63mm. It shall have shatterproof glass. Connection shall be ½" NPT (M) from bottom. Enclosure shall be weatherproof to IP65. Protection shall be 130% over range. Accuracy shall be ±1% of FSD. PG shall have blown out disc facility. For higher pressure applications (above 60 Barg), it shall be solid front type. Pressure gauge dial shall be white, non-rusting plastic with black figures. The dial face shall be marked with pressure element material. Pointers shall have micrometer adjustment. Pressure gauge sensing element shall be of SS 316 and moving elements of SS 304, as a minimum.

4.4 The temperature gauge shall be generally gas field in steel field type /bimetallic type. Capillary tubing shall be min. SS304 with SS flexible armouring. The gauge shall have an accuracy of +1% FSD and 63/100mm dial size. The range shall be 1.5 times of operating temperature.

4.5 Pressure Transmitter and Temperature Transmitters shall be used for CNG Gas application with 4-20 mA output signals to PLC. Ex proof enclosure. The units of measurement for pressure shall be Kg/cm2 (g)/Barg and temperature shall be degree C. Pressure and temperature switches are not acceptable.

4.6 RTDs are 4 wire type and element shall be Pt100 as per DIN 43760 & accuracy class A and thermo well's immersion length shall be suitable for the line size. All RTDs shall have duplex elements. RTDs sheath OD shall be 8 mm and material SS 316. Cable entry shall be ½" NPT (F). Enclosure shall be WP to IP-65. All line mounted RTD shall be supplied with flange or socket welded type thermowell. Thermowell shall be SS316, drilled bar stock type. 50% insertion inside the pipe from top shall be considered for calculating wake frequency calculation. This calculation shall be submitted along with data sheet for approval.

4.7 Coriolis type mass flow meter with element, transmitter and integrated display shall be provided at inlet and outlet of compressor. All the electronic shall be Ex proof or intrinsically safe. Accuracy shall be ±0.5%. Refer data sheet enclosed with tender document.

4.8 Calibration certificates required for all instruments such as Mass Flow Meter, Pressure transmitters, Pressure gauges, Temperature gauges, Temperature transmitters, Gas detectors, Flame detectors etc.

4.9 Refer data sheet of gas detectors and flame detectors enclosed with this document. Gas detectors and flame detectors should be mounted with the canopy.

4.10 Gas Detection by installation of hydrocarbon gas detector with display (IR type) with self check function and transmitter with adjustable alarm levels (0-100%) with preset of 20% and 50%.

4.11 Installation of flame detector (UV-IR type) with self check function and transmitter, alarm on detection of flame.

4.12 PLC CABINET

a) PLC cabinet shall be ex proof, Zone 1 & 2, gas group IIA & IIB, weatherproof min IP 65. Día cast aluminum alloy LM 6 MOC with Inside & outside epoxy powder coating, with shade RAL 7032, gasket neoprene rubber with single door, glass arrangement for HMI view. Panel shall be provided is Ex proof cable gland. 10% spare gland entry of each size with SS plug.

b) Panel shall be complete with start, stop push buttons, alarm acknowledge, hooter, alarm rest & test button for checking healthiness of annunciation system, HMI, power on, fault indication lamps, fault reset button. All necessary timers and intrinsically safe relays to control the system on an automatic starting and stopping basis shall be provided. The compressor package control system shall be designed for unattended operation in automatic mode and in case of any fault it will go in a safe mode.

c) Redundant 230 V AC to 24 V DC power supply unit shall be provided with diode circuit for auto switch over. Healthiness of both the PSUs shall be provided in front of cabinet and same shall be repeated in PLC for failure of alarm.

d) In additional to inbuild in PLC, surge protection device for 24 V DC, 230 V AC UPS power supply, 230 V AC non-UPS power supply at inlet shall be provided in cabinet.

e) Compressor package shall be provided with a PLC based local control with HMI for local operation & monitoring, which shall be mounted on the package enclosure. All the interlock, monitoring and controlling of the CNG compressor package shall be done through PLC based control system.

4.13 **PLC SPECIFICATION**

a) PLC hardware shall be in accordance with IEC-61131. PLC shall be 32 bit microprocessor, min 8 MB RAM, and support to protocols DNP 3.0 over TCP/IP, DNP 3.0 Over modbus, Modbus (TCP/IP).etc as min

b) PLC shall be of modular in construction, rack for mounting cards, hot redundant CPU, Input output cards, Power supply card, communication card.

c) PLC shall be suitable for controlling of compressor parameters as indicated in instrumentation and all other parameters that are recommended by the compressor manufacturer for 24x7 operation. PLC shall be suitable interfacing port for Laptop for programing, configuration and diagnosis. Type of communication with laptop shall support upto 30 mtrs distance from compressor to safe area.

d) A dedicated Modbus serial (RS 485) slave communication port shall be provided for Remote terminal unit (RTU) interface. RS 485 ports two pin type or RJ 45 type connection shall be provided. A separate Modbus TCP/IP communication ports shall be provided for GPRS modem for communication with SCADA system.

e) All the parameters shall be time stamped in PLC. It shall be possible to synchronize PLC clock with GPS system.

f) PLC shall be 20% spare each type of input output channels for future use. All these IOs shall be wired upto the spare terminal block inside the PLC cabinet. Diagnosis feature shall be available in CPU and I /O used in PLC.

The PLC shall comprise the following subsystems:

- Redundant Central processor with system software.
- Power supply unit
- Analogue input
- Contact (digital) input
- Contact (digital) output
- Modbus Serial ports configurable (RS 232/485)
- Ethernet port
- Diagnostic port

g) The Digital Output shall be configured for pulse duration. No separate program or logic will be acceptable at PLC end. On restart/ power failure, PLC shall not reset the output circuit, shall not generate false control signal and shall necessarily cancel all pending control signal.

h) Configurator software licenses shall be preferred in software (software key) form instead of hardware (dongle). Multiuser software licenses shall be provided.

i) Suitable bypass for interlocks shall be provided for start-up.

j) The compressor package control system shall be so designed that the first item to go into alarm condition shall lock out to indicate the cause of the trip though the cause of the trip may have disappeared. The lock out condition shall be manually reset. A change over set of contacts shall be provided for Owner's use to give a remote indication of alarm and trip.

k) In case of fault, a warning hooter shall operate, the sound of which should be audible at distance of at least 15 meters. Further the fault alarm and emergency stop PB shall be duplicated in the CNG station control room. Acknowledgement/resetting of fault shall be possible only from compressor panel. Emergency stop PBs shall be mushroom head turn lockable type. Once the fault is acknowledged or compressor is under normal maintenance, the valves of priority panel shall take the position so that gas available in the stationary CNG storage cascade can be dispensed

l) Configuration and diagnostic tool should be able to connect to remotely over TCP/IP.

m) There shall be provision of relay for DO cards between PLC & SOV & barriers/ isolators for DI cards between field & PLC. The barriers and isolators should be multichannel for easier replacement.

n) All the instrumentation shall be capable or operating for full range of operation.

o) Separate junction boxes shall be provided for each type of signal i.e. analog, digital, solenoids RTD, thermocouple, intrinsic safe and for power supply. No cable shall share power & signal.

p) Suitable bypass for interlocks shall be provided for start-up.

q) The PLC System offered shall be supplied with monitor and memory card for Processing of live data and stored data. PLC shall be capable of

a) All the process parameters as per P&ID

b) Compressor Control & Emergency Shut down

c) Fire and gas detection and monitoring

d) Graphics, Data acquisition, monitoring & logging, viewing, modifying set point and range of all process parameters for which transmitters are provided.

e) Record the last 20 Alarms of abnormal operations on separate page.

f) PLC shall be capable for display of flow meter data for flow rate and flow totalizer (i.e. Gas Suction, Gas Discharge) and power consumed by the motors, compressor running hour:

4.14 **Compressor package shall be provided with the following indicators**:

a) Pressure transmitter and pressure gauge at suction, discharge, cascade bank distribution header.

b) Pressure transmitter at high bank line

c) Pressure gauge & temperature gauge at each stage of compressor

d) Temperature transmitter at discharge.

e) MFM at suction , vent & discharge

f) Oil pressure indicator on each pressure lubrication system

g) Oil levels indicator

h) Each compressor non resettable running hours calculation in PLC. Alarm shall be generated after preset point.

i) Compressor jacket water coolant temperature indicator on local gauge panel

j) Hydraulic oil cooler inlet & outlet temperature gauge

k) Hydraulic oil pressures each stage on local gauge panel (if required)

l) Air compressor discharge pressure transmitter

4.15 **The compressor package shall be furnished with the following trip logic that shall stop the compressor and suction of compressor shall be isolated:**

- On high oil temperature
- On low suction gas pressure
- On high discharge pressure
- On high discharge gas temperature
- On coolant flow low
- On fire detection
- On gas detection
- On pressing manual sop button at local control panel
- On pressing emergency stop devices
- Fail safe/ wire break alarm for safe operation
- Interlocking provision in PLC program for tripping of machine

4.16 Compressor package shall be furnished with following tripping circuit (the motor shall stop and suction of compressor shall be isolated)

- On actuation of gas detector alarm.
- On actuation of flame detection alarm.
- On pressing of manual stop button at compressor package
- On pushing of emergency stop device

4.17 Each compressor package shall be provided with an audible and visual alarm system for annunciation on compressor abnormalities.

4.18 EMERGENCY SHUT DOWN DEVICES

ESD button (5 Nos.) shall be provided (Control Room, Process Area, one side of compressor). A separate hooter for customer interface room shall be provided with annunciation window alarm of individual protection device.

The emergency shut down (ESD) system is also in scope of vendor. A fail-safe system shall be designed and incorporated to isolate cascades storage from dispensers, stop compressor isolate the compressor suction storage line and cut off power supply on activation of ESD switch. This ESD switch shall have to be manually reset to restart the compressor package again. Red ESD button.

4.19 CABLE SPECIFICATION

Cables shall be Flame retardant low smoke (FRLS) type shall be used for all field instruments except ESD device. Voltage Grade of cables shall be 650/1100 V.

Fire resistance type for Fire detection fire detection system, ESD service, instruments used for ESD purpose, and ESD push buttons.

1T x 1.5mm² shall be used for gas detection system. Quad cable shall be used for RTD. 1P/2P x 1.5 mm2 shall be used from field instruments and 2/3 core x 1.5 mm2 /2,5mm2 for power to cabinet or SOV

Multi pair cable individual and over all shielded shall be used for all the along signals and Multi pair over all shielded cable shall be used for all the digital input /output signals.

Single Pair and quad Shielded Cable

Each core shall be 1.5 mm2 made of 7 stranded annealed electrolytic copper conductors. Each strand shall be 0.53 mm dia. For Intrinsically safe application, primary insulation shall be low density poly ethylene (LDPE). For non-intrinsically safe application, primary insulation shall be 85°C polyvinyl chloride (PVC) as per IS5831 Type C. Thickness shall be 0.5 mm minimum.

A pair shall have twisted cores and number of twists shall be not less than 10 per metre. Colour of core insulation shall be black blue in pair and black, blue and brown in triad.

Individual pair shall be shielded. Shield shall be Aluminium backed by Mylar/polyester tape with the metallic side down helically applied with either side 25% overlap and 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be 0.5 mm2 multi-strand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with Aluminium side of the shield.

Inner and outer jacket shall be made of extruded flame retardant 90°C PVC to IS 5831-Type ST2. Oxygen index of PVC shall be over 30%. Temperature Index shall be over 250°C. The thickness of the jacket shall be as per IS-1554 Part 1.

Inner jacket colour shall be black. Outer jacket colour shall be black except, for cables to be used in intrinsically safe systems it shall be light blue. A rip cord shall be provided for inner jacket.

Armour over inner jacket shall be galvanized steel wire as per IS-1554 Part.

Multipair Cable with Individual Pair Shield and Overall Shield:

Generally, the cable shall be same as single pair shielded cable conductor sizes shall be 1.5 mm2 made of 7 strands of annealed electrolytic copper conductor. Each strand shall be of 0.53 mm dia.

Overall shield shall be of Aluminum backed up by Mylar/polyester tape helically applied with the metallic side down with either side 25% overlap and 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be similar to individual pair drain wire and shall be of the overall shield. Pair identification shall be with numbers at interval of not more than 250 mm as per vendor's standard.

Multipair/core Cable with only Overall Shield

These cables shall be same as above except that the individual pair shall not have shielding. Fire resistance cable

Fire resistance cable will be multi core copper conductor, Mica tape with overlap as fire resistance layer Extruded XLPE insulated per IEC 60092-351, Braid of copper wires designed to act as collective screen, sheath as per 60092-359. Fire resistance cable shall be tested for fire resistant properties 750 Deg C for 3 hours as per IEC 60331-31.

Control Cable

Single pair control cables shall be used between field mounted solenoid valves and junction boxes/local control panels. Multi pair control cables shall be used between junction boxes/local control panel and control room mounted devices in general. These cables shall have only overall shielding. These control cables shall have 1.5 sq mm conductor size with 7 stranded conductors of annealed electrolytic grade copper, with each strand of 0.53 mm diameter.

Power Supply Cables

All power supply cables shall be as per IS-1554 Part I and shall have copper /aluminum conductors depending on conductor size. Power cables shall be 3-core, minimum 2.5 mm2 copper conductors with PVC insulation, galvanized steel armoring and overall PVC sheathing.

Earthing Cables

Earthing cable shall be 1C x 6 mm2, outer sheet Yellow with Green strip, voltage grade 1100V. Annealed Bare Copper conductor, PVC insulated Un-armoured.

4.20 PRIORITY FILL SYSTEM

Vendor shall supply 3-bank (7 line) priority fill system with compressor top-up facility inclusive of regulating valves, check & by pass valves, all mounted inside the integrated CNG compressor package. All fittings and tubes used in priority system shall be of stainless steel of suitable pressure rating. The priority fill system is to be installed to ensure that vehicle filling takes priority over cascade filling and direct CNG to three storage banks in correct sequence. The compressor shall shut down once all three-cascade storage banks are filled to 250 barg g. Compressor shall start on pressing of manual start push button & automatically when the cascade storage high bank pressure of compressor falls to 200 barg and shutdown automatically when all 3 stages of stationary cascade are filled to a pressure of 250barg.

4.21 DOCUMENTS

Vendor shall submit documents during engineering stage for review & approval to client/consultant.

a) Specification /data sheet with statutory approval certificate, W&M certificate, PESO certificate of all the instruments as per P&ID,

b) Instrument index

c) Input output list

d) Power consumption calculation,

e) Cause & effect

f) Cables specification

g) Cable schedule with termination details

h) Operation & control philosophy

i) PLC specification & architecture.

j) Comprehensive Maintenance Manual (In English) – 02 Copies

k) Calibration certificates of all instruments & devices

l) P&ID with tag numbers for each item, line size, valve size, type of connection, instrument symbol connectivity with PLC, interlock number.

m) Bill of Material with Tag No & Technical Specifications

n) Wiring Diagram of Electrical & PLC Panel

o) Specifications of Electric Motor & Characteristic Curves

p) Foundation Drawings

q) Capacity vs. Suction Pressure curve

r) Capacity vs. Energy Consumption curve

s) List of spares required for Comprehensive maintenance. The list of spares should include ordering specification. Bidders to keep inventory of spares as per list in centralized stores at one or two GA's location as finalized by the owner. The availability of the spares will be checked by the owner on regular basis.

t) List of special tools & tackles to be provided.

5.0 SKID AND ENCLOSURE

Each compressor module shall be housed within a purpose built acoustic enclosure only. The units shall incorporate a rigid framework with a combination of fixed and removable panels. Enclosure wall and doors shall be fire resistant and insulated from inside with rockwool or better shall be used in acoustic enclosure.

The enclosure shall be assembled onto the package base plate at the supplier's works to give a fully transportable unit.

LED Lights used inside package should be designed for 220V AC, 50 Hz supply. There should be an inbuilt provided chain pulley system for handling of heavy equipments like main motor / heat exchange fan motor inside the package

Enclosures shall be designed to include cooling air inlet and outlet louvers together with a forced ventilation system to prevent the possibility of gas build up inside the enclosure. Suitable interlocks shall be built in for clearing entrapped gases (if any) within the enclosures before the startup of the electric motor / compressor. Packages design

should be such that its vent should not go upward (package vent in vertical direction not required) i.e. opening of package vent should be in horizontal directional with duct arrangement.

The maximum temperature within the enclosure shall be limited to 520C. Adequate ventilation fans shall be provided to meet the above and also to account heat dissipation of the coolers/ all other components.

Enclosures shall be engineered to give a noise level of maximum 75 + 3 Dba + measured at 1 meter. Specifying maximum burn extent with UL certification covering aluminum or steel with perforated steel inner face. Materials shall be non-combustible to deter spread of flame requirements.

The enclosure shall be designed for ease of access to the equipment within and has suitable entry doors.

To prevent the discharge of gas into the enclosure, all safety relief valves within to be connected to a manifold. From this connection a single pipe passes through the enclosure roof to a vent stack to allow satisfactory dispersion of gas at a height of minimum 3m above ground level.

A viewing window at operating level to be fitted to allow monitoring of gauges, etc. without entering the enclosure.

External emergency stop push-button shall be fitted to wall of enclosure close to main access door. Total 5 Nos. of Emergency shut off push buttons with hooter. One to be provided local at package mounted area, one on panel and one in customer interface room (control / sales room). Bidder to assume that the sales / control room and compressor area, each, will be max 50 Mtrs away from the compressor. Bidders to include the cables along with cable trays / flexible PVC ducts for Emergency stop push buttons and have to install the same at the site. Cables shall be PVC insulated with steel armored and of 1.1 KV grade. Any unutilized cables shall be returned to CLIENT with no extra cost.

Enclosure shall have gas detection & Fire detection system consisting of 01 no. Infrared type LEL detectors and 01 no. flame detectors (UV type) shall be provided. The detectors shall be re- calibrated at site during commissioning. Also the performance of the detectors shall be demonstrated at the time of commissioning.

Adequate fixed flameproof lighting (minimum at 1 location) shall be provided inside the enclosure.

Bidder shall optimize the compressor package for minimum possible space requirements considering space constraints of sites where the compressors are proposed for installation.

Suitable gradient shall be provided on the enclosure roof for rain drainage and to avoid water pockets. Enclosures shall be designed with proper rain protection in the ducting or any other cut out to protect the inside equipment from rain water.

For handling of all heavy parts for maintenance purpose suitable lifting arrangement shall be provided according to manufacturer standard i.e. beam fitted with chain hoist arrangement or similar. The chain hoist arrangement i.e. chain pulley block shall be removable type, which can be disassembled and shifted onto the other machines. 1no. each shall be provided for tendered quantity of compressors. Eye bolt arrangement shall be provided on heavier components like electric motor, cylinder crankcase, and wherever felt necessary for lifting during maintenance.

Jack arrangement required for alignment of the motor. All FLP lighting inside enclosure should have LED lamp.

The bidder shall be providing a degree of protection equivalent to IP44 as defined in AS 1939. All the pressure temperature & level indicators shall be visible from outside of enclosure.

The package shall be protected by automatically operated CO2 flooding system designed as per NFPA-12, which should have minimum following features as stated clause 4.1 of technical specification.

6.0 PAINTING AND PROTECTION:

Packing shall be sufficiently robust to withstand rough handling during ocean shipment & inland journey. Sling points shall be clearly indicated on crates.

The colour shade of canopy completely from outside shall be RAL 7032. All compressors shall be identical in colour.

Painting of Internal process piping should be either manufacturer standard or as per international color coding standard, e.g- Gas line-Yellow, Water line- green, Air line-Blue, Fire suppressing system – Red etc. The paint shall be chosen, primed and applied to have a service life of ten years the exterior of equipment and enclosure is required to be corrosion free for ten years.

7.0 INSPECTION & TESTING

a) For all the shop inspection & tests specified to be witnessed by CLIENT or CLIENT's authorized representative. The bidder has to provide 15 days advance notice prior to said inspection & test. The bidder shall be responsible for all sub bidders of specified inspection & testing requirements.

b) Bidder shall keep following data available for at least 5 years for examination by purchaser.

c) All necessary certification of materials, such as mill test reports.

d) Purchaser specification for all items on bills of materials.

e) Test data to verify that requirement of the specification have been met

f) Result of quality control test.

g) Pressure retaining parts including auxiliaries shall be hydrostatically tested with water at following minimum test pressure for a minimum period of 1 hour :

- Cylinder: 1-1/2 times maximum allowable working pressure.
- Cylinder cooling jacket & packing case 1-1/2 times coolant pressure but not less than 8 barg effective.

8.0 MECHANICAL RUNNING TEST (MRT)

a) These tests shall have mechanical operation of compressor, driver and accessories, Instruments, control system and the coolers.

b) The MRT for the 25% compressors block of the lot shall be carried out with job or shop driver including complete job driving system i.e., job driven V-belt, job pulleys etc., for 4 hours continuously at the premises of compressor

block OEM. The compressor need not be pressure loaded for MRT test. During this test following shall be recorded at agreed intervals (as applicable).

- Vibration levels measured on cylinders and frame
- Bearing temperature
- Oil cooler inlet and outlet temp

Subsequent to satisfactory run the compressor shall be examined as per standard procedure & following shall be examined as minimum:

- Bore & other parts by opening a valve
- Piston & cylinder clearance
- Visual examination of position rod, cylinder guide bore without dismantling

If any of part found damaged, all similar components shall be stripped for inspection. The MRT test shall be repeated after replacement of such parts.

8.1 Mechanical String Test

Mechanical String Test for 4 hrs. is a mandatory requirement to be performed at packager's shop before dispatch in presence of CLIENT representatives (or a third party as arranged by CLIENT). This test can be clubbed up with the Mechanical Run Test of compressor as specified above, provided the job driver & lube Oil system is used for the test.

8.2 Erection, Testing & commissioning at Site

The bidder shall be responsible for erection, testing, commissioning & performance test and noise level test of all packages at site. Commissioning of various equipment and systems shall be carried out by the bidder as per the accepted procedures and as per the instruction of the manufactures of the equipment. The units will be considered commissioned only after the successful performance tests are carried out by the bidder.

The bidder shall ensure integrity of compressor package and safety of electrical supply system available at back end while testing package, at site. Also, bidder shall arrange its own control/ single phase (UPS supply) for testing and commissioning and operation of package.

8.3 Field Trial Run

Bidder shall conduct a field trial run of each online compressor package for minimum 72 hrs. in which satisfactory operation of complete package together with all accessories controls shall be established for specified operation conditions. In case of any defect, discrepancies under specified site conditions, bidder shall first rectify the same and repeat the field trial run. The bidder shall record data of field trial run.

8.4 Noise Level Test During the field trial run, noise level test shall be carried out and bidder shall demonstrate /achieve the granted noise level. All necessary instruments /accessories required for fields trial run and noise level test shall be arranged by the bidder.

8.5 Performance Acceptance Test (PAT)

Before conducting performance acceptance test at site, Bidder is required to clear all punch points (if any) raised by CLIENT / CLIENT's authorized representative.

Compressor Package Performance test at sites shall be carried out as per ASME PTC9/equivalent according to manufacturer standard. All necessary instruments/accessories required for this test at site shall be arranged by the bidder and repatriated after successful performance test by the bidder.

All such instrument shall be pre-calibrated. In case any defect/deficiency is noticed under the specified site conditions bidder shall first rectify the same and repeat the performance test. Bidder to quote for performance test per compressor package separately at site inclusive of boarding, lodging office space, local transport for bidder personnel and hiring ;of local contractor, crane etc. bidder shall be liable to pay all local taxes, levies applicable and strictly comply with rules, laws prevailing in India.

Performance test shall be conducted at site for minimum 4 hours continuous duration at guaranteed parameters as quoted by the bidder (PAT procedure shall be in accordance with ASME-PTC-09).

However, if load is not available at site intermittent running for 4 hours shall be permitted with maintaining minimum continuous operation of ½ hour. Bidder to submit PG test procedure for review / approval. Complete package shall be performance tested as a module whereby along with motor & compressor performance bidder shall demonstrate all controls, shutdown, trips/alarms etc.

The test shall be the basis of, acceptance/rejection of the package thereon. Bidder shall submit the detail test procedure for the same, which shall be approved by OWNER. The test for the package shall be witnessed by OWNER/ OWNER's representatives.

9.0 GUARANTEE, LOADING AND PENALTY CRITERIA

The bidder shall furnish the guaranteed value for the following:

Compressor Capacity: Compressor shall guarantee the capacity as mentioned in Guaranteed Parameters.

Compressor BKW: Bidder shall indicate guaranteed BKW including all losses such as mechanical, transmission etc.

Motor Power Output of the prime mover (KW)

Total power required for the package including power consumed by accessories.

9.1 Compressor Capacity

Bidder shall guarantee 400 SCMH capacity for Online suction pressure compressor with suction pressure varying of 16 kg/cm2(g) on continuous basis and suction temperature of 35°C, discharge pressure of 255 kg/cm2(g) continuously with the no negative tolerance for errors in instruments and measurements.

Note :

For calculation purpose 1kg of CNG =1.33 SCM (Density considered as 0.7518 Kg/SCM)

The same shall be used to establish the capacity at site during package performance test.

10.1 Loading against Package Gas Loss

The bidder shall design the compressor package so that no venting and leakage of gas takes place. Bidder shall indicate actual vent & leakage losses through the compressor package. package loss is limited upto 0.5% of suction capacity of gas consumption.

10.2 Loading against Power Consumption:

The compressor package shall be designed in such a way that Energy Consumption of package (KWH/Kg) should be minimum for production of CNG. Bidder shall indicate actual energy consumption for their compressor package. This quoted figure will be used for evaluation and total quoted price for all compressors towards supply, special tools & tackles, erection and commissioning, operation and maintenance will be loaded as per following formulas:

F = (G-50) x H x I

Where,

F = Loading amount in Rs.

G = Bidder's Power consumption rate quoted in KWH for every Average 400 SCMH (300 Kg) of CNG

(G-50) = Bidder's Energy consumption rate over and above 50KWH

H = Cost of Energy INR 10/- per KWH for tender evaluation purpose.

I = Factor towards lifecycle in hours @ 36,500 hours (i.e.365 days*10hrs/day*10 years)

Density considered as 0.75 Kg/SCM

Note: Bidder shall not be given any advantage/credit for quoting power consumption below 50 KWH.

The entire equipment shall be mounted on a common skid. The electrical power consumption of the CCDU compressor package in kWh, shall include the consumption of the air compressor, exhaust fan motors, and all other associated auxiliaries, for the purpose of loading energy consumption and calculating the penalties.

10.3 Penalty towards Excess Gas Loss:

At the start of Operation & CAMC period or even at any point of time during the Operation & CAMC period, cost towards excess gas loss beyond the quoted figure shall be deducted from Operation & CAMC bills. This penalty shall be imposed on compressor blocks not capable of delivering rated capacity of 400 SCMH, acceptable loss is 0.5%. If it exceeds 0.5% then Following calculations shall be used for penalty towards package efficiency loss:

Following calculations shall be used for deduction towards excess gas loss: F = [G-(D*0.5%)] * H

Where,

F =Penalty in Rupees to be deducted from Operation & CAMC bill

G = Monthly Vent/Leakage loss observed during Operation & CAMC period in kg

H = Cost of NG per Kg i.e INR 50.54/ Kg (INR 38/SCM)

D = Production during the month in Kg (Discharge meter) Considering:

G above shall be taken as (Suction – Discharge) OR Reading from Vent Mass Flow Meter, whichever is higher.

10.4 Penalty towards Excess Power Consumption:

At the start of O&M period or even at any point of time during the Operation & CAMC period, cost towards excess power Consumption beyond quoted figure shall be deducted from Operation & CAMC bills.

Following calculations shall be used for deduction towards excess power consumption.

F = (G-Q) x H

Where,

F = Monthly Penalty in INR

G = Monthly Actual power consumption

Q = Guaranteed consumption rate quoted by supplier for every 300 Kg of CNG x CNG produced during the month / 300 (for 400 SCMH)

H = Actual applicable cost of power in the respective month

10.5 Penalty towards Package Efficiency Loss

This penalty shall be imposed on compressor blocks not capable of delivering rated capacity of 400 SCMH Following calculations shall be used for penalty towards package efficiency loss:

This penalty shall be imposed on compressor blocks not capable of delivering rated capacity of 400 SCMH Following calculations shall be used for penalty towards package efficiency loss:

F = 2 x {(400 x H x 0.75) – M}

Where,

F = Penalty Amount in INR

H = Hours clocked in a month

Density of NG =0.75

M = Discharge mass flow during the month in Kgs

Note:

- Gauge Pressure at Station Inlet shall be used as benchmark for imposition of penalties and not suction pressure being displayed at the PLC.
- Pressure regulator shall not be used to reduce the pressure at the compressor block inlet below 16 Kg/Cm2.
- In case pipeline pressure at the station itself is less than 16 Kg/Cm2, then the penalty shall be imposed if the package delivery falls below discharge values corresponding to the station pressure.

 Penalty for Non-Performance during Period of Maintenance:

Details of Penalty for non performance of equipments

a. On normal day (i.e. the day other than the schedule maintenance day):

i. The party has to ensure that the equipments are available for operation for minimum 20 hours per day and on an average the equipment availability has to be 97.5% i.e. 585 Hours in a month.

ii. The penalty in case of breakdown /shutdown for any reason would be as follows:

Beyond 4 hours upto 8 hours : Rs 5,000

Beyond 8 hours upto 16 hours : Rs 10,000

Beyond 16 Hours upto 24 hours :Rs 12,000

Beyond 24 Hours upto 48 Hours : Rs 15,000

Beyond 48 Hours to upto 72 Hours: Rs 20,000

Beyond 72 Hours to upto 15 days: 75% of monthly maintenance charges will be deducted. Beyond 15 days to upto 30 days : 100% of monthly maintenance charges will be deducted.

Vendor will make all efforts to maintain operation (availability) for duration of > 97.5%. In Case of monthly average availability is below 97.5%. Then penalty @ of Rs 10,000 per % or part thereof shall be applicable additional to hourly penalties subject to maximum cumulative penalty for a month i.e. 100 % of monthly maintenance charges for that particular calendar month.

Note: If there is carry over of breakdown period from previous month to next month (for example if machine breakdown on 20th day of a month and put on operation in next month on 16th day then the penalty will be calculated on monthly basis i.e. 10 days for 1st month & 16 days of 2nd month means 75% of Maintenance charges for 1st month & 100% of 2nd month.

b. On schedule maintenance day:

The party would be required to carry out the recommended schedule/preventive maintenance of the equipment as per the agreed schedule for which the party has to indicate the time required for each type of schedule maintenance and take prior approval from EIC.

In case, breakdown occurs due to the noncompliance of agreed schedule maintenance, penalty will be imposed @ 200% of the penalty defined for breakdown during normal operation day subject to maximum cumulative penalty for a month i.e. 100 % of monthly maintenance charges for that particular month.

11.0 SPECIAL TOOLS AND TACKLES

- Bidder to provide a list of all special tools and tackles along with offer. Special Tools & Tackles means all the specialized tools and tackles specific to the make of the compressor package supplied required for assembly and dismantling.
- Bidder shall provide two sets of new special tools and tackles.
- Bidder to have a separate set available with him to carryout erection, start up, commissioning and maintenance of packages as per the contract.
- Vendor shall maintain sufficient spares to fulfill the warranty & subsequent Comprehensive maintenance period requirements. In case of additional requirement during the warranty period, if any spare part is taken from OWNER, the same shall be replaced to OWNER with new part supported by necessary document for its authenticity of being new & original spare parts.

12.0 DOCUMENTATION

- The drawings/documents to be submitted by the bidder shall be divided in three categories:

a. Drawing documents to be supplied with the offer

b. Drawing /document to be submitted for approval (After placement of order)

c. Drawing/document to be submitted for information (After placement of order)

- The bidder shall submit list of drawings, which shall be submitted by them in above three categories. All drawing /document shall be submitted in 4 sets.
- Title block of each drawing shall contain at least following information: Name of the Client:

Name of the Consultant :

Name of the Project :

Name of Bidder :

Descriptive title :

Drg. No :

Revision No :

Sheet No./ Total No. of sheet in the drawing :

- Bidder shall furnish relevant calculation and protection relay setting table for the equipment /system being supplied by them, It shall also contain the manufacture's catalogue, Comprehensive maintenance manuals for all types of relays/components used,

  • The bidder shall submit all drawing within specified time, in requisite number, for each equipment/item for approval.

  • Approval of drawings by Owner.

  • The bidder shall submit furnish drawings as indicated/agreed for each item for approval of the Owner/Consultant.

  • Owner/Consultant will scrutinize drawing/data furnished by Bidder and comments, if any, will be communicated to the Bidder within 2 weeks from the date of receipt.

  • The Bidder shall submit all the drawings/documents in two (2) sets. All the drawing of sub-bidder/bidders etc. shall be checked by Bidder for correctness and compliance with requirement of order/contract and signed before submission to Owner.

  • The drawings shall be stamped in either of following category and one print shall be returned to the Bidder. "APPROVED"

  "APPROVED SUBJECT TO INCORPORATION OF COMMENTS" "NOT APPOVED"

  "FOR INFORMATION ONLY"

  • Wherever drawings are returned to the Bidder with the marking "Approved subject to incorporation of comments" the bidder shall make the necessary modifications/corrections and resubmit the revised drawings and data for final approval.

  • Bidder shall be responsible for correctly incorporating all the points conveyed to him and resubmit the drawings to the Owner for final approval. Specified number of copies of approval drawing and reproducible of specified quality shall be submitted after the final approval of drawings.

  • Approval of drawing by owner shall not relieve the suppliers of his contractual obligations and responsibility for engineering design, workmanship, materials and performance of equipment, Work shall be carried out exactly as indicated on the approved drawings and data and no alterations shall be made without the written approval of the Owner,

  • If any subsequent alterations are found necessary and approved by the Owner, all drawings and data affected by such alterations shall be duly revised and re-submitted for the approval.

  • Bidder shall incorporate/cause to incorporate all change made in the drawings from approval stage to the handing over of equipment and submit as built drawings in the requisite sets (these will be in addition to the sets submitted at the time of approval/for information and up to commissioning). The drawing to be submitted shall include all the drawings submitted for approval, information as also the drawings required for normal operations, trouble shooting repair, and maintenance and testing of equipment etc.

• Bidder shall submit the following drawings/data/document in bound volume prior to submission of final bill to the Owner in soft and hard copies (2 Sets).

• All drawings submitted to Owner for approval information

• Equipment manufacturing drawings submitted for information of Owner.

• Equipment drawings required for Comprehensive and maintenance.

• Fault calculations, protection relay setting calculations and recommended settings.

• Inspection reports, factory and site test certificates in bounded volume.

• As built drawings incorporating all site modifications.

• Instruction manuals

• Operation and maintenance procedures for individual equipment and total system.

ANNEXURES FOR SECTION - I

(BIDDER TO SUBMIT FILLED UP ANNEXURES FOR 400 SCMH SEPARATELY)

ANNEXURE – I : GUARANTEED PARAMETERS

For Basis of loading and penalty

Sr No.	Parameter	Unit	Tender's Requirement	Bidder's data
1	**Compressor Capacity** Flow at suction pressure of 16 kg/cm2 , g Discharge Pr.- 255 Kg/cm2 (g) Bidder to confirm 400 SCMH	**SCMH**	400	
2	Power consumption of package in KWH for 400 SCMH delivery, at suction pressure of 16 kg/cm2 (g) Discharge Pr.-255 Kg/cm2 (g) with no (-) tolerance without air compressor and exhaust fan. **(basis for loading & penalty)**	**KWH**	-	
3	Gas loss as % of production, including loss from SRV, due to oil top ups and idling **(basis for loading & penalty)**	**%**	-	
4	Min. Flow Capacity @ suction of 19 kg/cm2	**SCMH**	-	
5	Min. Flow Capacity @ suction of 14 kg/cm2	**SCMH**	-	
Guaranteed General Package Data				
6	Compressor BKW in KW @ Rated Conditions (No + ve tolerance)	**KW**	-	
7	Compressor BKW in KW @ RV Set Conditions (No + ve tolerance)	**KW**	-	
8	Net of all auxiliaries/package ventilation loads in KW	**KW**	-	
9	Site rated BKW of Electric Motor (No-ve tolerance)	**KW**	-	
10	Noise level @ 1 meter from enclosure	**DBA**	75 ± 3 DBA	
11	Footprint area of compressor package	**M x M**	**Max. 8 SQM**	

NOTE:

1. Bidder to quote the data in above Tables for the basis of loading and penalty. **Bidder must fill all the rows in above tables. If any row is not filled by bidder or ANNEXURE-I:GUARANTEED PARAMETERS is not submitted by the bidder in first submission of bid or above tables are modified in any manner, then bid will be rejected summarily.**

2. The Guaranteed value of power consumption and Gas loss quoted by the bidder (Sr. no.2 & 3) at Guaranteed parameters will be used for price loading during bid evaluation and for penalties during operations and CAMC. Bidder to quote the data in the unit as asked for in the above table. Bidder has to fill all rows in above table. If any row is not filled by bidder or above tables are modified in any manner, bid will be rejected summarily

3. Conversion factor for Kg to SCM is 1 kg = 1.33 SCM (Density considered as 0.75 Kg/SCM)

4. **Bidder has to guarantee that offered compressor package will deliver minimum 400 SCMH under the condition described above. Delivery of less than 400 SCMH is not acceptable and will be summarily rejected.**

5. Power consumption mentioned in Sr. no. 2 is including Main motor, Auxiliary motors, oil pumps etc. which are running continuously except Exhaust Fan Motor and Air compressor motor which runs intermittently. Separate power

consumption shall reflect in the panel for maintaining records while running of compressor.

ANNEXURE – II : COMPRESSOR DATA SHEET

1.0	**PROJECT: CNG Expansion Project**		**DATA SHEET NO:**	
1.1	NO. OF UNITS	:	As Per SOR	DRIVE: Electrical Motor
1.2	DUTY	:	Continuous	LOCATION:
2.0	**OPERATING CONDITIONS**			
2.1	Service/Stage	:	Compressor for CNG Stations/ Three	
2.2	Gas Handled	:	Natural Gas	
2.3	Composition (%)	:	Natural Gas	
2.4	Corrosive due to:			
2.5	Molecular Weight at Intake (Avg.)			
2.6	Cp/Cv at intake/compressibility Factor			
2.7	Relative Humidity			
2.8	Suction Temperature (°C)	:	35°C max	
2.9	Suction Pressure (Kg/cm², Gauge)	:	16Kg/cm² Gauge	
2.10	Discharge Temperature (°C)	:	Maximum 52^0C After Cooler	
2.11	Discharge Pressure (Kg/cm², G)	:	255Kg/cm² (Gauge)	
2.12	Required Capacity (SM^3/hr.) : 400			Driver Motor Rating: KW
2.13	Drive arrangement Direct Coupling/V-belt			
2.14	Standard Conditions referred to	:	Standard Atmospheric pressure (1.033 Kg/cm² abs) and Temperature of 15.6°C	
3.0	**SITE CONDITIONS**			
3.1	Place	:		Installation: Outdoor
3.2	Site Ambient Temp. (°C)	:	Min : 2°C Max : 47.5 °C	Max. Relative Humidity (%) : 90%
3.3	MSL – 230 - 2000 m			
3.4	Area Classification	:	Class1 Div1 Group D or Zone 1 Div1 Group IIA Group IIB	
4.0	**APPLICABLE CODES & SPECIFICATIONS**			
4.1	Compressor	:	API 11P, 2nd edn. ; API 618	Piping: ASME/ANSI B 31.3
4.2	Driver	:	Electrical Motor Data Sheet	
4.3	Air Cooled Exchangers	:	API 661	Water cooled exchangers : TEMA 'C' - NA
4.4	Pressure Vessel	:	ASME Sec. VIII Div.1/2	Control Panel : Refer Tech Specs
5.0	**MANUFACTURER'S SPECIFICATION**			
5.1	Name	:		Model:
5.2	No. Off	:		Compressor RPM/Stroke (mm):
5.3	Type	:		Drive Arrangement:
5.4	Service/Stage			
5.5	Mol. Wt. At Intake (Avg.) (Gas Composition)	:		Cp/Cv Value/ Compressibility Factor at Intake
5.6	Adiabatic Power (KW)	:		Shaft Power @ RV set pressure (KW)

5.7	Driver Rating & Speed (KW/RPM)	:		Noise level:

5.8	Suction Line (Size/ Rating)	:		Discharge Nozzle (Size/Rating)
5.9	Direction of Rotation from Driving End:			
5.10	Compressor Weight :	Max. Erection Weight:		Max. Maintenance Weight::
5.11	Diff. Pr. In Suc. Strainer, Piping, puls Dampener:		Diff. Pr. In after Cooler	

5.12	PERFORMANCE DATA OF PACKAGE			
	Gas	Suction Pr 16 kg/cm2g		
		Ist Stage	IInd Stage	IIIrd Stage
	Mol. Wt at intake			
	Specific Gravity			
	Cp/Cv Value / compressibility Factor at intake			
	Cp/Cv Value / compressibility Factor at discharge			
	Suction Pressure, kg/cm2 g			
	Suction Temp. °C	35		
	Suction capacity, SM3 / Hr			
	Discharge pressure, kg/cm2 g			
	Discharge Temp. Adiabatic °C			
	Discharge Temp. Actual, °C			
	shaft power, Kw			
	V-belt / coupling losses, kW			
	Shaft power at RV set pressure including			
	V-belt / coupling losses, kW			
	Volumetric Efficiency, %			
	Valve lift			
	Valve lift area			
	Valve velocity (Average) M/sec			
5.13	DESIGN DATA	Suction Pressure 19 Kg/ Cm2g		
		Ist Stage	IInd Stage	IIIrd Stage
	Mol. Wt at intake			
	Specific Gravity			
	Cp/Cv Value / compressibility Factor at intake			
	Cp/Cv Value / compressibility Factor at discharge			
	Suction Pressure, kg/cm2 g			
	Suction Temp. °C	35		
	Suction capacity, SM3 / Hr			
	Discharge pressure, kg/cm2 g			
	Discharge Temp. Adiabatic °C			
	Discharge Temp. Actual, °C			
	Shaft power, kW			
	V-belt / coupling losses, kW			
	Shaft power at RV set pressure including			
	V-belt / coupling losses, kW			
	Volumetric Efficiency, %			
	Valve lift			

	Valve lift area			
	Valve velocity (Average) M/sec			

6.0	**CYLINDER & PACKAGING DATA**			
6.1	Service / stage	Ist Stage	IInd Stage	IIIrd Stage
6.2	Cylinder bore (mm/No. off)			
6.3	Single / Double Acting			
6.4	Liner (yes/ No.)			
6.5	Type of Valves			
6.6	Piston Displacement (M3/Hr)			
6.7	Volumetric Efficiency (%) Min/ Nor/max			
6.8	Mean Piston Speed(m/sec) [<3.5 m/sec]			
6.9	Suction / discharge valve gas velocity (m/sec)			
6.10	Relief valve setting (kg/cm2 g)			
6.11	Max. allowable cylinder pressure (kg/cm2 g)			
6.12	Max. allowable cylinder temperature (°C)			
6.13	Pneumatic Test By (kg/cm2 g)			
6.14	Hydrostatic test (kg/cm2 g)			
6.15	Hydrostatic test water jacket (kg/cm2 g)			
6.16	Suction / discharge nozzle orientation			
6.17	No.of suction / discharge valves			
6.18	Piston Rod Dia (mm)			
6.19	Piston Load			
	-Max. Rod load gas compression, Kg			
	-Max. Rod load gas tension, Kg			
	- Rod load (Inertia alone) compression, Kg			
	- Rod load (Inertia alone) tension, Kg			
	-Rod load rated Pr. (gas + inertia) compression, Kg			
	-Rod load rated Pr. (gas + inertia) tension, Kg			
	-Rod load at R.V set Pr. (gas + inertia) compression, Kg			
	-Rod load at R.V. set Pr. (gas + inertia) tension, Kg			
6.20	Max. Permissible Piston Rod loads (kg)			
6.21	Rod packing cooling by liquid (yes/No.)			
6.22	Rod packing lubrication (Yes/No)			
6.23	Rod packing vent to			
6.24	distance piece type			
6.25	Cylinder jacket cooling by			

7.0	**LUBRICATION SYSTEM**	
7.1		
	☐ Splash	☐ Force feed Lubricated
	☐ Pressure lubrication including piping, valves and	☐ Mini Lubricated
	☐ Oil filter : single	☐ Non Lubricated
	Degree of filtration	☐ Lubricator Driven by
	☐ Oil cooler	☐ Compressor shaft
	☐ Oil pump driven by compressor shaft	☐ Electric Motor (kW)
	☐ Auxiliary oil pumps, if reqd,	☐ Lubricator equipped with sight flow indicator for each point storage tank with level gauge
	☐ Pre-lube Motor driven pump, in case of splash system	
	Grade / viscosity of lube oil	Grade / viscosity of lube oil
	Oil sump capacity	Oil sump capacity (For 500 hrs)
	Lube oil consumption (Lt/100 Hr.)	Lube oil Consumption(Lt./100 hr)
	Change lube oil after	Hours

	Type of bearing : Main Big End:	Small End:
8.0	**COMPRESSOR CONTROLS**	
8.1	☐Automatic start / stop on storage pressure level and manual start stop	☐ Actuators (To be included in supply)

8.2	☐Automatic drain of separators	☐ Manual on machine
8.3	☐ Compressor to start automatically after power interruption with 10 seconds delay.	☐ Intermediate devices (to be included in supply)
8.4	☐Automatic recovery of gas form gas recovery vessel	☐ Solenoid valves
8.5	☐Automatic closing of suction isolating valve on compressor trip	☐ Manual -mounted in a local panel.
		☐ Controller(For auto control)
		☐ Pressure switches (For auto control)
8.6	Compressor shall unload on Power failure/ stoppage through (Vendor to indicate) ☐Automatically ☐ Manually	☐ Any other instrument required.
8.7	Compressor shall load on start through (Vendor to indicate)	☐ Automatically ☐ Manually
8.8	Recommended time duration for compressor operation @ 0% capacity (minutes)	
8.9	Recommended number of starts/ stops for the Motor : Per Hours	

AUXILIARIES

9.0	**COOLERS**				
9.1.1		Oil Cooler (Required)	After cooler	Inter coolers	
9.1.2	Cooler Type				
9.1.3	Tube Material				
9.1.4	Tube sheet material shell Material				
9.1.5	Shell Material				
9.1.6	ASME / IBR CODE STAMP/TPIA	Yes	Yes	Yes	
9.2	Suction Strainer	Temporary Mesh Size			
9.3	Volume Bottles / Pulsation Dampers		1st Stage	2nd Stage	3rd Stage
9.3.1	Type at Suction /Discharge				
9.3.2	Residual Pulse Amplitude (peak to peak)		3% / 3%		
9.3.3	Maximum Allowable Working Pressure (kg/cm2g)				
9.3.4	Capacity (M3)				
9.3.5	ASME / IBR CODE STAMP/ TPIA		Yes	Yes	Yes
9.4	Separator	1st Suction	1st Discharge	2nd Discharge	Final Discharge
9.4.1	Type				
9.4.2	Max allowable Pr (kg/ cm2g)				
9.4.3	Capacity (M3)				
9.4.4	ASME / IBR CODE STAMP /TPIA	Yes	Yes	Yes	Yes
9.5	Oil Mist separator at final discharge to limit oil carry over to 5 PPM				
9.5.1	Type			Capacity:	
9.5.2	Max allowable Pr (kg/ cm2g)			ASME / IBR CODE STAMP /TPIA: Yes	
9.6	Gas Recovery vessel			Capacity:	
9.6.1	Max allowable Pr (kg/cm2g)				
9.6.2	ASME / IBR CODE STAMP /TPIA			yes	
10.0	**INSTRUMENTATION**				
10.1	PRESSURE INDICATION			PRESSURE SWITCHES	

10.2	Gas At inlet	Frame oil header (1 no. For trip on low pressure.)
10.3	Gas at discharge (each stage)	Jacket water system failure
10.4	Frame oil Header	Compressor discharge Pr high (Each stage)

10.5	Frame oil filter (Differential local)	Compressor discharge Pr Low (Final stage)
10.6	Gas at after cooler exit (local)	Compressor suction pressure low
10.7	Hydraulic Oil Pr. (each stage)	Compressor suction pressure high
10.8	**TEMPERATURE INDICATION**	Frame High vibration
	Gas at suction to compressor	TEMPERATURE SWITCHES
	Gas at Discharge of Comp (Each stage before cooler)	Temperature after compressor discharge before cool (each stage)
	Gas at after cooler	
10.9	Oil cooler oil outlet	
10.10	**OTHER INSTRUMENTS**	**LEVEL TRANSMITTERS**
10.11	Junction Box with interconnecting wiring	Suction K.O.D (for automatic drain)
10.12		Discharge K.O.D (for automatic drain)
10.13	Pressure Relief Valve at discharge each stage	BAFFLE FLOW SWITCHES OR ORIFICE DIFF. PRESS SWITCHES
10.14	Pressure Relief Valve at suction to compressor	Low cooling water flow
10.15		Water outlet -after cooler
10.16	Instruments for closed circuit cooling water system	SIGHT FLOW INDICATORS
10.17	Hour meter	As reqd. in close ckt. cooling system
10.18	Gas detection system	Sight flow indicators, cylinder and packing lubrication oil lines
10.18	Flame detection system	LEVEL GAUGE AND INDICATORS
10.19	Forced feed lubrication failure to stop comp.	Frame oil (Bull's eye type)
10.20	Priority fill panel	Packing / cylinder lubrication oil
10.21	Emergency shut down system	Make up water tank
10.22	Other instrument for safe running of compressor	
	Note : 1. Each pressure gauges and pressure switch with an isolating valve and a drain valve. Switch contacts to open under fault conditions Switch / junction box enclosure (As per the electrical area classification)	
11.0	**INSTRUMENT PANEL**	
11.1	PNEUMATIC CONTROLS FOR	TRIP CIRCUIT TO BE CONNECTED TO MAIN DRIVER CONTROL SWITCH
11.2	Capacity Indication	Cause of shut down
11.3	Pressure Regulator	Frame Oil Pressure-Low

11.4		Low Cooling Water Flow
11.5	PUSH BUTTONS AND SIGNAL LIGHTS FOR	
11.6	Main Motor & Aux.Motors	Compressor discharge PR.(Each stage)
11.7	Ammeters for main and Aux. Motors	Compressor suction Pr. Low
11.8	ESD	Compressor suction Pr.
11.9	Common machine trip-alarm	

11.10	**Following to be included in vendor's scope of supply :**				
11.11	All interconnecting oil gas water piping & tubing as per schematic attached.				
11.12	All electrical power distribution and interconnection as specified.				
11.13	Intrinsically safe system for trips (Ref. Inst. specs)				
11.14	Electrical circuits to be housed in Explosion Proof Cabinet (Refer Elect. & inst. Specs)				
11.15	Electrical circuits to be provided for repeating pre alarm and trip alarm on the local panel.				
11.16	Annunciation system with test / acknowledgement push buttons & sole first off sequences				
11.17	Motor Interlock against loaded start				
11.18	Motor Interlock against start without air cooler fan running				
11.19	Motor interlock against start without pre-lubrication				
11.20	Provision shall be made for common alarm and trip alarm				
11.21	Any additional instruments & controls required for safe operation of compressor (as recommended by compressor vendor)				
12.0	**MATERIAL OF CONSTRUCTION & GRADES**				
12.1	Stage	1st	2nd	3rd	Remar ks
12.2	Cylinder & Head				
12.3	Liner				
12.4	Piston				
12.5	Piston Ring				
12.6	Piston Shoe (Wear Band)				
12.7	Valve seat				
12.8	Valve stop				
12.9	Valve / plate / Ring				
12.10	Valve spring				
12.11	Cylinder Packing Ring				
12.12	Crank Shaft F.S (Forged steel)	Connecting Road (CR) F.S	CR cap. Bolts FS		
12.13	Main bearing: Big End Beating: Small end bush:				
12.14	Piston Rod Yield strength Hardness(RC) Surface Finish				
12.15	Pulsation Dampers / Volume Bottles	Suction/Discharge KOD			
12.16	Non Return Valve- Shall be compressor Discharge valve type				
13.0	**INSPECTION AND TESTING**				
13.1	X-ray examination for welded joints for heat exch./ Press. Vessel / gas Piping (Certificate to be furnished)	NO only TC			
13.2	Ultrasonic testing for piston rod, connecting rod, crank shaft, big end bolts, main brg. studs.	YES			
13.3	Magnaflux testing for crankshaft, piston rod, connecting rod	YES			
13.4	Dye penetrant testing for cylinder liners , piston	YES			
13.5	Shop inspection by purchaser during construction	YES			
13.6	Barring over to check clearance	YES			
13.7	Mechanical running test with shop job driver at compressor vendor's works	YES			
13.8	Stripping check and internal inspection	for one comp			
13.9	Hydrostatic test of Cylinders, Pressure Vessels	Yes			

13.10	Leak proof test of crank case (min 24 hrs with With kerosene)	Yes
13.11	Fit up test at compressor packager's	Yes
13.12	Performance Acceptance Test	YES
13.13	Field noise level test	YES
13.14	Field trial run at site for 12 hours	YES

13.15	Functional / continuity tests - control panel (At sub vendor's works)	YES	
13.16	Inspection and tests of compressor vessels		
	Piston	Piston Rod	
	Cylinder and liner	Connecting Rod	Crank case
	Crank shaft	Heat Exchangers	Valve components
	Pressure vessels		
	Test Certificate required for		
	Auxiliary Motor & Pumps	Safety Relief Valves (Temp / F	Capacity control devices
	Safety switches	Solenoid valves	All instruments
	Note : 1. For electrical / instrument items, vendor shall provide certificates issued by statutory inspection authority confirming suitability of design / construction for specified Hazardous area classification.		
	Service		
	Size Type (Induced Force)		Craft/No. of Bays
	Surface per Unit-Finned Tube (m2)		Bare Tube (m2)
	Heat Exchanged (KW)		MTD. Eff °C
	Transfer Rate * Finned Tube : Bare Tube, Service Clean W/m2 °C		
	PERFORMANCE DATA-TUBE SIDE		

				Min. Suc. Pr.		Normal. Suc. Pr.		Max. Suc. Pr	
				In	Out	In	Out	In	Out
	Gas Composition	Inter Cooler 1st Stage	Flow Kg/s						
			Temp °C						
			Pr. Kg/cm2						
			Total Heat KJ/Kg						
		Inter Cooler 2nd Stage	Flow Kg/s						
			Temp °C						
			Pr. Kg/cm2						
			Total Heat KJ/Kg						
		After Cooler Stage	Flow Kg/s						
			Temp °C						
			Pr. Kg/cm2						
			Total Heat KJ/Kg						

	Oil Cooler Stage	Flow Kg/s						
		Temp °C						
		Pr. Kg/cm2						
		Total Heat KJ/Kg						
	Water/Air Cooler Stage	Flow Kg/s						
		Temp °C						

		Pr. Kg/cm2						
		Total Heat KJ/Kg						
	Total Heat all streams KJ							
	Pressure Drop Allow/Calc Kg/cm2 g							

	Soft Starter Data Sheet to be provided by the Compressor.
	Performance –Data –Air Side
	Air Quantity (Total Kgs.)

ANNEXURE - III - DATA SHEET FOR ELECTRIC MOTOR

ITEM NO.:			As per requirement
QUANTITY:			
DESCRIPTION:			
A.	APPLICABLE SPECIFICATION AND STANDARDS		IS:325 / IEC / EQUIVALENT INTERNATIONAL STANDARDS
B.	SERVICE CONDITIONS:		
		Max. Ambient Temp. (Deg. C)	
		Min. Ambient Temp. (Deg. C)	
		Design Ambient Temp. (Deg. C)	
		Altitude Above MSL (MTS)	
		Relative Humidity (Max.) (%)	
		Environment	
		Location (Indoor / Outdoor)	
		Area (Safe / Hazardous)	
C.	SYSTEM CHARACTERISTICS:		
		Systems Voltage with ± %	415 V ±10%
		Number of Phases	3
		Rated Frequency with ± %	50 Hz ±5%
		Combined Variation	±10%
		Fault Level	25 KA
		Space Heater Supply	Space heater for 30KW & above rating motor
		Low Voltage Stator Winding Heating Supply	NA
D.	Motor Rating / Details:		
		Rated Output	As per Vendor
		Rotor Type	Squirrel Cage
		Syn. Speed (RPM)	As per pump and fan vendor
		Direction of Rotation	Bi-Directional
		Insulation Class	'F', Temperature Rise Limited to 'B'
		Duty	S1, Continuous
		Winding Treatment	Moisture Protection Varnish
		Insulation Process	Anti Corrosive Treatment
		Starting Method	Soft Starter
		Starting Current	Vendor to Furnish
		Minimum Voltage Start at Terminal	80% of 415V
		Starting Torque	Min. 200% of FLT
		Pull Out Torque	
		No. of Hot Starts	2 Nos.

		No. of Cold Starts	3 Nos.
		Shaft Extension	Required
		Type of Coupling	
		Earth Terminals	2 Nos. on Body & 2 Nos. on T. Box
		Greasing Arrangement	Yes
		Name Plate	Yes, as per IS:325
		Starter Connection	Vendor to Furnish
		Efficiency at	
		100% load	
		75% load	
		50% load	
E.	ENCLOSURE:		
		Degree of Protection	EExd IP55
		Mounting Arrangement	As per requirement.
		Type of Cooling	TEFC
F.	TERMINAL BOX		
i)	Terminal Box (Main)		1 No.
		Type	

		Fault Withstand	
		No. of Terminals	6 Nos.
		Side of Terminal Box seen from the Driven End	RHS
ii)	Auxiliary Terminal Box		--
	1.	Separate Terminal Box for	
		Space Heaters	YES
		Thermisters	--
G.	TESTS TO BE WITNESSED		
		Type Tests	CMRS test certificate to be furnished
		Routine Tests	As per IS:325
H.	ACCESSORIES		
		Anticondensation Heaters	Yes
		PTC Thermisters	NA
		Voltage Rating of Space Heaters	230V, …..
		Foundation Bolt	Yes
		Cable Glands	Required
		Earthing Terminals	Body & T. Box
		Motor peak Amplitude Vibration at no Load at Bearing should not exceed	40 Microns for 1500 RPM 15 Microns for 3000 RPM
		Max. Motor Noise Level Measured at a Distance of 1.5 Mts. from Motor	75 dB
I.	CABLES		
	1.	Type & Size	
		- Motor	Vendor to furnish
		- Space Heater	Vendor to furnish
		- Thermister	NA
	2.	Cable Lugs	
		- For Motor	Copper
		- Space Heater	Copper
		- Control Cables	NA
	3.	Cable Glands – Type Material	
		- Motor	FLS-Double Compression, Ni-Cd Plated
		- Space Heater	FLS-Double Compression, Ni-Cd Plated
		- Control Cables	FLS – Double Compression Ni-Cd Plated
		J. PAINTING	
		TYPE	Epoxy
		SHADE (AS PER IS:5)	692 (Smoke Grey)

Note:

Certificate from Compressor block manufacturer towards guaranteed shaft power calculation at 400 SCM per hour compression (on given parameter) and from Motor manufacturer towards their KWh consumption (KWh on guaranteed parameters) on above guaranteed shaft power to be submitted by bidders along with bid. A confirmation is required from bidders prior to bid opening.

ANNEXURE – IV

LIST OF MOTORS

S.No.	DESCRIPTION	KW	DUTY	QTY.

NOTE: -Motors are in hazardous area classification Zone 1 and Zone 2. Therefore, the Motors shall be flame proof. Vendor shall furnish the list of motor(s).

ANNEXURE – V: SPECIFICATIONS OF INSTRUMENTS

SPECIFICATION OF CORIOLIS MASS FLOW METER (SUCTION)

Sl. No.	PARAMETER	REQUIREMENT
1.	Fluid	Compressed Natural Gas
2.	Measuring Principle	Coriolis Principle
3.	Operating Pressure	**250 (max.) bars ,16 (Normal) bars, 8 (min.) bars**
4.	Molecular Weight	17 – 22
5.	Ambient Temperature	0 – 60 ^{O}C
6.	Hazardous area classification	Class I, Div I, Gas Group D as per NEC or Zone1,Group IIA/ IIB as per IS/IEC specifications
7.	Range of operation	Flow range shall be 150% of defined compressor capacity (SCMH) in tender
8.	Accuracy	± 0.5% of indicated flow accepted (over the whole operating range on gas)
9.	Rangeability for specified accuracy (Min.)	50:1
10.	Line Size	Vendor to specify
11.	Pressure drop at max. flow	< 0.2 Kg/cm^{2}g
12	Repeatability	± 0.25% or better
13.	Material - Tube	SS 316 or Better
14.	End Connection	Vendor to specify
15	Power supply (nominal)	24 V DC or 230±10% V, 50±2 Hz, 1 Φ
16	Outputs (Active)	
16.1.	4 – 20 mA dc	Reqd.
16.2.	Frequency	Reqd.
16.3.	RS 485	Reqd.
17	Outputs Informations	
17.1	Mass Flow rate	Reqd.
17.2	Mass totalizer, non-resettable	Reqd.
17.3	Temperature	Reqd.

17.4	Integral Display	Display all outputs with specified accuracy, programmable and sequential with password protection, Touch screen or touch keypad type
18	Communication	**MODBUS with RS485**
19	Mounting	Field mounting
20	Certification	Hazardous area compatibility, Weather proof certification i.e. IP 67 ,Material Test, Manufacturer's certification, Custody Transfer approval, AGA 11 Conformance certification and Calibration Certificate on water and Natural Gas from accredited test labs with traceability acceptable internationally

SPECIFICATION OF CORIOLIS MASS FLOW METER (DISCHARGE)

Sl. No.	PARAMETER	REQUIREMENT
1.	Fluid	Compressed Natural Gas
2.	Measuring Principle	Coriolis Principle
3.	Operating Pressure	**300 (max.) bars ,250 (Normal) bars, 100 (min.) bars**
4.	Molecular Weight	17 – 22
5.	Ambient Temperature	0 – 60 ^{O}C
6.	Hazardous area classification	Class I, Div I, Gas Group D as per NEC or Zone1,Group IIA/ IIB as per IS/IEC specifications
7.	Range of operation	Flow range shall be 150% of defined compressor capacity (SCMH) in tender
8.	Accuracy	± 0.5% of indicated flow accepted (over the whole operating range on gas)
9.	Rangeability for specified accuracy (Min.)	50:1
10.	Line Size	Vender to specify
11.	Pressure drop at max. flow	< 0.2 Kg/cm^{2}g
12	Repeatability	± 0.25% or better
13.	Material - Tube	SS 316 or Better
14.	End Connection	Vendor to specify
15	Power supply (nominal)	24 V DC or 230±10% V, 50±2 Hz, 1 Φ UPS
16	Outputs (Active)	
16.1.	4 – 20 mA dc	Reqd.
16.2.	Frequency	Reqd.
16.3.	RS 485	Reqd.
17	Outputs Informations	
17.1	Mass Flow rate	Reqd.
17.2	Mass totalizer, non-resettable	Reqd.
17.3	Temperature	Reqd.
17.4	Integral Display	Display all outputs with specified accuracy, programmable and sequential with password protection, Touch screen or touch keypad type
18	Communication	**MODBUS with RS485**
19	Mounting	Field mounting

20	Certification	Hazardous area compatibility, Weather proof certification i.e. IP 67 ,Material Test, Manufacturer's certification, Custody Transfer approval, AGA 11 Conformance certification and Calibration Certificate on water and Natural Gas from accredited test labs with traceability acceptable internationally

SPECIFICATION OF THERMAL MASS FLOW METER (TO MEASURE VENT LOSS)

SR. NO.	PARAMETER	REQUIREMENT
1	Fluid	Natural Gas
2	Measuring Principle	Thermal
3	Operating Pressure	50 mbar g
4	Molar Mass	17 -22
5	Ambient Temperature	0-60°C
6	Hazardous area classification	Class I, div I Gas Group D as per NEC or Zone 1, Group IIA / IIB as per IS / IEC Specification
7	Range of Operation	0.6 - 16 SCM/Hr
		0.5 - 12 Kg / Hr
8	Measured Error Mass	± 1.5% of indicated flow accepted (over the operating range of 2-12 Kg/Hr on gas)
9	Meter Size	Vendor to specify
10	Pressure drop at max. flow	2 mbar max.
11	Repeatability	± 0.5% or better
12	Material Tube	SS 316 or better
13	End connection	To suit the line size, flange Connections
14	Power Supply (nominal)	24 V DC or 230 ± 10% V, 45-65 Hz
15	Output (Active)	
16	RS 485	Required
17	Outputs Information	
17.1	Mass Flow Rate	Required
17.2	Mass Totalizer, non – resettable	Required
17.3	Temperature	Required over MODBUS
17.4	Integral Display	Display all outputs with specified accuracy, programmable and sequential with password protection. Touch Screen or Touch Keypad Type
17.5	Density	Required
17.6	Pressure	Required
17.7	Volume flow rate	Field configurable with password protection for molecular weight range: 17 to 22
17.8	Volume flow totalizer	Field configurable with password protection for molecular weight range: 17 to 22
17.9	Periodic mass & totalizer, non-resettable	Four (one each monthly, daily, fortnightly and one for configurable period)

18.	Programmer	Calibration software, perpetual licence with portable hardware platform complete with all connectors, power adopter, batteries. System should be suitable for effecting calibration changes, configuring the flow meter / transmitter, storing test result, plotting and storing graphs, diagnostics, password protection etc. Carrying case, easily installable in the field for calibration set up
19	Communication	MODBUS with RS 485,
20	Mounting	Field mounting, (Vertical)
21	Certification	PESO

SPECIFICATION SHEET FOR FLAME DETECTORS

Flame detector Type:	UV, visible and IR sensors
Spectral sensitivity	UV radiation over the range of 185 to 260 nanometers (1850 to 2600 angstroms)
	IR radiation in the 4.2 to 4.6-micron range and Visible sensor – 400 to 700 nanometer
Field of View	120° cone of vision (or) Better.
Sensitivity	Approved Performance Specification-50 feet (15.2m) distance for a 1 sq. ft (0.m2) heptane fire.
Response Time:	Less than 5 seconds
Status Indicator:	LEDs indicate status of Healthy, fault, and alarm conditions
Operating Medium	Natural Gas.
Nominal supply voltage:	24 VDC
Supply voltage range:	20 to 36 VDC
Maximum output signal load:	600 Ohms
Electrical Specifications [OUTPUT: mA, Relay, Hart]	
(all 3 below mentioned outputs must be available in separate connectors/ ports)	
1. Analog (mA):	
Output signal range:	0 to 20 mA *
FAULT signal:	0 to 0.2 mA *
COPM fault signal:	2.0 ± 0.2 mA *
Ready signal:	4.0± 0.2 Ma
IR only signal:	8.0 ± 0.2 Ma
UV only signal :	12.0 ±0.2 mA
WARN signal:	16.0 ±0.2 Ma
ALARM signal:	20.0 ± 0.2 mA
2.Relay Contacts: (Alarm, Fault and Auxiliary)	Fire relay (alarm)- Both Contact output NO and NC required. Fault relay - Contact output NO and NC required. Contact rating 30 VDC, 2 A or 125 VAC, 1 A
3. HART	
Protocol	HART protocol
	External HART Port connector (without opening of Housing cover of Flame Detector) is required in transmitter for calibration and parameter accessing.

Vibration	As the detector shall be vibrations arising mounted inside CNG compressor canopy, the same shall be capable of withstanding from reciprocating compressor.
Approvals (sensor, Transmitter and Terminal box / Junction Box)	CCOE/PESO, CSA, FM, ATEX, HART Registered, and AMS Aware
	Class 1, Div. 1, groups B, C, and D (-40°C to +65°C), Type 4X, Ex d IIC, T4
WP Protection	IP54
SIL 2	IEC 61508 required
AMS Aware:	Certified by AMS
RFI/EMI Protection:	Complies with EN 50130-4, EN 61000-6-4

Accessories	Housing: Anodized aluminum with powder coated finish or equivalent (Explosion proof enclosure) Mounting: Roof mounted, or wall mounted. For threaded type detectors suitable termination box (approved for use inside hazardous area) shall be provided. The detector shall be supplied with suitable Deluge protection, Strom baffle, Weather protection, Dust barrier, Gassing Cap, etc as applicable protection against dust particles. .
	2 No's Cable Glands (1/2" or 3/4" Double compression)
Flame detector built-in test	Automatic and manual test
Flame detector immunity	False alarm sources like Arc welding, X-Ray's or hot vibrating object, lightening.
Manuals (soft and Hard Form)	Comprehensive Maintenance, Calibration and Troubleshooting
Software (soft and Hard Form)	Software or additional device, cables required for calibration or troubleshooting of instrument shall be supplied free of cost with instrument.
Flame detector calibration	Must be inbuilt or else calibration device must be supplied along with FD at free of cost.
Calibration procedure	(both zero and span) for the model quoted to be provided in detail

SPECIFICATION SHEET FOR GAS DETECTORS

Tag nos	As per P&ID
Sensor Type	Infrared Absorption, Point gas detector
Model	*
Make	As per approved/Recommended vendor list
Operating Voltage	24V DC
Range	0-100 % LEL (Low Explosive Limit)
Repeatability	Better than +/-3% of Full Scale
Response Time	T 90 < 15 second or better

Temperature Range	0 deg C to 50 Deg C
Humidity range	0 to 99 % RH
Power Consumption	Vendor to indicate
Digital Signal Outputs	required
Current Signal Outputs	
Ingress Protection	IP 65 or better NEMA 4X
Housing Material	SS 316
Dimension	*
Cable Entry	Two entries, inch NPT (F), for one spare cable entry stop plug shall be provided
Electrical Area Classification	Zone-1,2, Gr. II A & II B, T3 or better
Enclosure Class	Explosion proof EEx'd' / Intrinsically Safe EEx'ia'
Alarm at	20 % & 40% of Range
Accuracy *	± 2% FSD or better
Calibration Kit	Required
SIL 2 Certificate	Required
Accessories	required

SPECIFICATION FOR KWH METER

1	**Meter type**	3Phase 4 wire Static Energy meter
2	**Accuracy class**	0.5 S as per IS14697
3	**Connection**	Transformer Operated
4	**Rated Voltage**	240V(P-N), 415V(P-P) ± 10%
5	**Rated Basic current**	5A
6	**Rated maximum current**	10A
7	**Rated Frequency**	50 HZ
8	**Power Factor range**	Zero lag- Unity- Zero lead
9	**Standards compliance**	IS 14697, IEC 62052-11, IEC 62053-21, IS 15959
10	**Calibration**	Meter shall be calibrated at factory and no modifications should be permissible
11	**Energy Audit Data**	a. Meter serial number b. Date and time c. Cumulative forwarded active energy d. Cumulative reactive energy - Lag e. Cumulative reactive energy - Lead f. Cumulative forwarded apparent energy g. Cumulative Maximum Demand in kW and kVA with date and time
12	**Metering philosophy**	**Metering should be 2 quardrant lag only and programmed accordingly**
13	**Auto/Manual Scroll mode**	a. LCD test b. Date c. Time d. Cumulative Active Energy e. Cumulative Apparent Energy f. Cumulative Reactive Energy – Lag g. Cumulative Reactive Energy – Lead h. Active Maximum demand with date and time i. Apparent Maximum demand with date and time j. Active load k. Reactive load l. Apparent load m. Phase wise power factor n. Average power factor o. R phase voltage p. Y phase voltage q. B phase voltage r. R phase current (line) s. Y phase current (line) t. B phase current (line) u. Instantaneous average power factor with sign for lag/lead v. Frequency reading
14	**Maximum demand Registration**	Meter should store and display maximum demand in kW/kVA with date and time. Demand integration period should be 30 minutes. It is preferred that MD is computed using separate counter rather than by difference of initial and final energy counter.
15	**Auto Reset of Maximum Demand**	Meter should reset to zero and date should be customisable date

SPECIFICATIONS FOR DISCHARGE FILTER

SUPER FINE FILTER (Coalescing Filter)

Super fine filter for removal of liquid (e.g. water & oil) and solid particles down to 0.01 microns out of compressed natural gas

Residual Oil Contents less than 0.01 mg/m3.

Filter Designed :

Paint Compatible

CE mark in accordance with European Directive for Pressure Equipment, PED (97 / 23 / EC)

Are Designed to meet the ATEX European Directive for Explosion Protection, (94 / 9 / EC)

All natural gas filters in accordance to CE Eex 2GD IIB T6.

Standard equipment:

Complete filter including manual drain.

Specification Filter Elements.

Filter Fabric : Borosilicate Microfibre Fabric coated with polypropylene homopolymer support - fabric.

Drainage Layer: Parafil - Fibre fabric incorporated in the filter fabric (Without Foam Sock)

Rib Mesh : Stainless Steel VA 1.4306 **Temperature** : + 1 ° C to + 80 ° C **Direction Of Flow** : From Inside to Outside.

NOTE : Bidder to get the inspection done by TPIA accordance with European Directive for Pressure Equipment, PED (97 / 23 / EC) if CE marks are not available.

ANNEXURE – VI: RECOMMENDED VENDOR LIST

Refer Master vendor list attached below.

Notes:

1.Above vendor list is indicative only and any other vendor(s) apart from as mentioned above may be accepted subject to approval by Owner/Owners representative based on their past track record / credentials. However, no relaxation or advantage in delivery period will be given to the successful bidder on account of this approval.

2.For the vendors of items not covered in above vendor list, but required for completion of project successfully, supplier shall take approval form Owner/Owners representative for the same during project execution. Bidder shall submit the required certifications, documents, PTR and Performance letters from clients for the same.

ANNEXURE – VII : VENDOR DATA REQUIRED

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
A	GENERAL			
1	PROJECT SCHEDULE		YES	
2	DEVIATION LIST (IF ANY) TO THE APPLICABLE SPEC., DATASHEETS	NA		
3	UTILITIES REQUIREMENT SUMMARY	YES		YES
4	FLANGE DETAILS OF PIPING CONNECTION WITH CONNECTION AT BATTERY LIMIT		YES	
5	DULY FILLED IN EXPERIENCE RECORD PROFORMA	YES		
6	GUARANTEE PARAMETERS AS SPECIFIED	YES		YES
7	TENTATIVE LOAD DATA FOR FOUNDATION DESIGN		YES	YES
8	LIST OF SUB-VENDORS FOR ALL BOUGHT OUT ITEMS INCLUDING ELECTRICAL & INSTRUMENTATION ITEMS		YES	
9	LEAFLET, CATALOGUES FOR ALL ITEMS			YES
10	O & M MANUAL			YES
11	VALID PESO APPROVAL FOR OFFERED MODEL	YES		YES
B	**COMPRESSOR**			
1	DATASHEETS FOR THE FOLLOWING	YES		YES
A	- COMPRESSOR	YES		YES
B	- HEAT EXCHANGERS			YES
C	- PRESSURE VESSELS			YES
D	- ELECTRIC MOTOR	YES		YES
2	CATALOGUE FOR COMPRESSOR			YES
3	TYPICAL CROSS SECTIONAL DRAWING AND LITERATURE TO FULLY DESCRIBE THE DETAILS OF OFFERING			YES
A	- COMPRESSOR		YES	YES
B	- SUCTION VALVE, if required			YES
C	- DISCHARGE VALVE, if required			YES

5	COOLER DATA / DRG WITH THERMAL & MECH DESIGN , if			YES

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
	required CALCULATION, if required			
6	DESIGN CALCULATION, GA DRGS FOR PULSATION DAMPNER , if required			YES
7	PIPING & INSTRUMENTATION DIAGRAMS FOR THE FOLLOWING	YES	YES	
A	- PROCESS GAS		YES	
B	- OIL CIRCUIT		YES	
C	- COOLING SYSTEM		YES	
8	TORQUE ANGLE DIAGRAM, PISTON ROD LOAD VS CRANK ANGLE , if required			YES
9	TORQUE SPEED CHARACTERISTICS , if required			YES
10	ACOUSTIC / MECHANICAL EVALUATION REPORT , if required			YES
11	ITEMIZED LIST OF ESSENTIAL SPARES			YES
13	DRG. FOR TESTING ARRANGEMENT & TEST PROCEDURE TO BE ADOPTED -PAT		YES	
14	CERTIFICATE FOR FOLLOWING:		YES	
A	HYDRAULIC TESTING		YES	
B	NON DESTRUCTIVE TESTING		YES	
C	MATERIAL COMPOSITION & PHYSICAL PROPERTIES		YES	
D	LEAK PROOFNESS TEST OF FRAME		YES	
E	LUBE PUMP, FRAME OIL PUMP, HYD OIL PUMP		YES	
15	DESIGN / ACTUAL ASSEMBLY CLEARANCE CHART		YES	
16	TEST RECORDS OF FOLLOWING			
A	MECHANICAL RUNNINGS		YES	
B	PERFORMANCE TEST / PACKAGE TEST		YES	
C	NOISE LEVEL TEST		YES	
17	LIST OF SPECIAL TOOLS & TACKLES FOR INSTALLATION & MAINTENANCE	YES		YES
C	**ELECTRIC MOTOR**			

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
1	MOTOR DATA SHEET	YES	YES	
2	TECHNICAL LITERATURE / CATALOGUE, SELECTION CHARTS, NOMOGRAPHS ETC.	YES		YES
3	GA DRAWING	YES		YES
4	TERMINAL BOX ARRANGEMENT DRAWING			YES
5	MOTOR CHARACTERISTIC CURVES , if required			YES
6	TORQUE SPEED CURVES , if required			YES
7	CURRENT TIME CURVES, if required			YES
8	P.F AND EFFICIENCY			YES
9	TYPE TEST CERTIFICATES			YES
10	CERTIFICATE FROM THE RELEVANT STATUTORY AUTHORITY (BASED ON THE COUNTRY OF MANUFACTURE) FOR SUITABILITY OF THE OFFERED MOTOR FOR INSTALLATION IN THE SPECIFIED AREA CLASSIFICATION			YES
11	PRE-COMMISSIONING AND COMMISSIONING PROCEDURE, if required			YES
D	**INSTRUMENTATION**			
1	G.A. OF INSTRUMENT PANEL WITH BILL OF MATERIAL & WIRING DIG. FOR LCP		YES	
2	INSTRUMENT DATASHEET		YES	
3	LOGIC DIAGRAM / LADDER DIAGRAM / FUNCTIONAL DIAGRAM		YES	
4	LOOP SCHEMATIC		YES	
5	INTER CONNECTING DIAGRAM		YES	
6	OPERATING / CONTROL WRITE UP		YES	
7	ALARM / SHUT DOWN LIST		YES	
8	WIRING DIAGRAM / INTER CONNECTING PIPING		YES	
9	START UP AND SHUT DOWN WRITE UP		YES	
10	START UP AND SHUT DOWN INLET LOCK DIAGRAM		YES	
11	ALARM AND SHUTDOWN LIST WITH SET POINT		YES	

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
12	LOAD CONTROL PANEL LAYOUT		YES	
13	TERMINATION DIAGRAM, PANEL WIRING DETAIL		YES	
15	INTER CONNECTING DIAGRAM		YES	
16	CABLE SCHEMATIC and CABLE SCHEDULE		YES	
17	BILL OF MATERIAL		YES	
18	TEST / INSPECTION CERTIFICATE		YES	
19	LIST OF RELIEF VALVES WITH SETTINGS, if required			YES
20	CERTIFICATE FROM THE RELEVANT STATUTORY AUTHORITY (BASED ON THE COUNTRY OF MANUFACTURE) FOR SUITABILITY OF THE OFFERED INSTRUMENTS FOR INSTALLATION IN THE SPECIFIED AREA CLASSIFICATION		YES	

1. DOCUMENT DISTRIBUTION SCHEDULE

1.1. Documents and drawings under column no. 3 shall be submitted with each copy of the bid.

1.2. Documents listed under column 4 are to be submitted as soft and hard (if required) for approval.

1.3. Documents listed in column 4 and column 5 are to be submitted as hard bound indexed book containing all details in Two (2) copies within 4 weeks of release note/dispatch of materials/ equipment from vendor's works.

1.4. If any of the above documents is not required, same shall be at the discretion of Owner/owner's representative.

1.5. Single document contatining multiple information can be accepted if found reasonable, same shall be at the discretion of Owner/owner's representative.

2. DETAILS TO BE INCLUDED IN FINAL DOCUMENTS BOOKS

2.1. Copy of P.O. and all amendments.

2.2. Copy of Purchase Requisition and all amendments.

2.3. Manufacturing Data Book containing all test certificates of components, raw materials, stage manufacturing tests and inspections, final tests & inspection documents including welders' qualification & welding procedure qualification, repairs & reworking carried out in shops. All raw material test certificates must be correlated to the
P.O. Item No. & component to which they relate by clear noting on the certificates.

2.4. Spares details including assembly drawings, part numbers, delivery, prices and ordering information.

2.5. Final Drawing Index and all as-built drawings reduced to A3/ A4 size and wherever reduction is not possible, full size copies duly folded and placed in plastic pockets.

2.6. Catalogues/leaflets of sub-vendors/suppliers of various bought out components highlighting the components actually supplied correlated to P.O. Item Numbers.

2.7. Operating and maintenance instructions including lubrication schedules with details of suppliers for procurement by OWNER for subsequent needs.

2.8. Release Note and Packing List.

2.9. Any other documents asked for in the Purchase Requisition.

2.10. All final drawings shall also be given to purchaser in digitized form , if required by owner.

2.11. Final documents including Comprehensive maintenance manual should be submitted, one copy per package plus one original.

2.12. Comprehensive maintenance manual shall include assembly and disassembly, specification (torque chart), parts manual, complete list of bill of material, bought out spares and accessories. One original plus individual copies for the no. of compressor packages supplied.

3. SPECIAL INSTRUCTIONS FOR SUBMISSION OF DWGS./DOCUMENTS:

3.1. Contractor to forward the drawings and documentation to OWNER (Attention vendor prints control department) clearly specifying purchasers Job no. & Req. No.

3.2. The drawing/Document no. with Rev. No. is essential. The number may be upto a maximum of 28 characters in length.

3.3. Each Drawing/Document submitted to OWNER must be checked and signed/stamped by contractor before it is submitted to OWNER.

3.4. Revision number must change during subsequent submission of vendor document.

3.5. Multi-sheet documents other than drawings must be submitted in their entirety in the event of a re-submission even if only a few sheets are revised.

3.6. Final submission in bound volumes shall necessarily have a cover page giving project title, Item name, P.O. No. particulars of owner, consultant & vendor and an index giving list of drawings & documents included (with revision no.).

3.7. The review of the vendor drawings shall be done by OWNER, as applicable, under the following review codes:

CODE A	**"APPROVED"**
CODE B	**"APPROVED SUBJECT TO INCORPORATION OF COMMENTS"**
CODE C	**"NOT APPOVED"**
CODE D	**"FOR INFORMATION ONLY"**

3.8. Review of vendor drawings by OWNER would be only to check compatibility with basic designs & concepts & would in no way absolve the contractor/vendor of his responsibility to meet tender terms, applicable codes, technical specifications & statutory rules/regulations. If required, Vendors has to make necessary changes after stamping of drawings also for compliance of tender terms and conditions.

Vendor shall submit all drawings and documents for necessary approval as required by Owner/Owner's representative within 7 days after placement of LOI, the complete list of drawings/ documents with submission dates against each. Critical drawings, only, the list of which will be agreed during kick-off meeting shall be reviewed jointly at **Owner/Owner's representative** office.

ANNEXURE – VIII: DEVIATION SCHEDULE FOR INTEGRATED CNG COMPRESSOR PACKAGE

Vendor:		
S.No.	Vendor to specify Specification number and clause number against which Deviation is sought	Description of Deviation and give reasons in support of Deviation
	----------NO DEVIATION----------	----------NO DEVIATION----------

ANNEXURE – IX : DELETED

ANNEXURE –X: EXPERIENCE PROFORMA RECORD

A) EXPERIENCE RECORD PROFORMA OF INTEGRATED CNG COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 400 sm3/h**		
1	Status of bidder			
	a) Compressor manufacturer			
	b) Electric Motor manufacturer			
	c) Packager			
2	**COMPRESSOR**			
	Name of compressor manufacturer			
	Place of compressor manufacturer			
	Compressor model			
	Anticipated Life in running hours			
	Compressor max frame BKW			
	Comp Manufacturing code			
	Lubricated/Non lubricated			
	Nos of stages			
	Max stage temperature ^{o}C (150^{o}C)			
	Compressor max RPM			
	Compressor operating RPM			
	Piston speed m/s			
	Vibrations at comp cylinders <10 mm / sec. Unfiltered peak velocity Vibration comp frame : Unfiltered peak velocity of 5 mm/sec or 200 micron unfiltered peak to peak vibration whichever is less			
	Material for all stages			
	Cylinder (C.S)			
	Piston Rings (PTFE)			
	Rider Rings (PTFE)			
	Piston Rod (Forged steel)			
	Valve (Rings / plates / spring) : (SS/SS/SS)			
3	**PERFORMANCE OF COMPRESSOR**			
	GUARANTEED POINT:			
A	Flow capacity (overfull range of suction pressure from 16 barg to 50 barg)			

A) EXPERIENCE RECORD PROFORMA OF INTEGRATED CNG COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 400 sm3/h**		
B	Minimum Flow capacity corresponding to suction pressure of 16 barg.			
C	BKW required by compressor including compressor's lube oil pump BKW			
D	Power required for all fans including radiator fan in Kw			
E	Ventilation fans for enclosure No of fans Type of fans (included or forced draft)			
F	Site Capacity of Motor (max of "B+D" above) * 1.1			
	Piston rod and cross head pin loading at any specified operating condition including the relief valve set condition shall not exceed 80% of the maximum design rod load of the offered compressor			
	---- Piston rod : max design			
	--- Piston rod: calculated at safety set pr condition			
	--- Max cross head pin loading: Design '			
	--- Cross head pin loading: calculated at safety set pr condition			
	Guaranteed gas loss through rod deals; sm3/h			
	Other information of compressor			
	a) Year of manufacturing of the compressor			
	b) Name and address of user with FAX no, phone no, E-mail address			
	c) Nos of hours the compressor have clocked on bid due date (Enclose certificate from user)			
4	**ELECTRIC MOTOR**			
	Make			
	Model			
	Rating			
	Speed			

A) EXPERIENCE RECORD PROFORMA OF INTEGRATED CNG COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 400 sm3/h**		
5	**PACKAGE**			
	Name of Packager			
	Place of Packaging			
	Name of Enclosure Manufacturer			
	Palace of enclosure manufacturer			
	Sound level at 1 m distance from package in db (A) 75±3			
	Skid size (LxBxH)			
	Skid Gross Weight (Comp. + Motor + Aux.) Kg			
	Make and model LEL detector – 1 no. each comp			
	Make and model fire detector – 1 no. each comp			
	2 nos. min C02 cylinder with online weight monitoring.			
	Volume of enclosure in m3			
	Nos. of explosion proof tube light in each enclosure			
	Coupling Direct / V – belt			
6	**Other information of complete package**			
	a) Year and place of manufacturing of the package			
	b) Name and address of user with FAX no, phone no, E-mail address			
	c) Nos of hours the complete package have clocked on bid date (enclose certificate from user)			
7	**Gas recovery system**			
	Gas recovery system with pr relief valve, pr regulator, pr gauge, manual & automatic drainage system			
8	**Gas Delivery system**			
	High pr piping with SS 316, tubing, compression fittings, NRV			

A) EXPERIENCE RECORD PROFORMA OF INTEGRATED CNG COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 400 sm3/h**		
	KOD			
	Coalescent filter			
	PLC based Priority panel with full bore ball valve			
	Final gas outlet connection from priority panel 3/4" SS valves and 1" OD SS compression fittings			
9	**ESD system**			
10	**Volume bottles / dampers at each compressor stage of compressor**			
	Vessels			
	Drainage system			
11	Manual double isolation valve			
12	Automatic valves			
13	**Heat exchanger**			
14	Code of construction API 661			
15	Gas sections of coolers shall be as per API – 11P requirements			
16	Tube material			
17	Piping between stages shall be continuous with flange connection			
18	Other tubing shall be SS 304/ 316 as per TS.			
19	Gas recovery vessel provided			
20	Area classification; " class 1, group D, division 1 as per NEC " OR " Zone 1, group IIA / IIB as per IS/IEC"			
21	The size of the complete package			
25	Instrumentation as indicated in TS			
30	Cabling – Double compression type cable glands and copper lugs			
31	Junction box with metallic enclosure			

ANNEXURE – XI : PARAMETERS FOR SCADA

Parameters required for SCADA

We want to monitor / control all parameters available on the PLC through SCADA system.

Hardware Details: Connector Type, Communication Standard, Communication port Pin details,

Communication Port Configuration: Baud Rate, data bits, stop bit, parity Polling Constraints:

Minimum time period between two consecutive poll cycles.

Protocol Details: Protocol name and message structure for different read / write functions.

Function codes for reading digital and Analog inputs

Function code for writing analog values in the IED registers

List of parameters available in the IED which can be accessed from the IED through serial port. Register address of each parameter in the IED.

System to be provide for remote / local monitoring of paramters like Kwh, Amperes,voltage, power factor, HMR, flow meter readings etc

A Sample of the details is given below for understanding:

PROTOCOL DETAILS:

Sr. No.	Description	Content/Details
1	Protocol	MODBUS RTU
2	Connection Type	FCC –68 RJ45
3	Communication standard	RS232D
4	Signals supplied	Tx, Rx, GND
5	Baud Rate(Speed)	300, 600,1200,4800,9600,19200
6	Format	Software configurable
7	Port Configuration	Speed : 19,200 bps Data Bits : 8 Bits Stop Bit : 1 Bit Parity : None
8	Min. Time period between consecutive Query	2 Sec.

- PORT PIN Details:
- Example: RS232 Pin Details:
  - IED SCADA
  - RJ45
  - GND
  - DTR
  - RTS
  - TXRX
  - RXTX
  - CTS
  - DCR
  - DCD
- Function Code & Message Structure:

Function Code: 3 – Read Output
Register Poll Format:

Address 1 Byte

Function
1 Byte Start Item
2 Byte

NO. ITEM 2 BYTE

Response Format:

Address 1 Byte

Function 1 Byte

Length 1 Byte

Date Item 1 4 Byte
Date Item n 4 Byte

- Function Code & Message Structure:

Function Code: 2 – Read Input Status
Poll Format:

Address 1 Byte

Function 1 Byte
Start Item 2 Byte

NO. ITEM 2 BYTE

Response Format:

Address 1 Byte

Function 1 Byte

Length 1 Byte

Date Item 1 2 Byte
Date Item n 2 Byte

Memory Mapping, Data Type & Parameter Information:

A. Digital Parameters :

Sr. No.	Description	Address
1	Flow computer malfunction Alarm	8247
2	Mass Flow Low alarm	8245
3	Mass Flow High alarm	8246

B) Analog Parameters:

Parameter	**Register details**			
	Engineering Range and Unit	GC Register	Register Format	
Density	Kg/m3 (500-600)	8655-56	Float	
Pressure		8657-58	Float	
Temperature		8659-60	Float	
Mass Flow Rate		8661-62	Float	
Totalized mass flow		8663-64	Float	
Yesterday's Total Mass flow		8665-66	Float	
Today's Total Mass Flow		8667-68	Float	
Corrected volumetric Flow rate		8669-70	Float	
Yesterday's Total corrected Volumetric Flow		8671-72	Float	
Totalized Mass Flow at 6 AM (Snapshot of cumulative)		8673-74	Float	

ANNEXURE – XII

QUALITY ASSURANCE PLAN

Sr.No	Description	Quantum of Check	Reference Document	Acceptance Norms	Format Of Records	Inspection By		
						Vendor	TPIA	Owner/ Owner's Representative
1.1	Hydrotest of Cylinder, Press. Vessels, Heat Exchangers		Technical Specification	Technical Specification	Test Report	W	W	R
1.2	Hydrotest of Cylinder Heads		Technical Specification	Technical Specification	Test Report	W	R	R
1.3	Leak Proof Test of Crank Case (4 Hours . with Kerosene) Refer Note :4		Technical Specification	Technical Specification	Test Report	W	W	W
1.4	Ultrasonic Test of - Crank Shaft, Connecting Rod, Piston Rod Etc. Refer Note: 1		Technical Specification	Technical Specification	Test Report	R	R	R
1.5	Magnetic Particle Test of - Crank Shaft, connecting Rod., Piston Rod Refer Note: 1		Technical Specification	Technical Specification	Test Report	R	R	R
1.6	Radiography as Applicable - Pressure Vessels, Heat Exchanger. Gas Piping (Only 10% Joints To Be Witnessed)		Technical Specification	Technical Specification	Test Report	W	W	R
1.7	Barring Over to check Cylinder End Clearance And Piston Rod Runout		Technical Specification	Technical Specification	Test Report	W	W	R
1.8	No Load Mechanical Run Test Of the Compr. with Rated (Or More) Speed And Shop Driver. (4 Hrs. Min.)		Technical Specification	Technical Specification	Test Report	W	W	W

1.9	Strip Check And Internal Inspection After "NLMRT" Of All Compressors **Refer Note: 2**		Technical Specification	Technical Specification	Test Report	W	W	W
1.10	Electric Motor Performance Test- at Sub-Vendor's Works as per ISO Std. **Refer Note: 3**		Technical Specification	Technical Specification	Performance Test Report	R	R	R
1.11	Material Test Certificates for: Crank Shaft, Connecting Rods, Cylinder Liner, Piston (Compliance Cert.), Pressure Vessels, Heat Exchanger		Technical Specification	Technical Specification	MTC	R	R	R
1.12	Canopy Structure Painting Inspection At Works. Surface Preparation to be Inspected after cleaning and before application of First Coat of Primer.		Technical Specification	Technical Specification	Inspection Report	W	W	R
1.13	Functional / HV / Continuty Test for Control Panel (at Sub Vendor's Works**)**		Technical Specification	Technical Specification	Test Report	W	R	R
1.14	Mechanical String Test for 4 Hours,		Technical Specification	Technical Specification	Test Report	W	W	W
1.15	Test Certificates For - Safety Switches, Safety Relief Valves, Solenoid Valves		Technical Specification	Technical Specification	Test Certificate	R	R	R

1.16	Final Mock-Up Assembly of the Package - As Per GAFD, P& I Drawings. Wiring Diagram		Technical Specification	Technical Specification	P&ID, Wiring Diagram	W	R	R
1.17	Performance Test (at site) at Guaranteed Parameters.		Technical Specification	Technical Specification	Performance Test Report	W	W	W

1.18	Field Trial Run for 72 Hrs.		Technical Specification	Technical Specification	Field Trial run report	W	W	W
LEGENDS	W = WITNESS, R = REVIEW OF DOCUMENTS, Y = DOC. SUBMISSION BY VENDOR / SUB-VENDOR							
NOTES:								
1	Crank Shaft, Connecting Rod: UT / MPT shall be conducted in either in forging-OR-in finish condition							
2	Strip test is limited to open Crank Case cover, Crosshead guide & Distance piece. Cover and opening of bore & other (sails. Piston one valve per cylinder).							
3	Review of manufacturer's test reports/certificates of all compressor package.							
4	Witness of tests by TPIA or owner/owner's representative.							
5	Inspection of the components / assembly, shall be conducted as per standard Test Procedures.							
6	All reference codes/ Standards, documents, P.O. copes shall be arranged by vendor/ supplier for reference of Owner / Owner's representative / TPIA at the time of inspection.							
7	The owner shall submit their own detailed QAP prepared on the basis of above technical specification for approval of Owner/ Owner's representative.							
8	**Bidder to furnish FAT test Procedure for Review**							
NOTE:	TPIA (THIRD PARTY INSPECTION AGENCY WILL BE APPOINTED BY SUPPLIER AFTER DUE APPROVAL FROM OWNER.							

ANNEXURE - XIII DATA SHEET

DATA SHEET: MEDIUM VOLTAGE SQUIRREL CAGE MAIN INDUCTION MOTOR ELECTRICAL DESIGN DATA

1.	Motor tag no.			
2.	Voltage (V)	415V ± 10%	Phase 3	Frequency (Hz.) 50 Hz+3%
3.	Fault level (KA)	**NOT APPLICABLE**		
4.	Method of starting	**SOFT STARTER**		
5.	Phase	**THREE**	Connection – **AS PER STARTING METHOD**	No. of terminal – **AS PER STARTING METHOD**
6.	Design Ambient temp (^{0}c)	**50 ^{0}C (IN ACCOUSTIC ENCLOSURE)**		Temp. rise (^{0}c) **70 ^{0}C (Maximum)**
7.	Cable size (mm^2)	AS PER SPEC ATTACHED		Type **CU. COND. PVC INS.**
8.	Enclosure type	IP 55, Ex-d, IIA, IIB,T3		Cooling **TEFC**
9.	Insulation class	CLASS-F with temperature rise of CLASS B		
10.	Haz. Area classification/ Gas Group	ZONE-1, GROUP-IIA, IIB, Temp Class T3 as per IS/IEC		
11.	Type of explosion protection: Ex (d)		Applicable standards: **IS/IEC**	
Technical particulars from Driven equipment manufacturer				
12.	Suggested Motor Rating in KW/ Manufacturer		# / #	
13.	Shaft kw/kw at end of curve		# / #	
14.	Speed/ rotation of equipment from Coupling End		# / #	
15.	Starting/ max. Torque required (mkg)		# / #	
16.	WK^2 of equipment including/ excluding lywheel (kgm^2)		# / #	
17.	Thrust up/ down (kg)		# / #	
18.	Equipment/ coupling type		# / #	
19.	Starting Condition-On no load/ Under loaded condition		#	
Technical particulars from motor manufacturer				
20.	Manufacturer	*		
21.	KW Rating	*	No. of poles	*
22.	Frame designation	*	Mounting (Horizontal)	*
23.	Full load speed (Max. 1500 rpm)	*	Full load Torque (mkg)	*
24.	Starting torque as % of full load torque	*		
25.	Full load current (A)	*		
26.	Starting current at 100% Voltage (A)	*		
27.	Breakdown or pull out torque %	*		
28.	Rotation viewed from coupling end	*		
29.	Starting time at 75%V	* (sec.)	Starting time at 100%V	* (sec)
30.	Time (Te) for increased safety motors at 100% Voltage (secs.)		NOT APPLICABLE	
31.	Locked rotor with stand time cold/ hot at 75% V(sec)	*	At 100% V(sec)	*
32.	WK^2 of motor (kg m^2)	*		
33.	Power factor at 100% load	*	Power Factor at 75% load	*
34.	Efficiency at 100% load	*	Efficiency at 75% load	*
35.	Space heater watts/ volts	***/ 240V AC**		
36.	Bearing type/ no. DE	*/*	Bearing type/ no. NDE	*/*
37.	Type of Lubrication	*		
38.	Weight of motor (kg)	*		
39.	Canopy required/ Not required	NOT REQUIRED		

TO BE FILLED BY BIDDER BASED ON THE PACKAGE DESIGN

* TO BE FILLED BY MOTOR MANUFACTURER

Bidder must quote for only one make of motor. Bidder shall submit filled up data sheet for the selected make of motor only.

Motor Terminal Box must be suitable for the cable size indicated on data sheet.

POWER CABLE SIZES FOR 415V MOTORS

S.No.	Motor Rating KW	CABLE SIZE mm2		No. of Cores	CABLE DIAMETER - mm (APPROX)		
		CU	AL		Overall	Under Armour	Over Armous
	Below 3.7 KW	4		3			
	3.7	6		3			
	5.5	10		3			
	7.5	10		3			
	11.0	16		3			
	15.0	16		3			
	18.5	16		3			
	22.0	16		3			
	30.0	25		3			
	37.0	25		3			
	45.0	35		3			
	55.0	50		3			
	75.0	95		3			
	90.0	120		3			
	110.0	2x95		3			
	125.0	2x120		3			
	132.0	2x120		3			

NOTES:

1. Above table is valid for 2/4/6 pole motors. For low speed motors cable sizes shall be defined at the time of detail engineering.
2. Cable size for motor space heater shall be 3x2.5 mm^2 with Cu Conductor.
3. Cables will be 650/1100V, copper conductor, FRLS-XLPE insulated, FRLS-PVC extruded inner sheath armoured with overall FRLS-PVC sheath.

   Cables external to Integrated CNG Compressor package will be supplied by Owner. All cabling inside the package is the scope of Supplier.

DATA SHEET: PRESSURE, VESSEL

(To be filled in by the Vendor)

PROJECT

UNIT

ITEM NO.

EQUIPMENT

CLIENT

JOB NO.

PACKAGE

MR. NO.

CODE FOR DESIGN AND CONSTRUCTION	ASME SEC-VIII DIV1
DESIGN CONDITION	
PRESSURE (kg./ cm^2g)	
TEMPERATURE (^0C)	
OPERATING CONDITIONS	
PRESSURE (kg./ cm^2g)	
TEMPERATURE (^0C)	
CORROSION ALLOWANCE	3 MM
SERVICE	CNG LETHAL [X] OTHERS CO_2
LIQUID LEVEL (mm)	
SPECIAL SURFACE FINISH INSIDE VESSEL	REQD. [ ] NOT REQD. [ ]
TYPE OF VESSEL	HORIZONTAL [ ] VERTICAL [ ]
DIAMETER (mm)	

HEIGHT TL TL (mm)		
SKIRT/ LEG HEIGHT		
JOINT EFFICIENCY	SHELL 1.0	HEAD 1.0
RADIOGRAPHY	SHELL100%	HEAD 100%
POST WELD HEAT TREATMENT		
MATERIALS OF CONSTRUCTION	SA 516 GR 60/70	
SHELL, REINFORCEMENT PADS		
HEADS/ CONES		
SHELL FLANGES		
NOZZLE FLANGES		
NOZZLE NECK		
MAN-WAY NECK		
PIPE FITTINGS		
GASKETS (EXTERNAL)		
GASKET (INTERNAL)		
SKIRT/ LEG SUPPORT		
INTERNAL PARTS		
EXTERNAL PARTS		
INTERNAL BOLTS/ NUTS		
CLIP ATTACHMENTS (EXTERNAL)		
ANY OTHER GENERAL REQUIREMENT		

NOTE: VENDOR SHALL SUBMIT COMPLETED DATA SHEET ALONG WITH OFFER WHEREVER ENGG. DRAWING IS NOT ATTACHED FOR THE VESSEL.

SECTION – II: TECHNICAL SPECIFICATION FOR CASCADE

1.0 SCOPE

2.0 SITE ENVIRONMENT

3.0 INSTRUCTIONS TO VENDORS

4.0 GAS COMPOSITION

5.0 CODES AND STANDARDS TO BE FOLLOWED:

6.0 EXTENT OF SUPPLY AND SERVICES

7.0 TECHNICAL SPECIFICATIONS

8.0 INSPECTION AND TESTING

9.0 DOCUMENTATION

10.0 EXPERIENCE RECORD PERFORMA FOR CASCADE

1.0 SCOPE

This document covers, minimum requirement for design, engineering, procurement, fabrication/manufacture, assembly, inspection, testing of CNG Cascades to be supplies with integrated CNG package.

2.0 SITE ENVIRONMENT

The climatic conditions to be considered for selection, design and derating of equipment shall be as indicated below:

Maximum Wind Velocity	:	160 Km/hr
Maximum Ambient Temperature	:	47.5 °C
Minimum Ambient Temperature	:	2`°C
Design wet bulb Temperature (WBT)	:	27 °C
Relative Humidity	:	90%
Altitude, M above MSL	:	230 - 2000 meters

The equipment offered shall be suitable for smooth, efficient and trouble free service in the tropical climate prevailing at site as indicated above.

The equipment shall be designed to give efficient and reliable performance under outdoor industrial conditions and shall be rendered protected against rats, lizards and other vermin.

3.0 INSTRUCTIONS TO VENDORS

This specification describes the technical specification of the equipment to be supplied and/or installed for CNG stations of CLIENT.

Various parts of the specification shall be read in conjunction with each other. In cases where requirements given in different parts differ, the most stringent shall govern.

The specification indicates the scope and requirements completely and clearly as possible. Any additional work/equipment or technical requirement not mentioned in the specification but required to make the offered system complete in accordance with the specification or required for safe operation shall be deemed to be included in the offer.

Vendor may contact CLIENT and obtain clarifications, required, if any, at any stage, after award of LOA.

The Vendors are advised to visit the sites before submission of their offers, to ascertain for themselves type, nature and extent of work involved and actual site conditions. Failure to do so shall not absolve the Vendor of their responsibilities regarding supply, installation, testing, commissioning etc. under their scope of work. Further more, no plea of the Vendor based on unfavorable site conditions and/or non-availability/lack of information shall be considered.

The Vendor shall confirm clause by clause acceptance of technical specification. Comments and/or deviation if any, of the Vendor on Owner/Consultant's NIT document (including technical specification) shall be given clause wise. Clauses, on which no specific comment or deviation will be indicated in the offer, shall be treated as accepted by the Vendor.

It will be the responsibility of the Vendor to comply fully with relevant National/International standards, Indian Explosives Act, Regulations of Insurance association of India and Factories Act, while supplying materials and/or carrying out work as per this specification.

Vendor's responsibility shall also include preparing and submitting all necessary drawings, calculations, test certificate etc. as required by concerned inspectorate / authorities.

The Vendor, free of cost and without affecting agreed milestones, shall carry out modifications suggested by the statutory bodies.

Civil engineering work i.e. foundation, trenches etc. shall be arranged by Owner. The vendor shall submit foundation and other drawings indicating requirement of work to be carried out by Owner within two weeks of placement of order. In case the requisite information regarding requirement of slots, holes, pipe and other fixing inserts etc. as required for proper installation of equipment is not indicated by the Vendor within two weeks form placement of order, such facilities shall have to be arranged/provided by the Vendor at their own cost.

All work shall be carried out to the satisfaction of the Owner. Any work found to be carried out without the approval of Owner or work which is considered to be unsatisfactory and of poor quality of workmanship shall be rectified by the Vendor without any additional cost.

The Vendor shall not vary the scope of work as detailed in the approved drawings and specification, without written permission of the Owner. The work shall be done as per approved prints of the drawing only.

The Vendor shall submit a bar chart showing all important milestones for the completion of supply within 15 days from the date of issuance of Fax of Intent (FOI) and shall provide the fortnightly progress report in duplicate accordingly.

The Vendor shall attend progress meetings and all other meetings called by the Owner. The Vendor's representative shall have the authority to make all decision related to the Contract.

All expenses for all the above activities shall be done and borne by the Vendor.

All pages of the offer shall be numbered and contents with page numbers shall be given at the beginning. All pages of the offer shall be submitted in bound volume.

4.0 GAS COMPOSITION

	Normal Gas Composition	Design Gas Composition
C1	82.43- 99.10	91.01
C2	7.27- 0.90	5.23
C3	3.47- 0.00	0.88
i-C4	0.65-0.00	0.08
n-C4	0.78-0.00	0.09
i-C5	0.17-0.00	0.03
n-C5	0.13-0.00	0.01
C6	0.10-0.00	0.05
C7	0.00-0.00	0.00
N2	0.06-0.00	0.22
CO2	4.93-0.00	2.4
H2O	0.01-0.00	0.00
TOTAL	100.00	100
Average Calorific Value (Kcal/SCM)	8950- 8150	8302.3

5.0 CODES AND STANDARDS TO BE FOLLOWED:

The design, construction manufacture, supply, testing and other general requirements of the Storage Cascades should be strictly in accordance with the Applicable Standards and Codes and should comply fully with relevant Indian/International standards, Gas Cylinder Rule 2016, Indian Explosives Act – 1884, Stationary and Mobile

Pressure Vessels (Unfired) Rules (SMPV)1981, Design Code,7285 (Part-2):2016, CNG Cylinder Valves, IS:3224-1979 (Amendments 1983,84,85,86,92,98), Hydrostatic Stretch Test, IS:5844-1970, Safety

Devices of Gas Cylinders, IS:5903-1970, regulations of Insurance Association of Indian and Factories Act while carrying out work as per the specification.

The bidder without any additional cost and delivery implications should carry out any modification suggested by the statutory bodies either during drawing approval or during inspection, if any.

CODES & STANDARDS TO BE FOLLOWED:

IS 7285 (Part-2):2004 Specification for seamless steel cylinders for permanent and high pressure liquefiable gases.

IS 3224:2002 Valve fittings for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders.

OISD – 179 Safety requirements on compressors, storages, handling and refueling of natural gas for use in automotive sector.

GAS CYLINDER RULES – 2016

FRAME STRUCTURAL STEEL SPECIFICATION-IS: 2062: 1992 GRADE-A INDIAN

EXPLOSIVES ACT.

SAFETY DEVICES OF GAS CYLIDNER IS:5903-1970, Regulations of insurance association NFPA

52 Standards for CNG Vehicular systems

All the applicable statutory codes, national laws and local regulations for safety and Environment protection shall be followed by the vendor for design , engineering, fabrication etc. the vendor shall obtain form concerned authorities all necessary approvals.

6.0 EXTENT OF SUPPLY AND SERVICES

6.1 Supply

Supply of CNG storage cascades of capacity minimum 450 water liter (-0%, + 5%) at 15°C for 400 SCMH compressor with following minimum details:

- All cylinders should be designed, constructed and tested in accordance with the Indian IS: 7285(Part2):2004 Part II or similar such other standard code approved by the Petroleum & Explosive Safety Organization.
- Each cylinder equipped with cylinder shut-off valve and Combination Bursting Disc & Fusible Plug (Conforming to IS 3224:2002).
- Robust painted Iron cascade frame. The iron surface shall be properly cleaned, primer and paint selected and applied to have a service life of at least five years. The exterior of the equipment is required to be corrosion free for at least five years and to have a fade free life without oxidation of paint surface for at least five years in an environment of bright sunlight with an intensive UV content. The bidder to specify the grade of paint intended to be used.
- Interconnecting tubing/piping, fitting, valves.
- Non return valves (NRVs) as required for three-bank operation.
- Pressure gauge on each bank.
- Temperature gauge on high Bank for stationary cascades

6.2 The services to be rendered by vendor shall include but not limited to the following:

- Obtaining approvals from concerned departments/agencies/statutory authorities such as BIS Certificate, PESO etc.
- Procurement of raw materials, bought out components, fabrication, shop assembly.
- Shop inspection and testing including third party inspection (TPIA) or inspections by CLIENT's delegate and statutory approvals.
- Testing at site.
- Packaging, crating, dispatch of cascades.
- Cascade commissioning assistance.
- Paintings as per the present document.
- Preparation and submission of documents/drawings as per schedule.

7.0 TECHNICAL SPECIFICATIONS

The following specification is to give the vendor the technical and operating conditions the cascades must fulfill. Features other than those indicated herein but which call for a better design, increase in efficiency, enhance reliability, optimization may be accepted subjected to CLIENT's approval. The cascade shall be shipped in completely assembled condition. Gas supply line and delivery connection shall be made at site.

The vendor shall bid in their main offer, items according to the technical specifications outlined below.

7.1 Cascade

- Cascade shall be a group of identical cylinders of capacity required to meet the specified total water capacity, dimensional and weight limitations. The cascades shall be provided with structural frame having facility of lifting and placement.
- Cascade storage Capacity.

  The water storage capacity of static cascade shall be minimum 450 (-0%, +5%) water litres at 15 degree C (Cylinders conforming to IS:7285 (Part 2)-2004) for 400 SCMH compressor.

- The water liter capacity of any individual cylinder in –group of cylinders forming cascades shall not exceed 125 liters at 15 degree C for 450 water liter capacity (Min.) cascades.
- The design, construction & testing of cylinder shall be as per IS 7285 – 2004 and approved by Petroleum and Explosives Safety Organization (PESO), Government of India for use in India for specified condition.
- Working pressure of cascade cylinder shall be minimum 250 bar g at 15 degree C.
- Storage cylinder manufactured older than 2017 shall not be accepted.
- Cylinder material shall be seamless alloy steel (Cr-Mo) as per design/drawings approval by Petroleum and Explosive Safety Organization (PESO), Govt of India.
- Cylinder neck threading shall be as per IS 3224-2002 or as per design approved by Petroleum and Explosive Safety Organization (PESO), Govt of India.
- In case cascades with 50 litres cylinders are offered vendor shall observe minimum neck threads size of dia 25.4 mm standard. Type 4 threads with a taper of 1 in 8 on diameter confirming to IS-3224:2002 or equivalent.
- The cylinder shut-off valve shall be with combination Bursting Disc and Fusible Plug conforming to requirements of IS 3224:2002 or as per design approved by Petroleum and Explosive Safety Organization (PESO), Govt of India.

- The burst disc shall rupture on excess pressure as well as excess temperature either individually or combined. The burst disc discharge shall be manifold to a common header for safe venting. Vendor shall indicate burst pressure and temperature.

- The cylinder shut-off valve orifice shall be designed for high flow to permit the combined flow of 100kg/min from each bank at pressure of 250 bar g. Vendor to furnish necessary calculations indicating overall pressure drop for each bank, Coefficient of flow (Cv) values orifice size etc.
- Number of cylinders in the cascade shall be divided into three independent banks of low, medium and high pressure of different storage pressures. Vendor shall optimize the number of cylinders in each bank for maximizing the recovery from the cascade storage and submit the calculations along with the bid. Vendor may assume the residual cylinder pressure of the vehicle coming for refill at 30 bar g.
- The interconnecting tube work of cylinders manifold in configuration suitable for priority filling and sequential dispensing system by the electronic CNG dispensers at the Retail Outlets.
- Full bore ball valves for isolation shall be provided at inlet of each fill line and at each bank outlet line. The final end connection at battery limit shall be 3/4" OD with nut and double ferrules for directly connecting a ¾ "OD tube.
- The interconnecting tube work shall be minimum of ¾ "OD tubing. The sizing of connecting tubing between each outlet and its associated cylinders shall be such that where they join the total incoming flow areas shall not be less than outgoing area. The loops in tube work shall be provided for absorbing contraction, expansion and vibration piping/tubing shall be suitably clamped to the frame structure.
- All cylinders should be new and unused. Re-certified cylinders are not acceptable. Before using/refilling, the cylinders which has to be made free of air contained gas shall be purged by an inert gas or by the CNG gas. All cylinders in a cascade shall be of same capacity.
- Cylinders in the cascade may be vertically or horizontally placed. In case of horizontal configuration, minimum 30 mm cylinder to cylinder gap shall be provided (Conforming to requirements of OISD-179). The material used to separate the cylinders should be sufficiently strong enough and should not absorb moisture. Special precautions should be taken to avoid corrosion at the point of contact.
- All cylinder valves and fittings must be rated for the full range of temperature and pressures and the manufacturer should stamp or otherwise permanently mark the valve body to indicate the service rating.
- Double compression ferrule Fittings shall be used in the connection tubes.
- All cylinders to be hydrostatically tested and approved by third party certification body. Test certificates shall be duly endorsed by approval body and issued before delivery.
- The location of inlet/outlet tube and pressure gauges shall be as per approved drawing.
- Cascade to be purged with N2 after testing and shipped with a positive pressure of N2 in the cascade. Suitable vent as attached in the drawing to be provided for stationery cascade.

7.2 Piping/Tubing/Fitting/Pressure Gauges

- Materials used for the piping shall be stainless steel 316 fully annealed seamless confirming to ASTM A269 with maximum hardness of Rb80 or less and suitable for bending and flaring. OD tolerance shall not exceed +0.005%.
- All fittings including valves shall be as per recommended vendor list. Material shall be SS 316 conforming to ASTM A269. Open ends on fittings and vents shall be provided with caps.
- Double compression ferrule fittings shall be used in tube connections.
- Liquid filled pressure gauge of diameter 4", (0-400 kg/cm2) with a 3 – way isolating valve on each bank

shall be used. Thus each cascade shall have three pressure gauges. Pressure gauges shall be securely mounted.

- All end connections, pressure gauges, valves and fittings of cascade shall be within tamper proof, wire cage enclosure. There shall be on one side of cascade for ease of operation.
- Material of vent tubing shall be Copper & Brass fitting as per ASTM B75, B 68 and make shall be as per recommended vendor list.

7.3 Painting

- Cylinder shall be painted as per Gas Cylinder Rules / IS :4379 Codes.
- CASCADE AND CANOPY FRAME

➢ The recommended painting system should be of Category C5–I Very high (Industrial) as specified in the Standard ISO 12944 Part 1 to 8. The proposed Painting system shall conform to Table A 5 of ISO 12944 – 5 Standard.
➢ Color of the Frame ----Yellow
➢ Three coats of paint shall be applied on frame with minimum overall thickness of min. 300 micron
- The paint shall be chosen, primed and applied as to have a service life of three (3) years. The exterior surface is required to be corrosion free for three years and to have faded free life without oxidation of paint surface for three years in an environment of bright sun light with an intense UV content
- Warranty shall be for period of 12 months from the date of Site acceptance by client / owner

Marking of cylinders

a) Every Gas cylinder shall be clearly and permanently marked in accordance with the following conditions by stamping, engraving or similar process.

a.1 on the shoulder of the cylinder which shall be enforced by forging or other means, or

a.2 on such a part which is inseparably bound with the cylinder, and which is not or only negligibly effected by the stresses due to the gas pressure within it.

b) The name plate shall not be affixed to the cylinder by soldering if there is risk of corrosion or embrittlement.

c) In conjunction with the original marking, space shall be provided for stamping the test date obtained at the periodic inspection.

d) Markings shall be as carried out and the letters and numerals used shall be such shape and size that the marking is clear and easily readable and does not give place for misreading.

e) All cylinders must be permanently stamped with the word CNG together with the following information:

e.1 Manufacturer's, owner's and inspector's marking and rotation number; (These markings shall be registered with the PESO.

e.2 Specifying that the cylinder has been manufactured for "CNG only"

e.3 A symbol to indicate the nature of heat treatment (such as normalizing, quenching, or tempering) given to the cylinder during manufacture.

e.4 The date of the last hydrostatic or hydrostatic stretch test, as the case may be, with the code mark of recognized testing station where the test was carried out. The code mark shall be registered with the PESO.

e.5 Working pressure and test pressure.

e.6 Tare weight

e.7 Water capacity.

f) All the markings, except the manufacturer's marking, which may be on the base, shall be stamped on the neck end of the cylinder.

Marking on valves

Valves fitted to the cylinder shall be clearly and durably marked in accordance with the following provisions by stamping, engraving or similar process:

i) Specification of the valves.

ii) Year and quarter of manufacture.

iii) Manufacturer's symbol.

iv) Working pressure.

v) The name or chemical symbol of the gas for which the valve is to be used.

vi) The type of screw threads on the outlet namely left-handed (L.H) or Right handed (R.H).

vii) Inspector's stamp.

Labeling of cylinders

- Every cylinder shall be labeled with the name "CNG ONLY" with letter of at least 25mm high in contrasting colour and the name and address of the Purchaser by whom the cylinder was filled with gas.
- A warning in the following terms shall be attached to every cylinder containing Compressed Natural Gas namely: -

  i) Do not change the color of the cylinder

  ii) This cylinder should not be filled with any gas other than CNG.

  iii) No flammable material should be stored in the immediate vicinity of this cylinder or in the same place in which it is kept.

  iv) No oil or similar lubricant should be used on the valves or other fittings of this cylinder.

  v) Please look for the next date of test, which is marked on a metal ring inserted between the valve and the neck of the cylinder, and if this date is over, do not accept the cylinder.

Pressure Relief Devices

- Each cylinder used for the storage of CNG should be equipped with a suitable pressure relieving device and a suitable isolating valve which should be readily accessible when installed in the storage bank. The isolating valve should not be capable of closing off the pressure relieving device, or should be locked in the open position.
- Relief devices should be positioned in such a way as to avoid discharge of high pressure gas to the operator or persons in close vicinity.

8.0 INSPECTION AND TESTING

- Vendor shall carryout cylinder bursting test of one cylinder from the entire batch produced for supply to CLIENT in case offered cylinders are of new design (conforming to the requirement of IS 7285:2004). Vendor shall inform the schedule of the test well in advance to enable Owner or their authorized representative to depute technical personnel for witnessing the test.
- Vendor shall carry out all standards shop test/QA/QC as per recommendation of manufacturer/Chief Controller of Explosives. Copies of the testing/inspection carried shall be furnished to CLIENT.
- Vendor shall furnish record of storage capacity check of each cylinder in a cascade and the same need to be demonstrated to Owner or their authorized representative.
- Each assembled storage cascade with all tubing, valves shall be pressure tested to ensure existence of no leakage prior to dispatch.
- Manifold of the cascade shall be tested to 250 – bar g. The manifold shall be checked for sequencing and no back flow between any two banks with all valves open.
- The bidder shall appoint Third Party Inspection Agency for carrying out the inspection at bidder's works as per approved QAP, approved drawings & tender documents and TPIA charges shall be borne by the bidder. Successful bidder will propose three names from the list and owner will approve the TPIA.

9.0 DOCUMENTATION

Following documents shall be submitted with the offer:

- Drawing of cylinder of specified parameters and proposed to be used in offered cascades, approved by Chief Controller of Explosives, PESO Nagpur and Government of India.
- Schematic of cascade piping.
- Bill of quantities with weight of each component.
- Make of bought out items.
- GA Drawing of the Cascade.

Following documents shall be submitted after release of order:

- Detailed quality control procedure/QAP, duly approved by PESO, Nagpur, for manufacture of cylinder, fabrication of frame etc within two weeks of release of order.
- Schematic of cascade piping, drawing of cascade frame and bill of quantities with weight of each component and make for Owner's review and approval.
- The supplied cylinders shall have the certification from PESO, Government of India. Nagpur for suitability of each cylinder for filling and storage of CNG upto 250 bar g at 15 degree C in India.
- Vendor shall furnish the material test certificates for all bought out items like cylinder raw material, tubing/piping, valves, check valves and fittings with the shipment.
- QA/QC report for manufacture of cylinder and testing with shipment.
- Two (2) sets of Comprehensive Maintenance manual. All test certificates and all others relevant documents per cascade in soft (PDF format) in CD/DVD & hard copy.

10.0 EXPERIENCE RECORD PERFORMA FOR CASCADE

Vendor must fill the following format, which is essential to access the bidder's capability.

S.No.	Parameter	Information on offered model	Information on existing cascade (Location)		
1	No. of units		1	2	3
2	Service				
3	Working pressure of cascade in bar g				
4	Site min/max temp.				
5	Normal flow from each bank kg/hr				
6	Cascade water capacity-liters				
7	Water capacity of single cylinder used in cascade - liter				
8	Material of cylinder				
9	Thickness of cylinder wall and disc end in mm				
10	Material of vent tubing				
11	Piping material and make				
12	Valve make				
13	Valve type and dia				
14	Nos. of banks in cascade				
15	Nos. of cylinder in low bank				
16	Nos. of cylinder in medium bank				
17	Nos. of cylinder in high bank				
18	Water capacity of cylinders in individual banks				
19	Contact person				
20	4 G static calculation for one complete assembled package				
21	Cylinder burst test for one cylinder				
22	Design standard (CODE) used				
23	Total weight of cascades in tones				
24	Burst pressure and temperature for burst disc in bar g and deg C				
25	Hydrostatic or Hydrostatic stretch test				
26	Pressure test for leakage				
27	Approval from PESO Nagpur				
28	Dimensions of package maximum				
29	Date of commissioning of cascade				
30	Where cascades are located: Address and fax/telephone no. of				
31	Major problems encountered, if any				

CASCADE DATA SHEET

S.No.	Parameter	Specification	Offered
1	Type of Service	CNG	
2	Capacity(Min. in water liter)	450 (-0%. +5%) **	
3	No. of Banks	3	
4	Cascade Dimensions	OISD-179	
5	Cascade frame structure is be able to withdraw 4 G four time of gravity) test from any direction without any distortion	Yes	
6	No. of Cylinders in each bank		
a.	Low Bank	*	
b.	Medium Bank	*	
c.	High Bank	*	
7	Cylinder		
a.	Cylinder make	PESO Approved	
b.	Compliance Code	IS 7285(Part2):2004	
c.	Cylinder Size at 15 degree C (in water liter)	Not exceed 125liters	
d.	Cylinder Operating Condition	250 bar g at 15 degree C	
e.	Cylinder Testing parameters	As per IS:7285:2004	
f.	Cylinder Material	Seamless alloy steel (Cr-Mo)	
g.	PESO approval	Yes	
h.	Gas quantity stored in the cylinder at 15 degree C		
8	Cylinder Shut-off Valve		
a.	Make	As per vendor list	
b.	Compliance Code	IS 3224:2002	
9	Combination Bursting Disc and Fusible Plug	To be provided	
a.	Burst Pressure (in bar g)	*	
b.	Fuse Melting Temperature (in degree C)	*	
10	Interconnecting Tube Size	Minimum ¾ " OD	
11	Pressure Drop for each bank		
a.	Low Bank	*	
b.	Medium Bank	*	
c.	High Bank	*	
12	Coefficient of Flow (Cv)		

Note:

1. All tubing fittings & other piping components shall conform to recommendations of ANSI B31.3" Process Piping".
2. (**) – For 400 SCMH Integrated compressor.
3. (*) – To be furnished by bidder.

- **MANDATORY SPARES FOR 450 WL CAPACITY CASCADES**

MANDATORY SPARES FOR 450 WL CAPACITY CASCADES.		
1	PRESSURE GAUGE RANGE -4" DIA- (0-400 KG/CM2)	4 NOS.
2	CYLINDER VALVE WITH END TUBE FITTING	4 NOS.
3	ISOLATION VALVE	4 NOS.
4	CHECK VALVE	4 NOS.
5	TUBE PIG TAIL	4 NOS.
6	BURST DISC WITH WASHER	8 NOS.
7	SPINDLE & HANDLES FOR CYLINDER VALVES	8 NOS.
8	SAFETY RELIEF DEVICE	4 NOS.

PRESSURE GAUGE -CNG CASCADE

UNITS: Flow<-> Liquid- m*3/hr Gas- Sm*3/hr Steam- kg/hr Pressure-> kg/cm*2 G Temperature<-> oC Level/Length<-> mm

1	Type:-	Direct	
2	Mounting:-	Local	
3	Dial Size:-	100 mm	
	Colour:-	White with black inscriptions	
4	Case Material:-	SS316	
5	Bezel Ring:-	Beyonet type SS316	
6	Window Material:-	Shatterproof glass	
7	Enclosure:-	WP to IP 65 as per IEC 60529 / IS 2147	
8	Pressure Element:-	Bourdon	
9	Element Material:-	SS316	
10	Socket Material	SS316	
11	Accuracy:-	+/-1% of FSD	
12	Zero adjustment:-	Micropointer	
13	Connection:-	* Note-1	
	Connection Location:-	Bottom	
14	Movement:-	SS316	

15	Diaphragm Seal:-	–
	Type:-	–
	Wetted Parts Material:-	–
	Others Material:-	–
	Process Connection: Size & Rating	–
	Facing & Finish:-	–
	Capillary Material:-	–
	Armour - Flexible Material:-	–
	Capillary Length:-	–
	Flushing/Filling connection with:-	–
16	Over Range Protection:-	130% of FSD
17	Blow Out Protection:-	Yes
18	Options :-	a) Snubber
	b) Syphon	c) Gauge Saver
	d) Liquid Filled casing	e) Vaccum Protection
	f) Solid front	
	g) Two valve manifold/block & bleed valve	
19	Make, Model & Quantity :-	*

SL. NO.	TAG NO.	RANGE kg/cm2g	PRESSURE kg/cm2g			TEMPERATURE °c			SERVICE	OPTIONS
			OP.	MAX.	DES.	MIN	MAX.	DES.		
	*	0-400	250	400	400				Natural Gas	d,f,g

NOTES:

'*' : Supplier to furnish

1 Vendor shall provide required size adapter in case of vary in process connection size

2 At the time of approval of DS, Supplier shall furnish DS with Catalogues.

☐ DEVIATION ☐ NO DEVIATION ☐ VENDOR'S SIGNATURE WITH SEAL

Datasheet No: P.015208 G 11087 I 005						
Sheet No. 1 of 1	**CLIENT:**					
	PROJECT: City Gas Distribution Project					
		0				
	VENDOR:	**REV.**	**DATE**	**PREP**	**CHKD**	**APPD**

Digitally signed by PRADEEP KUMAR YADAV
Date: 2025.08.08 18:47:38 IST

TEMPERATURE GAUGE - CNG CASCADE

UNITS: Flow<-> Liquid- m*3/hr Gas- Nm*3/hr Steam- kg/hr Pressure-> kg/cm*2 G Temperature<-> oC Level/Length<-> mm

1	Type:-	Liquid/Gas Filled	
2	Element	Skin/Surface contact type	
3	Mounting:-	Local	
4	Dial Size:-	100mm	
5	Colour:-	White with black inscription	
6	Case Material:-	SS316	
7	Window Material:-	Shatterproof glass	
8	Conn. Location:-	Bottom	
9	Accuracy:-	+/-1% of FSD	
10	Enclosure:-	WP to IP 65 as per IEC 60529/IS 13947	
11	Zero Adj. Screw:-	Required	
	BIMETAL:-		
12	Stem:		
	Type:-		
	Material:-		
	Size:-		
13	Stem Dia:-		
	Filled System:-		
14	SAMA Class:-	I	
	Compensation:-	Case	
15	Bulb Type:-	Adjustable union	
	Bulb Material:-	SS316	
16	Bulb Union Threaded To:-	*	
17	Extension Type:-	*	
18	Bulb Dia.:-	*	
19	Cappillary Material:-		
	Armour Flexible:-	*	
	Armour Material:-	*	
	Capillary Length:-	* 20	
	Over Range Protection:-		
	THERMOWELL:-		
21	Material:-		
22	Constn.:-		
23	Process Conn.:-	Surface contact type	
24	Gauge Conn.:-	*	
25	Thermowell Dwg.:-	*	
26	Over range protection	130%	

SL. NO.	TAG NO.	RANGE	TEMP.			WELL DIM.		FLANGE		LINE NO. / VESSEL NO. / PIPING CLASS	OPTIONS
			MIN	NOR	MAX	U	T	MATERIAL	RATING, FACING, FINISH		
	*	*				*	*	*	*		

NOTES:

*: Vendor to furnish

At the time of approval of DS, Supplier shall furnish DS with Catalogues.

☐ DEVIATION ☐ NO DEVIATION ☐ VENDOR'S SIGNATURES WITH SEAL

Datasheet No: P.015208 G 11087 I 007						
Sheet No.1 of 1	**CLIENT:**					
	PROJECT: City Gas Distribution Project					
		0	16.05.2023	AK	SS	AR
	VENDOR:	**REV.**	**DATE**	**PREP**	**CHKD**	**APPD**

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Date: 2025.08.08 18:47:38 IST

PRESSURE RELIEF VALVES -CNG CASCADE

UNITS: Flow<-> Liquid- m*3/hr Gas- Sm*3/hr Steam- kg/hr Pressure-> kg/cm*2 G Temperature<-> oC Level/Length<-> mm

General	1	Tag No.	Quantity	*	*
	2	Line No.	Schedule	*	*
	3	Vessel No.		*	
	4	Safety / Relief		Safety relief	
Valve	5	Full Nozzle Full Lift/Mod. Nozzle		Full nozzle full lift	
	6	Bonnet type		Closed	
	7	Conv./Bellows/Pilot Operated		*	
	8	Inlet Conn.	Size & Rating	*	
	9		Facing & Finish	*	
	10	Outlet Conn.	Size & Rating	*	
	11		Facing & Finish	*	
	12	Cap Over Adj. Bolt		Yes	
	13		Screwed / Bolted	Bolted	
	14	Lifting Gear - Type			
	15	Test Gag		Yes	
	16				
	17				
Material	18	Body and Bonnet		A351 CF8M / SS316 / A182	
	19	Nozzle and Disc		SS316	
	20	Spring		SS304	
	21	Bellows		--	
	22				
	23				
	24	Resilient Seat Seal		--	
Options	25				
	26				
Basis	27	Code		API 520	
	28				
	29				
Service conditions	30	Fluid	State	Natural Gas	Gas
	31	Corrosive Constituent			
	32	Required Flow Capacity			
	33	Mol.Wt.	S.G. at Rel. Temp		
	34	Oper. Pressure	Normal	Note 1	
	35	Oper. Temp.	Rel. Temp.	Note 1	
	36	Valve Discharges to		Atmosphere	
	37	Back Press.	Const. Or Variable	Constant	
	38	Set Pressure			
	39	Cold Bend Test Pressure			
	40	% Over Pressure	% Blow Down	*	
	41	Cp/Cv	Compressibility Factor		
	42	Viscosity @ Rel. Temp.	mPas(cP)		
	43	Vess. Wall Temp.	Surf.Area-m2		
	44	Max & Min Pressure		*	
Orifice	45	Calculated Area cm2		*	
	46	Sel. Area cm2	Orifice Design	*	*
	47	No. of Valves Reqd. for capacity		*	
	48	Total Area - cm2		*	
	49	Actual Flow Capacity		*	
	50				
	51	Model No.		*	
	52	IBR Certification		No	
	53				
	54				

NOTES:

'*' : Vendor to furnish

1 Process data shall be as per tender specification mentioned elsewhere.

2 At the time of approval, vendor shall submit the datasheet and catalogues of PRV

☐ DEVIATION ☐ NO DEVIATION ☐ CONTRACTOR'S SIGNATURE WITH SEAL

Data Sheet No P.015208 G 11087 I 008							
Sheet No. 1 of 1							
	CLIENT:						
	PROJECT:	City Gas Distribution Project					
	CONTRACTOR:		0	16.05.2023	AK	SS	AR
			REV.	**DATE**	**PREP**	**CHKD**	**APPD**

			QUALITY CONTROL TABLE - (TYPE -1 CASCADE) HIGH PRESSURE GAS CYLINDER , CASCADE FRAME & FITTINGS			QAP No.	:	P.015208 G 11013 M 017 Rev 0
						Date	:	28.05.2024
						Prepared by	:	P.P.S
						Checked by	:	SS
						Approved by	:	AR

S.NO.	OPEARTION / PARAMETER	CHARATERISTICS/ PARAMETERS	ACCEPTANCE CRITERIA & CERTIFICATION	INSPECTION FREQUENCY	VENDOR	TPIA	OWNER	REMARKS
1	Raw Material (seamless Tube)	Chemical Composition	Chrome Moly Steel,Grade-DS-202/IS:7285-2004 Cl. 5.2 Table-1	One sample per heat No.	P	R	R	Verification of RMT Certicate Received from RM supplier.
IN PROCESS								
2	Batch Test Certificate of Cylinder (Include as Hydraulic Pressure test , cylinder burst test , Air Leak test report, Neck Thread Report , Cylinder Tare WT with Valve, Cylinder Marking, UT Report and Heat Treatment Report, Painting, Marking, Color coding)	Test Report	As per approved drawing & IS-7285 : 2004	As per tender / Owner's Instruction	P	R	R	
3	SS Tubes	Physical test Chemical Test Visual (Welding etc) Dimensional Fitment & Alingment	Approved Drawing, Manufacture Test Certificate for bought out items.	As per tender / Owner's Instruction	P	R	R	
4	Fittings	Visual Dimensional Pressure Test Fitment & Alingment	Approved Drwaing/ Manufactures Standard.	As per tender / Owner's Instruction	P	R	R	
5	Valves 2 Way, QRC	Visual Dimensional Fitment & Alingment	Approved Drawing, Manufacture Test Certificate for bought out items.	As per tender / Owner's Instruction	P	R	R	
6	CNG Cascade Assembly	Visual (Welding etc) Dimensional Fitment & Alingment	Approved Drwaing/ Manufacture Std.	Owner's specification/ Instruction	P	W	R	
7	SS Tubes for venting of Burst Disc seperator	Visual (Welding etc) Dimensional Pressure Test Leakage Test Fitment & Alingment	Approved Drwaing/ Manufacture Std.	Owner's specification/ Instruction	P	R	R	
8	Cylinders	Visual	1. Cylinder certification by accredited TPI & N.O.C for cyl. From CCOE, Nagpur 2. Verification of NOC for cylinder Issued by CCOE Nagpur during time of inspection	1. Cylinder certification by accredited TPI & N.O.C for cyl. From CCOE, Nagpur 2. Verification of NOC for cylinder Issued by CCOE Nagpur during time of inspection	P	R	R	
9	Cylinder Valves	Visual Dimensional Fitment & Alingment	As per Approved CCOE Drawing, Bill of Material.	Owner's specification/ Instruction	P	R	R	
10	Gauge (PG, TG)	Visual Dimensional Fitment & Alingment	Approved Drawing, Bill of Material.	Owner's specification/ Instruction	P	R	R	
11	Permanenet sticker of CNG ONLY with letter at leat 25 mm high shall be provided on neck and bottom of the cylinder and warning sticker shall also be provided as per enclosed sketch	Visual	Visual inspection of CNG ONLY sticker having atleast 25mm provided on neck and bottom of the cylinder and warning sticker on every body	Visual inspection of CNG ONLY sticker having atleast 25mm provided on neck and bottom of the cylinder and warning sticker on every body	P	W	R	

	QUALITY CONTROL TABLE - (TYPE -1 CASCADE) **HIGH PRESSURE GAS CYLINDER , CASCADE FRAME & FITTINGS**	**QAP No.**	:	P.015208 G 11013 M 017 Rev 0
		Date	:	28.05.2024
		Prepared by	:	P.P.S
		Checked by	:	SS
		Approved by	:	AR

S.NO.	OPEARTION / PARAMETER	CHARATERISTICS/ PARAMETERS	ACCEPTANCE CRITERIA & CERTIFICATION	INSPECTION FREQUENCY	VENDOR	TPIA	OWNER	REMARKS
12	Leakage test of manifold assembly at 255 kgf/cm2 with high pressure air	Lekage Test	Hold for five min. and check all joints for leakage by soap solution and there shall not be any sign of pressure drop.	Hold for five min. and check all joints for leakage by soap solution and there shall not be any sign of pressure drop.	P	W	R	
13	Leakage test of vent manifold assembly at 5bar	Lekage Test	Pressurize to 5 bar and check for any leakage for soap solution	Pressurize to 5 bar and check for any leakage for soap solution	P	W	R	
14	Sequencing & No Back Flow check in Stationary cascade only	High Bank, Medium Bank, Low Bank	Sequencing and No Back flow between any two banks with all valve open condition.	After testing check the manifold for sequencing and there must not be back flow from medium bank to low bank and/or high bank to medium bank	P	W	R	
15	**Final Inspection of Finished Cylinders:** Visual inspection for internal cleaning and painting of Cylinder and Cascade frame. Final dimensional checking of cylinders & cascade frame. Check every cylinder for neck threads & cleaning from inside/ outside surface. Verification of stamped data like Cylinder Serial No., Tare Weight, Water Capacity etc.Verification of SS tube,valve and fittings.Paint DFT of Cylinder and cylinderframe Height of vent Pipe Min 3 meter		IS:7285-2004	Each Cylinder	P	W	R	
16	Nitrogen Purging in Cascade		At Min. 1 Bar Pressure	Each Cascade	P	W	R	
17	Spares and packing List As Per Tender		Visual	Visual	P	W	R	

LEGEND : W= WITNESS; H= HOLD; M= MONITORING; P= PERFORM; R= REVIEWS OF DOCUMENTS; R/M= RANDOM CHECH; A= APPROVED; TPIA= THIRD PARTY INSPECTION AGENCY

Notes	
1	The Above Testing and acceptance critera are minimum requirements, however, manufacturer shall ensure that the product shall also comply to the additional requirements as per Particular Technical specifications(PTS) and Data Sheet.
2	The supplier shall submit their own detailed QAP prepared on the basis of above / Technical specification or codes and standard for approval of Owner/Owner's representative.
3	Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relavant procedures and updated standards for TPIA reveiew/Approval.All reference codes / documents shall be arranged by Vendor for reference of TPIA at the time of inspection.
4	Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
5	TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.
6	Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organise Inspection.
7	Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.
8	All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA/Owner at the time of Inspection
9	Vendor shall carryout 4G static calculation of one complete assembled cascade with all the cylinders
10	The design, construction & testing of cylinder shall be as per IS 7285 - 2004 and approved byPetroleum and Explosive Safety Organization (PESO),Cylinder neck threading shall be as per IS 3224- 2002 or as per design approved by PESO, Government of India
11	Cylinder and cylinder valve ,all the fittings shall be as per approved tender vendor list
12	Certification requirement shall comply with European standard EN 10204 - 3.2 (latest edition).

PTS - CNG AUTO/CAR DISPENSER

0	15.11.2024	Issued for Procurement	Akshay Kandari	Saurabh Sharma	Antik Roy
Rev.	**Date**	**Description**	**Prepared By**	**Checked By**	**Approved By**

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SECTION: A

GENERAL SPECIFICATION

1.0 SCOPE

1.1. The intent of this technical specification is to outline minimum requirement for Design, Engineering, Manufacturing, Assembly, Inspection & Testing at Works, Packaging & forwarding, Custom clearances, Supply Transportation, unloading to Sites/Stores, Installation & Commissioning and Performance Testing at Vendor's works and Sites of CNG Car / Auto Dispenser along with comprehensive AMC for **4 (Four) years after warranty period of 01 year** including supply of all spares & consumables complete with all auxiliaries & Compatibility/capable for communicating with any third party devices, required for efficient & safe operation, in accordance with this specification, data sheets & other enclosures of this Material Requisition.

1.2. The Car / Auto Dispenser shall be complete including any/ all required auxiliary equipment/ systems for efficient & safe operation as a whole. Vendor shall be responsible for furnishing all electrical/ electronics, instrumentation, interconnecting piping & safety Items as required to make the Dispensers complete. Dispenser shall be supplied along with base frame with wire mesh (to prevent rodents) , installation of same shall ensure by the vendor.

1.3. It is not the intent of Purchaser to specify every piece of equipment/item but nevertheless any item not specifically mentioned but required as per Good Engineering Practice and for the safe & trouble free operation of the dispensers deemed to have been specified & shall be in the scope of Vendor without any implication in the price or schedule.

1.4. Dispenser's SOP and Dos & Don'ts should be pre-installed/pasted on equipment (Dispenser) body with waterproof coating along with BGL logo.

2.0 INSTRUCTIONS TO VENDOR

2.1. M/s BGL is planning for development of CGD Network at various locations in GAs allotted by PNGRB. The dispensers shall be installed at various refuelling outlets of OWNER and other Oil Marketing Company (OMC) retail outlets located in allotted GA for dispensing CNG to all types of Natural Gas Vehicles.

2.2. The specification states the scope of supply and services as completely and clearly as possible. Any additional work/equipment or technical requirement not mentioned in the specification but required to make the offered system complete in accordance with the specification or required for safe operation shall be deemed to be included in the scope of vendor.

2.3. Vendor may contact and obtain OWNER clarifications, if required, till 48 hours before due date.

2.4. The offered dispenser unit' model shall have certification for specified flow and accuracy from the Weights & Measurement Department of the country of origin. In case it is not available for dispenser unit then offered mass flow meter model shall have certification for specified flow and accuracy from the Weights & Measurement Department of the country of origin. The certificate(s) shall be in English language or in the language of originating country along with English translation. Vendor to arrange for Weights and Measures approval from Indian Authorities. The dispenser model has to be type approved by the Indian Weights & Measurement Department. the vendor shall have to give the approval as on bid due date.

2.5. The offered dispensers for dispensing CNG shall be type approved by the Petroleum & Explosive safety organisation, Govt. of India as per latest Gas Cylinder Rules. If the vendor is yet to get the dispenser model type approved, the vendor shall have to give the model type approved as on bid due date.

2.6. The Vendor shall carry out modification required by the statutory bodies either during the approval or during inspection of the installation. All expenses shall be done and borne by the vendor. Unless the above formalities are cleared, supply part would be deemed incomplete.

2.7. The Vendor shall provide civil foundation/ dispenser frame drawings within two weeks of placement of order.

2.8. Any work, which is considered to be unsatisfactory and of poor workmanship shall be rectified by the vendor without any extra cost and time implications.

2.9. The approval from concerned Govt. Bodies in respect of complete installation of a CNG Dispensing Station shall be obtained by the OWNER. Necessary Information/Data as may be required by Govt. Bodies shall be furnished by vendor to facilitate OWNER in obtaining approval.

3.0 SCOPE OF SUPPLY & SERVICES FOR CAR / AUTO DISPENSER

3.1 Supply of double arm type having flow capacity of max. 15 kg/min for a single arm under discharge to atmospheric condition. Each Car / Auto Dispenser shall have following as a minimum: -

3.1.1. Two CNG flexible electrically conductive twin (fill & vent) hose, with both hoses fitted with NGV-I for filling of vehicles. However, both the NGV nozzles should be suitable to attached with NZS-5425 nozzles and shall be along with NGV-I to NZS-5425 adapter nozzles and receptacles. Vendor shall include the supply of 3-way valve with each hose for filling & venting of gas. Vendor shall also include supply of Breakaway Coupling, suitable for NGV Industry, in the hose. Hose shall be 3/8" ID 5000 psig, Vendor shall demonstrate the function of breakaway coupling during performance test. The dispensers shall be designed in such a way that at free movement of hoses is possible, by spring loaded high mast or appropriate arrangement Supply of NGV-I to NZS-5425 adapter nozzles (Size 15 – 20cm).

3.1.2. Two numbers of Coriolis mass flow metering system with local indicator/display (for flow reading).

3.1.3. Three rows of liquid crystal backlit display for night viewing showing total sale in Rupees (0000.00), quantity of gas sold in kg (0000.00), unit price of CNG in Rs./kg (000.00) for each hose on either side of the dispenser (total two sets of three rows for each Dispenser, one display for each side). The dispenser's electronic unit shall have IP - 55 protection. The display should be with back cover to make the display free from dust and display cabinet shall have IP 54 protection.

3.1.4. Non-resettable and non-volatile totalizer up to 99999.99 for total CNG sold in Kg with an independent battery backup. For further details refer Section B: Instrumentation & Control specification.

3.1.5. One number electronic software and one no. controller including hardware for each dispenser for three bank filling at both side.

3.1.6. Two numbers of holster/ cradle for fill nozzles along with weather caps for the protection of nozzles. Holster/ cradle shall be suitable for both NZS and NGV nozzles. Holster/cradle shall be provided for NGV nozzle and shall be compatible to be attached with NZS-5425 nozzles.

3.1.7. Two number of Hi-mast or appropriate arrangement with flexible hose arrangement so that the hose doesn't touch the ground

3.1.8. Emergency stop switch is required. However, the both side should be stopped during activation of emergency switch, the power supply to the dispenser should be available.

3.1.9. One no. of liquid filled 4" dia. (0-400 Kg/cm2g) pressure gauges showing the vehicle filling pressure

for each filling arm.

3.1.10. Two Nos. bubble tight manual shut-off valve for fill hose.

3.1.11. One Stainless Steel body of cabinet thickness 1.6 mm with door/panel.

3.1.12. Vendor has to supply the dispensers preferably with solenoid operated or Air actuated valve made of ANSI 316 SS, for ON-OFF control of flow, on the gas inlet with 1/2" tube OD end connection. Valves shall be provided for each bank per hose separately. Vendor to ensure the system design in such a way that any gas if passes, should be recorded by dispenser and added to the mass inventory total (Both Electronics & Mechanical Totalizer). There should not be any possibility of unmetered gas supply through dispenser in case of malfunctioning of solenoid valves or Air actuated

3.1.13. The gas tubing inside the dispensers shall be seamless SS 316 fully annealed (Bright Annealed) conforming to ASTM A 269 with maximum hardness of RB 80 or less and suitable for bending and flaring. The tubes shall be fully annealed (bright annealed), 1/2" OD with a 1/2" SS 2-way Ball valve at inlet and 1/2" OD end connection suitable for connecting with 1/2" OD SS Tube. Any open ends on fittings and vents shall be provided with caps/ dust plugs.

3.1.14. Coalescent and particulate filter of Grade 6 or better to be provided at inlet of each bank supply line with manual drain valve to ensure that the oil carryover in the CNG being filled to vehicle is < 1 ppm and particulate size is < 0.5 Micron. Filter housing for said filter must be capable for collection of oil for a drain interval of 24 hrs with oil carryover < 1 ppm. Filter elements made of paper shall not be accepted. Vendor to provide appropriate drain valve outside the dispenser housing with suitable arrangement to collect the drained oil. Filter size shall be in accordance with max flow through the dispenser. Filtration efficiency shall not be less than 95%. Bidder shall provide liquid filled DP (Differential Pressure) Gauge across all the filters for observing the pressure drop in filter.

The CNG specification should meet the ISO 15403:2000 (E) or IS: 15958 natural gas quality designation for use as a compressed fuel for vehicles.

3.1.15. Vendor shall ensure that the system shall be designed in such a way that any gas if passes, should be recorded by mass flow meter and there should not be any possibility of unmetered gas supply through dispenser in case of malfunctioning of solenoid or air actuated valves. Any unmetered gas passing shall be recorded in the dispenser and added to the mass inventory totaliser (both electronics & mechanical Totalizer) which should be retrievable as and when required. Vendor shall also provide Protection device (Separate or inbuilt) for Power surge of approved make at 230 V AC in panel room to protect the dispenser from any electrical surge/spike.

3.1.16. Any other item required for safe and accurate operation of Dispenser.

3.1.17. Any spare(s) required during commissioning shall be in the scope of vendor.

3.1.18. Supply of complete O&M manual (along with instruments datasheet & schedule, bill of materials, instrument hook-up diagram, electrical wiring diagram, control logic algorithm & flowchart and certificates & user guide of bought out items) for each dispenser for easy operation & trouble shooting.

3.1.19. Supply the application program, ladder logic, and supply of manual for list of error codes with description for programming the dispenser parameter used in Dispenser Electronics

3.1.20. If dedicated programming unit is required for programming/ parameter change. The same shall be submitted in "Pendrive" along with supply of dispenser also hard copy of the same also be submitted.

3.1.21. Instrumentation & Electrical items specified in section B & C of the Job Specification. All electrical

equipment shall be supplied with approved cable glands tested & certified to be used in hazardous area classified as Zone-I.

3.1.22. On-Site Training to OWNER personnel (Three days each for three separate groups).

3.1.23. Training to OWNER personnel at vendors shop (10 personnel for three working days). The travelling, boarding & lodging of OWNER's Engineers shall be borne by OWNER. The training module shall cover the equipment construction features, operational & maintenance procedures, practical hands on experience on assembling, dismantling etc.

3.1.24. Vendor shall make a provision to change the price of CNG through the keypad or Switch (inside the dispenser unit or on the display panel of the dispenser unit) that shall be covered with security lock or sealed Switch respectively. It shall also be possible to change the price from remote station (from SCADA/ from any part of the world). RS 485 port shall also be provided for price change. In case standard RS485 port is not available in the dispenser, then RS232 to RS485 convertor with all relevant hardware and software to be provided by vendor.

3.1.25. RS 485 port shall be provided for downloading CNG sale data with the help of Purchaser's Personal Computer for each shift (8 hours interval). In case standard RS485 port is not available in the dispenser, then RS232 to RS485 convertor with all relevant hardware and software to be provided by vendor. Suitable Software shall be provided to obtain the same for each shift (8 hours interval).

3.1.26. Vendor shall provide a common processor and open communication protocol/ RS 485 port for RTU to transfer all the dispenser data to central SCADA system. In case standard RS485 port is not available in the dispenser, then RS232 to RS485 converter with all relevant hardware and software to be provided by vendor

3.1.27. Vendor must note that non-standard/ propriety type communication protocol in dispenser for communication with RTU is not acceptable. Protocol must be standard as specified above or any standard protocol with compatible convertor shall be made available and must be compatible to any make of RTU. RTU will have Serial communication port RS 485 protocol to interface with dispenser. Vendor is responsible to provide the communication port compatibility with RTU. Vendor is required to carry the communication port functional test and display all the values in Laptop or in applicable device during dispenser inspection (FAT) at vendor premises. Also, functional test shall be carried out by vendor after installation and looping is junction box at site. Vendor shall also share the dispenser protocol/RS485 details with OWNER during FAT at vendors works and submit relevant documents in desired format (both hardware/ software). RTU & SCADA supply is not in vendor's scope.

3.1.28. Contractor must furnish/ share the details of implemented MODBUS/RS485 protocol like function codes for read and write, slave ID, lisx`t of signals to be transferred, CRC implementation, register addressing methods / mapping etc. with M/s OWNER and provide their assistance during interfacing with RTU to automation vendor. Vendor must provide looping details and number of dispensers connected in one loop.

3.1.29. 01 no. of Junction Box per two number of dispenser is required be supplied under the contract. Quantity may vary depending upon actual nos. of CNG stations. Dispenser vendor shall loop (multidrop) all the dispensers in common junction box in the safe area. Supply of Communication Cables, cable glands, termination of cable and cable laying from dispenser to junction box is in dispenser Vendor's scope. Supply of standard make, WP IP 42 junction boxes, terminal blocks and installation of junction box shall be is in dispenser Vendor's scope. Junction box shall have 8 inputs cables entry points (side) and two outgoing entry points including spare (bottom), cable entry from top is not accepted, size of junction box to be decided by vendor. All the spare entry shall be plugged properly. Vendor shall be responsible to provide all the signals at the junction box which will be connected to RTU. During installation & commissioning of dispenser same will be checked by

OWNER's Engineer.

3.1.30. Communication cable is single pair (1Px 1.5mm2), multi strand, armoured cable with HR PVC insulation and PVC st2 inner and outer sheath. Tentative cable length from each dispenser to junction box is approx. 50 meters, however vendor shall provide cable length as per requirement.

3.1.31. Vendor must share junction box termination details with OWNER. Vendor shall Loop all the dispensers in junction box and looping shall be ring type or re-loop so that in case of communication break or physical loop break then only faulty dispenser should isolate, all others dispensers remain connected and continue to report.

3.1.32. The meter factor adjustment Port or Switch shall be without any additional functionalities and parameter controls as applicable. Same shall be sealed & tamper proof.

3.1.33. If any incident/problem occurs during the warranty period and comprehensive AMC period which needs breaking of W&M seal, W&M charges for re-stamping will be recovered from AMC charges.

3.1.34. The dispenser electronics software should be capable to print all alphanumeric refuelling data (as stated below) of each fill point of the dispenser as a receipt for the respective vehicle through the point of sale (POS) Computer / printer and shall generate the cash receipt for each refuelling operation. The Communication port for the interconnection of dispenser to POS shall be available in the dispenser and shall be intrinsically safe. Following information required on the receipt for each refuelling:

- Vehicle Identification Number.
- Quantities of gas dispensed in kg (4 digits in 2 decimal points i.e., 00.00).
- Unit cost of gas dispensed in Rupees, Rs/kg (4 digits in 2 decimal points i.e., 00.00).
- Complete transaction value in Rs (6 digits in 2 decimal points i.e., 0000.00).

3.2 Vendor must submit the following documents within 2 weeks of placement of LOI/ PO for review and approval of OWNER:

a) Detailed project schedule giving all activities such as Design and review, Major bought out items (such as Mass flow meter, electronics, Valves, Hoses etc.), Sub-assemblies, Stage inspection, Final Assembly, Final factory testing of dispensers, Final inspection, dispatch etc.

b) Process and instruments diagram (P&ID) of gas flow giving Bill of Material. The Bill of Material shall clearly indicate all items, quantity of all items installed per dispenser, make and part number etc.

c) Certification from Weights and Measures department, PESO Department or other statutory authorities of the country of origin for offered model dispenser for specified flow and accuracy.

4.0 DESIGN & ENGINEERING FOR DISPENSER

4.1. Design & Engineering

4.2. Manufacturing & Assembling

4.3. Procurement from Sub-vendors.

4.4. Inspection & Testing at Works.

4.5. Documentation and obtaining statutory approvals from the country of origin.

4.6. Packing, Forwarding and Transportation up to Job Sites/OWNER's stores.

4.7. Testing and commissioning, after site installation, of each Dispenser, individually.

4.8. Submit for obtaining type approval for the offered dispensers from Petroleum & Explosive Safety Organisation, Govt. of India as per the provisions of Gas Cylinder Rules, 2016.

4.9. Bidder shall have to arrange a 1-phase UPS with min.1 hr backup for operation of the electronics in the CCDU package.

4.10. Bidder has to arrange all civil foundation & trenches for tubes drawings.

5.0 Deleted

6.0 EXPERIENCE RECORD SCHEDULE FOR DISPENSERS

Sr. No.	Parameter	Information on offered Model	Information on existing dispenser									
			1	2	3	4	5	6	7	8	9	10
1.	Number of Units											
2.	Fluid handled	CNG										
3.	Gas molecular weight range											
4.	Site min/max temp.											
5.	Dispenser rated flow											
6.	Dispenser overall Cv											
7.	Dispenser batch accuracy %											
8.	Dispenser with temperature Compensation	Yes										
9.	Number of Hoses	Twin										
10.	Mass flow meter make/model.											
11.	Where dispenser is located: Address and fax/telephone number of contact person.											
12.	Any other information on Installation											

13.	Date of commissioning of Dispenser											
14.	Number of hours completed as on bid due date.											
15.	Major problems encountered, if any											

7.0 DESIGN BASIS FOR DISPENSER

7.1 Area Classification

For details refer Electrical Specification at section-C attached with this Specification.

7.2 Codes and Standards

Following Codes and Standards are referenced to and made part of this Material Requisition.

NFPA52	Standards for CNG Vehicular Fuel Systems
NGV 4.1/AG.A 2-92	Requirements for CNG Dispensing Equipment for Vehicles
NGV 4.2/AG.A 1-93	Requirements for Hoses for NGVs and Fuel Dispensers.
ANSI/NGV1	Compressed Natural Gas Fueling Connection Devices Standard for fueling nozzles and receptacles.
NGV 4/AG.A	Requirements for Breakaway Devices for CNG Vehicle Fuel Dispensers and Fueling Hoses
AG.A 2-90	Compressed Natural Gas Fueling Appliances.
AG 901	Code of practice for NGV refueling stations.
IS 5572	Classification of hazardous areas (other than mines) for electrical installations.
IS 5571	Guide for selection of electrical equipment for hazardous area.
OISD 113	Classification of areas for electrical installations at hydrocarbon processing and handling facilities.
OISD 179	Safety requirements of compression, storage, handling and refueling of CNG for use in Automotive sector.
OIML TC8/SC7	Recommendation with regards to CNG dispensers, December 2000.
	The Standards of Weights and Measures Act 1976.
	The Standards of Weights and Measures (Enforcement) Act, 1985.
	The Consumer Protection Act, 1986.

	The Standards of Weights and Measures (General), Amendment Rules, 2005 – Part X (Compressed Gaseous Fuel (CNG) Measuring Systems for Vehicles

Any other Codes & Standards mentioned elsewhere in this Specification/MR. or which are required to be complied with as per the prevailing Government of India regulations shall also be followed.

7.3 Precedence

In case of any conflict between Job Specification & other documents, the following order of precedence shall apply:

- Data sheets.
- Particular technical Specifications (PTS)
- Indian Standards/Codes as applicable, International Standards/Codes as applicable.

7.4 Gas Compositions to Be Handled by Dispensers:

GAS COMPOSITION

	Normal Gas Composition	Design Gas Composition
C1	82.43 – 99.10	89.45
C2	7.27 – 0.90	4.58
C3	3.47 – 0.00	0.83
I C4	0.65 – 0.00	0.07
N C4	0.78 – 0.00	0.06
I C5	0.17 – 0.00	0.09
N C5	0.13 – 0.00	0.28
C6	0.10 – 0.00	0.17
C7	0.00 – 0.00	0.00
CO2	4.93 – 0.00	4.38
N2	0.06 – 0.00	0.10
H2O	0.01 – 0.00	0.00
Total	100	100
Average C.V. (kcal/SCM)	8950 – 8150	8302.3

Apart from Gas composition, the proposed specification of the CNG is as follows:

Gas Temperature : -10ºC to +70ºC

Oil Content : 10 PPM

Particulate matter : Less than 5 microns

Odorant : <10 mg/sm3 (Ethyl Mercaptan).

The CNG specification should meet the ISO 15403:2000 (E)/ IS: 15958 natural gas quality designation for use as a compressed fuel for vehicles.

7.5 Safety

7.5.1 All Electrical devices shall meet the requirement for the area classification specified elsewhere in tender document.

7.5.2 Tubing & other devices shall be so arranged that there is proper access for operation & maintenance.

7.6 Location

All the Dispensers shall be suitable for Outdoor installation without roof/shed.

8.0 TECHNICAL SPECIFICATIONS FOR CAR / AUTO DISPENSERS

8.1. The specifications described herewith are intended to give vendor the technical & operating conditions the Dispenser must fulfil. These are to be referred along with relevant description including in earlier sections. Vendor may indicate in his bid, the additional features, which his dispenser has in terms of better design, enhance reliability etc., however such feature may be accepted subject to OWNER's review and approval.

8.2. The specifications of FLOW METER are described under Instrumentation & Control Specification Section- B attached with this Specification.

8.3. The Car / Auto dispensers shall be designed to handle flow rate of ≥ 15 kg/min, under discharge to atmospheric condition. The dispensers shall be suitable for a turn down of not less than 50:1 on flow.

8.4. Dispensers shall be based on three banks sequential filling. The sequential panel shall be within the cabinet of the dispenser itself and not as a separate unit. Sequencing should be on flow rate and pressure

8.5. The normal operating pressure of CNG at dispenser inlet shall be 250Kg/cm^2 (g). However, supply from dispenser to the Car shall get positively cut off at outlet pressure of 200 Kg/ cm^2 (g) to ensure the safety of the vehicle.

8.6. Once the particular cycle of filling has been completely stopped (on achieving the maximum fill pressure and/or minimum flow rate) then next filling can be started only after initialization

8.7. The normal operating temperature of wetted parts of dispenser shall be (-) 10 °C to 55°C.

8.8. The design of 3 bank system should be such that, the gas from all the 3 banks flow should be through the low bank

8.9. Necessary NRV's should be provided to prevent reverse flow of gas.

8.10. The holes in doors for installing wire seals should be provided. The location of the holes will be finalized during the inspection of the first lot of the dispensers at vendor's works.

8.11. The Dispenser shall automatically and immediately shut-off CNG supply to fill hose individually (with

error codes for diagnose) in case of:

- Power failure or excursion beyond permissible limit.
- Loss of display
- Power failure of mass meter (Provided with Single Error code for Power failure in Mass meter).
- Failure for metering
- Reading creeping problem
- Flow beyond high and low limits
- Failure of totalizer
- Overfill by quantity and/or pressure
- Failure of pressure sensing transmitter
- Malfunctioning / Passing of electro valve
- Repeated operation of reset or start/ stop switch as per OWNER customization.
- Removal or break of any electrical wire, communication wire connected to controller and other electronics cards.
- Removal of any electrical wire connected to controller.
- Program step is in hold due to any error.

8.12. Cabinet

8.12.1. Complete cabinet (except base frame) shall be of Stainless Steel (SS-304) Cabinet wall thickness shall not be less than 1.6 mm. Cabinet shall be sized to accommodate all electrical, electronic and mechanical components for metering and display within the cabinet. Cabinet shall be designed to protect all tubing, pressure gauges, valves, fittings, electrical & electronics item from tampering, rain, dust, vermin etc. Dispenser cabinet shall be provided with adequate size bottom opening for the entry of gas supplyline/lines and power supply connections. Adequate ventilation shall be provided so that there is natural convection current and cooling takes place inside. Cabinet shall be structurally robust and should not resonate at the frequencies emanated during normal flow or during choked flow through the nozzles, breakaway coupling or valves etc. Dispenser shall be supplied along with Base frame with wire mesh (to prevent rodents) ,installation of the same to be ensure by the vendor.

8.12.2. Appropriate drain valves of the filter outside the dispenser housing with suitable arrangement to collect the drained oil to facilitate the operator to drain the oil on regular basis without requiring to open the lock of the dispenser cabinet. The layout of tubing and other component should be such that it gives unhindered access to all parts and maintenance becomes easy.

8.12.3. OWNER's Logo and name to be displayed on both sides of dispensers, in **OWNER approved colour scheme**. OWNER's Logo and name shall be painted on stainless steel panel with an appropriate coloured background or alternatively, vendor shall provide self-adhesive PE film sheet with OWNER's approved design. Logo Design can be approved at the time of detailed engineering.

8.12.4. The dispensers shall be shipped in fully wired and assembled condition. Only gas and power supply connection shall be made at Site.

8.13. Spring Type Hi-Mast or equivalent arrangement shall be of appropriate height and shall allow free movement of flexible hose, prevent strain on the fill hose connection and avoid touching of

ground.

8.14. Fill Hose & Fill Nozzle

8.15. Two CNG flexible electrically conductive twin (fill & vent) hose shall be included for supply of Dispensers meeting the requirement of NFPA-52 and NGV 4.2.

8.16. Both fill hose shall be fitted with NGV-I for filling of vehicles. The nozzle shall meet the requirements of NGV-1 Type-2, Class B nozzle (As per specification & make provided in tender doc). Vendor shall include the supply of 3-way valve with each hose for Filling & venting of gas. Vendor shall also include supply of Breakaway Coupling, suitable for NGV Industry, in the hose (As per specification & make provided in tender doc). Hose shall be 3/8" ID 5000 psig,. Vendor shall demonstrate the function of breakaway coupling during performance test.

8.17. Designing of the dispensers would take into account severity of service. The dispensers shall be designed in such a way as to operate in cyclic (start, fill, stop, start.) round the clock basis with about 1-minute (typical) interval between stop and start modes. The dispenser also to work satisfactorily when the time between stop and start is indefinitely high, e.g. during lull time or when the dispenser is commissioned after it was decommissioned for prolonged period or in storage after initial commissioning. For this purpose, if any specific storage facility is required, the same to be indicated by the bidder

8.18. Dispensers should be ergonomically designed.

8.19. All gas flow from dispenser, flow meter under normal filling conditions must be recorded in electronic totalizer and mechanical (user non-resettable) totalizer

8.20. Any un-intentional flow of gas from dispenser, flow meter (without filling initialisation by user) must be recorded in electronic totalizer and mechanical (user non-resettable) totalizer

8.21. The communicating port/switch for adjusting flow meter mass/meter factor should not have any other functionalities and parameter controls.

8.22. W&M charges before commercial sales & annual stamping charges to be paid by owner. However necessary liasoning & coordination shall be in vendor's scope. If any other incident/problem occurs during the annual comprehensive maintenance contract period which needs breaking of W&M seal, then Vendor will pay W&M charges and coordinate with W&M department for stamping.

8.23. All totalizer readings, batch filled reading, transaction details, which are accessible in motherboard should also be accessible in open system architecture/protocol (OPC)/RS 485 for remote monitoring and data acquisition.

9.0 DATA SHEETS

Vendor shall fill up data the as per enclosed Data Sheet, attached with this job specification and submit along with bid.

10.0 CLIMATIC CONDITIONS

10.1.	Wind Velocity	:	160.0 Km/Hr
10.2.	Minimum ambient temperature	:	1.0 ºC
10.3.	Maximum ambient temperature	:	49 ºC
10.4.	Maximum relative humidity	:	98% non-condensing
10.5.	Maximum shed temperature	:	47.5 ºC

All the Dispensers shall be suitable for outdoor installation without roof / shed.

11.0 UTILITY SPECIFICATION

11.1. Electric Power Supply

Single phase, AC, 230 Volts ± 1%, 50Hz ± 1% UPS is also to be provided by bidder. Surge protector device (Separate or inbuilt) is to be provided by the vendor at the 230VAC inlet. All instrument (such as mass meter, solenoid, pressure transmitter/ switch etc.) power supply shall be as per approved OEM design. Suitable voltage conditioning unit shall be in the scope of vendor wherever required.

Note:

1. Vendor to confirm that supplied dispensers are suitable with the above power supply and indicates the maximum and minimum tolerable values of voltage for accurate metering and safe operation of dispenser.
2. Vendor to include suitable voltage conditioning unit in their scope, if required.

For further details refer Electrical Specification, Section-C, attached with this job specification.

12.0 INSPECTION AND TESTING

12.1 At Vendor's Works

All the dispensers shall be subjected to Inspection ("Stage wise" if required by OWNER) by OWNER's or their Authorised Representative

12.1.1. The following activities shall be covered under inspection:

- Review of Q.A. documents.
  - Review of calibration certificates for flow meter, dispenser, pressure transmitters, pressure gauges and all instruments.
  - Review of all statutory certificates including W &M, type approval from PESO, Govt. of India.
- Review of area classification compatibility of all items including bought out items.
- Review of Mill Test reports.
- Review of NDT reports.
- Review of bought out sub-assemblies/major components, test/inspection certificates.
- Dimensional checks as per approved drawings and data sheets.
- Safety shutdown of dispensers.
- Immediate cut off of dispensers due to abnormalities.

12.1.2. Functional Test

All the dispensers shall be tested to demonstrate the functioning of all the components and controls.

12.1.3. Performance Acceptance

All the dispensers shall be performance tested for flow capacity, measuring accuracy and dispenser functioning with CNG/Nitrogen/Compressed Air. CNG/Nitrogen/Compressed Air shall be arranged by vendor.

12.1.3.1. During the shop test of dispenser, in case the dispenser flow capacity from inlet of dispenser to the outlet of filling nozzle is found below the specified capacity the dispenser shall stand rejected.

12.1.3.2. During the shop testing if the dispenser batch accuracy is found beyond ± 1.5% dispenser shall stand rejected.

12.2 AT OWNER SITES

All the dispensers shall be tested by vendor for their function & performance in presence of OWNER authorised representative. Any part or components, which are not functioning to the satisfaction of OWNER, shall be repaired or replaced by the vendor without cost & time implication to purchaser and performance test again carried out.

12.3 Performance Guarantee

12.3.1 The vendor shall guarantee the satisfactory performance of each dispenser as per the operating parameters indicated in data sheets. The dispensers shall be performance tested after installation at site by vendor. Vendor shall carry out tests as required by Govt. Statutory Agencies.

12.3.2 Guaranteed Performance for the Dispensers shall be as follows:

- Flow Rate (≥ 15 kg/min for Auto/Car Dispenser)
- Batch Accuracy of ± 1.5%.

Note:

1 All the dispensers shall be tested by Vendor for their function & performance in presence of OWNER authorised representative.

2 Any part or component, which is not functioning to the satisfaction of OWNER, shall be repaired or replaced by the vendor without cost & time implication to purchaser and performance test shall be carried out all over again.

3 Vendor to execute performance test of all the dispensers after commissioning for accuracy and repeatability and safety parameters.

4 Vendor to make all arrangements for carrying out performance test viz. Std. Mass Flow Meter, Laptop etc. Vendor shall also carry out tests as required by Govt. statutory agencies.

13.0 VENDOR DATA REQUIREMENT

Vendor data requirement shall be as per attached specification Annexure-2.

14.0 DEVIATION SCHEDULE

A typical format of Deviation Schedule is attached at Annexure-3. Vendor shall categorically specify the deviation they have on entire material requisition in above format and sign & stamp each sheet and submit it along with bid. In case vendor has no deviation, even then they should write "No Deviation" on this deviation schedule and submit it along with bid. This is an essential requirement; the bid should accompany Deviation Schedule.

15.0 MATERIAL REQUISITION COMPLIANCE SCHEDULE

A typical format of Material Requisition Compliance Schedule is attached at Annexure-4. Vendor shall categorically confirm the requirements in above format and sign & stamp each sheet and submit it along with bid. This is essential requirement; the bid should accompany Material Requisition Deviation Schedule.

16.0 PACKAGING

The dispensers shall be packaged to withstand rough handling during ocean shipment and in-land journey. It shall be vendor's responsibility to make good any deterioration that occurs during shipment. Sling points shall be clearly indicated on crates.

17.0 ON SITE TRAINING

Vendor shall provide 3 days of training to 3 separate groups of OWNER personnel. The

details of Training Program shall be finalized with purchaser after award of order.

18.0 TRAINING TO OWNER PERSONNEL AT VENDOR'S SHOP

Vendor shall provide adequate training to OWNER personnel (10 personnel for three working days). The travelling, boarding & lodging of OWNER's Engineers shall be borne by OWNER. The training module shall cover the equipment construction features, operational & maintenance procedures, practical hands on experience on assembling, dismantling etc. The details of Training Program shall be finalized with purchaser after award of order.

19.0 COMMISSIONING OF DISPENSERS

Vendor shall carry out commissioning of Dispensers within 3 days of receipt of intimation from OWNER.

20.0 COMPREHENSIVE MAINTENANCE

21.0 General

21.1.1 The contractor must follow the MAINTENANCE REQUIREMENT/ SERVICES as stated below but not limited to and ensure to provide trouble free services as defined in the bid documents.

i. The contractor shall deploy adequate number of technicians / supervisors / Engineers / helpers as well as tools, spares, consumables and equipment for smooth and proper maintenance of the Dispenser supplied in terms of the contract. In case required to meet operational requirements, the contractor shall augment the same as per direction of Engineer–in-Charge. Contractor to submit a detailed organogram with key person details before starting maintenance of the Dispenser package.

ii. The contractor is required to carry out all services as mentioned in the Scope of Services and Schedule of Rates on all the 365 days and shall be available 24X7 including Sunday and all Holiday & around the clock.

iii. The contractor shall follow Central/State guidelines for labour laws, rules and regulations. However, no work shall be left incomplete/unattended on any holiday/weekly rest. Technician/operators provided shall have minimum qualification of ITI. Contract in person or his authorized representative shall provide the services on daily basis to interact with Engineer-in-charge and deployed workman.

iv. The work force deployed by the contractor for maintenance service of CNG installation, shall be of sound relevant technical professional expertise which is otherwise also essential from the safety point of view of the personnel of the contractor as well as for the installation.

v. Contractor has to ensure the safety of man and machine all the times. Damages of equipment due to negligence will be recovered as per the decision of Engineer-in-Charge, which will be final.

vi. Regarding work completion, the decision of the Engineer-in-Charge will be final and binding.

vii. The contractor shall make his own arrangements to provide all facilities like boarding and transport etc. to his workmen.

viii. All personnel of the contractor entering on work premises shall be properly and neatly dressed and shall wear uniform, badges while working on premises of the Owner including work sites.

ix. Contractor shall maintain proper record of his working employee's attendance and payment made to them.

22.0 Scope of Comprehensive Maintenance Services

Contractor/vendor to include comprehensive maintenance of all the Dispensers. The start/ commencement of the comprehensive maintenance shall be after successful testing, commissioning and commencement of commercial operation of the dispenser. Contractor to submit the organogram of the maintenance team on receipt of the order. This maintenance shall include.

x. Replacing all spares but not limited to (flow meter, electronic cards , display , two way valves three way valves ,, drain valves , electro valves , breakaway coupling , Bus nozzle ,Safety valves, PT&PG, etc.), & consumables such as NO/NC contacts , communication cables ,Filter Cartridges, Valve Knobs , switches Electromechanical (except electric power).

xi. The contractor/vendor has to replace coalescent filter at least once every year during comprehensive maintenance period.

xii. Contractor/vendor to furnish the list of consumables required for normal operation of the dispensers and the time interval between change of the consumables like filters, valve repair kit for both solenoid valve, 2 way & 3 way valves, breakaway coupling, drain valves, display connectors, display, all valve knobs, ESD switches, reset switches NC/ NO contacts etc.

xiii. The Contractor/vendor has to provide scheduled maintenance details and list of normal **Operation spares required for operation & maintenance along with bid** as per mentioned in **Annexure -A.** The bidder should maintain sufficient spares for breakdown & scheduled maintenance. OWNER can check/ audit spare stock and vendor has to ensure availability of required spares as per list*.
*The provided list is only indicative. Bidder has to maintain all spares / consumables required for un-interrupted operations of atleast 06 months for each Dispenser Unit.

xiv. The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. The bidder shall provide the detailed preventative maintenance schedule along with

a) Estimated down time required for each type of maintenance schedule.

b) List of spares and their quantities required for each type of maintenance schedule per dispenser.

c) Type and number of man days required for each type of maintenance schedule per dispenser.

The contractor shall plan such maintenances during non-peak hours and in consultancy with the Engineer- In Charge (EIC) of OWNER. Any maintenance that needs to be taken up shall be well planned in advance with due approval of the EIC.

xv. The contractor/vendor shall use only OEM's certified spares during maintenances. In case, the schedule maintenance of the OEM manual recommends to check and replace parts like valve spring, valve seat etc. after certain time interval, same shall replaced or used further only on approval from the OWNER's representative. However, any untoward consequences for non-replacement of such parts shall be the responsibility of the contractor.

xvi. All routine and periodic checks / inspections required to be done as per OEM recommendation shall be done by the bidder. Instruments required for above inspection like Vernier calliper, micrometre screw gauge, fill gauges, bore gauge etc shall be in scope of the bidder and these instruments shall be calibrated every year.

xvii. All parts replaced by the contractor/vendor during the above contract period shall be properly packed and handed over to client on replacement.

xviii. The contractor/vendor shall submit a copy of the daily / weekly / fortnightly / monthly / bimonthly /

quarterly and yearly performance report to the EIC in both soft and hard form. All stationery including the printed material shall be in scope of Contractor.

xix. All the maintenance / inspection job carried out by the bidder shall be recorded in a service report and the report of the same shall be jointly signed by OWNER representative and submitted immediately after carrying out the maintenance.

xx. The EIC will be final authority to take decision with regards to maintenance or replacement of parts or any disagreement between the bidder and OWNER, during the execution of the contract.

xxi. The contractor/vendor shall carryout calibration of safety relief valve, PT, PG etc. will be in vendor's scope for comprehensive maintenance duration and shall be done minimum once in a year.

Bidder shall note that the calibration of the Dispenser Instruments, Mass Flow Meter / Electronics, other major items shall be valid at the time of commissioning. Due to any reason if the validity of the calibration (to be considered one year from the last calibration date, if not indicated) expired, then bidder shall arrange

/ complete the calibration before commissioning. The Performance Guarantee test shall be conducted positively within two months of commissioning. Bidder has to provide all the necessary arrangements if required for PG test.

Bidder shall ensure that Dispenser supplier shall provide necessary supports and input for client's SCADA (Supervisory Control and Data Acquisition) system and provide data register address details & protocol for automation / SCADA integrations.

A Logbook for time records shall be maintained in the central Control Room (Vendors) wherein the records shall be made for the time dispensers develops trouble and the time at which the trouble is rectified by contractor's maintenance staff and dispenser put back to service.

All spares required during CMC are in the Bidder's Scope. The Bidder shall submit the list of critical spares which are to be stored necessarily in the bidder's store during CMC.

For comprehensive maintenance, the penalty per dispenser per instance in case of breakdown beyond stipulated time frame reckoned from time of complaint lodged would be as mentioned in commercial part.

ANNEXURE – A

* Bidder has to maintained following minimum quantities of spores at each GA location. Same shall be replenished after usage. • The list is indicative only. Actual list of items and quantities may be vary depending upon site usage and OEM recommendations.

Sl No.	Full Description no.	Base stock qty
1	3 Way Seals for stem Leakage 1000 PSIG	2
2	3 Way Seals for end connection extemal leakage 10000 PSIG	2
3	3 Way Seals for handle kit 10000	2
4	3 Way Seals for intemal leakage 10000 PSIG	1
5	Rubber O-nng tn Black for Solenoid Valves/ Regulator valves/ Relief Valves	50
6	Car Receptacle for NGV to NZS Conversion-in SS316 as per aproved sample	2
7	Emergen Stop Button	1
8	Start Button	1
9	NZS nozzle Probe with O-ring In SS316 (As per approved sample)	1
10	Door Lock	1
11	3 way Valve	1
12	3 Way Valve Repair Kit	1
13	NGV Nozzle	1
17	Breakaway coupling	1
20	sov	1
21	Coalescent filter	1

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SECTION: B:

INSTRUMENTATION & CONTROL SPECIFICATION

1.0 SCOPE

1.1. The purpose of this specification is to define the minimum general requirements and philosophy of instrumentation & control for the dispenser package of OWNER.

1.2. This specification cover the design, engineering, procurement, supply and testing, calibration & commissioning of instrumentation and control system with all accessories and materials and any special test requirements required for completing the job in all respects.

1.3. Coriolis mass flow meter, electronics and other accessories shall be provided as required for the Dispenser arms.

1.4. Vendor's scope of instrumentation and control for the dispenser package shall include the following as:

a) Basic instrumentation and control indicated in this document.

b) All local and field-mounted instruments in dispenser panel.

c) All additional instruments and control system necessary for safe and efficient operation of the dispensers which are not listed specifically in this document, but which are required as per vendor's experience/recommendations.

d) Impulse piping/tubing including all miniature valves, fittings and mounting to install all sub vendor supplied instruments.

e) All other erection material necessary for mounting of instruments in vendor's scope as per OWNER installation standard.

f) Shop testing of all instruments and control system under vendor supply.

g) Calibration, loop checking, pre commissioning and commissioning of the complete system.

h) All weatherproof and explosion proof double compression type cable glands for all instruments, dispenser panel etc.

i) All pressure relief valves.

1.5. In case of further clarifications, bidder shall obtain clarification/confirmation from OWNER before proceeding.

1.6. All instruments must be procured from OWNER recommended vendor list. However, for that instrument/equipment, which are not covered in the list, the sub vendors shall be approved by OWNER.

2.0 BID PROPOSAL

The bid proposal shall be accompanied by the following as minimum for technical evaluation of offer.

a) Filled in data sheet of all instrument.

b) Deviation list.

c) Power supply consumption for each item & type of power supply whether earthed/ floating.

d) Utility requirement & consumption.

e) Complete dispenser along with mass flow meter shall be approved by Weights & Measures Department of India and NMI or PTB as per latest standards. In case dispenser has not been approved by Weights & Measures Department of India, the mass flow meter shall have Weights & Measures Department of India approval.

f) PESO approval for explosion proof enclosure for all electrical & electronic instruments. Bidder to ensure compliance to all statutory requirements such as PESO, weight & measurement department etc. In case any penalty is imposed by authorities, same shall be borne by the supplier

g) Type approval certificate from Petroleum & Explosive Safety Organization (PESO), Nagpur, Govt. of India .

3.0 DESIGN PHILOSOPHY

3.1 All Electrical and electronic instruments shall be installed in accordance with NFPA 70, IEC for Gas Group IIA, IIB & Temperature Class T3 and shall have approval of a recognized certifying authority.

3.2 Mass flow meter shall be Coriolis type and shall conform to AGA 11 standard.

3.3 Each and every mass flow meter 'zeroing' shall be done before delivery from vendor's works.

3.4 Mass flow meter design considerations, piping, meter, zero verification and proving facility shall be as per AGA 11 standard.

3.5 Control valve and solenoid valves shall be of conventional type design, no integral design is acceptable.

3.6 Control valve body and trim materials selection shall be done by the bidder to ensure that there is no erosion, cavitation and flashing. Trim & seat shall be fully stellited.

4.0 SPECIAL INSTRUCTION TO VENDOR

4.1 Supply of Auto/Car dispenser with two arm of flow rate ≥ 15 kg/min under differential pressure of 200 kg/cm2 g.

4.2 Each dispenser arm shall have Coriolis type mass flow meter with necessary sensor, electronic and special cable recommended by vendor. Performance record and Weight and Measure (W&M) certification (Type approval issued by Ministry of Consumer affair Food & Public Distribution) of the meter to be submitted for acceptance.

4.3 Three rows liquid crystal backlit displays for night viewing showing total sale in Rupees of (0000.00), quantity of gas sold in Kg.(0000.00), unit price of CNG in Rs/Kg (000.00) for each hose of the dispenser (total two sets and three rows for each dispenser). The display should have a back cover to make the display free from dust.

4.4 Vendor shall make a provision to change the price of CNG through the keypad on display panel of the dispenser unit that shall be covered with security lock. It shall also be possible to change the price from remote station (from SCADA/ from any part of the world). RS 485 port shall also be provided for price change. In case standard RS485 port is not available in the dispenser, then RS232 to RS485 convertor with all relevant hardware and software to be provided by vendor

4.5 Non-resettable and non-volatile totalizer up to 99999.99 (7 digits and two decimal) for total CNG sold in Kgs. Since the dispensers are used for custody transfer purpose, the totalizer must not reset/change/jump in any eventuality not even in the case of electronic failure/power supply failure or excursion beyond permissible limit. If there is any abnormality in power circuit during filling, the running batch value should be added in totalizer. Dispenser electronics shall be common for both totalizers.

4.6 Totalizer figure would be displayed only when it is recalled through a remote keypad or some device integral to dispenser. The totalizer value would cover up to the last transaction details at the time of recall. These remote key pad device should not be used for any programming of the dispenser and are distinct from those, if used for programming the dispenser while operating these keys in no way shall hinder the operations, functioning, veracity of display, storage of parameters and values. The remote keys need not function if filling is going on.

4.7 Dispenser shall be capable of communicating with outside system using the open system

architecture/protocol (OPC)/RS 485. Bidder must handover the details of communication port of dispenser and signals to be transferred to OWNER. It should be possible to transfer the data through twisted pair wires, transaction data as also flow meter data (both process and diagnostic) RTU. All totalizer readings, batch filled reading, transaction details, which are accessible in motherboard should also be accessible in open system architecture/protocol (OPC)/RS 485 for remote monitoring and data acquisition.

4.8 One number of three bank electronic software and controller including hardware. Vendor shall include solenoid operated valve made of ANSI 316 SS for dispensing of gas. Vendor to ensure the system design in such a way that in both options any gas if passes, should be recorded by dispenser added in the mass inventory total (both electronic & mechanical totalizer) and there should not be any possibility of unmetered gas supply through dispenser in case of malfunctioning of valves. The valve assembly shall be fatigue free and tight shut off characteristics at least for 8000 operation hours.

4.9 Pressure gauge showing the vehicle filling pressure shall be of 4" dia. (0-400 Kg/cmg2) with shatterproof glass. Vendor to provide a bypass isolation valve with associated tubing to facilitate routine servicing/calibration of Pressure gauge without shut down of the dispenser.

4.10 Temperature compensator to limit fill pressure to an adjustable value (with normal value 200 Kg/cm2g) equivalent at 15-degree C. A temperature compensation facility button shall be provided to enable or disable the temperature compensator.

4.11 To limit fill pressure to 200 Kg/ cm2 g, Vendor to provide the following options per hose / arm of the dispenser:

a) One number of pressure limiter (electronics transducer) (with adjustable value upto 250 Kg/cm2 g)

b) One number of mechanical pressure regulator or One number of pressure limiter (electronics transducer) with adjustable value upto 250 Kg/cm2 g.

c) One number additional pressure relief valve may also be provided as final safety to avoid overfilling for both sides.

In case vendor is providing Pressure regulator, same shall be designed in such a way that there shall not be any flow restriction to the maximum flow of dispenser. Otherwise, minimum flow through the regulator shall be 15 Kg/min at 5 kg/cm2g differential pressure.

4.12 Back-up Power supply for displays so that display remains at least for 5 minutes after power failure. Vendor shall provide battery backup of 72 hours to the RAM of dispenser controller.

4.13 Hardware required with the dispenser for Weights and Measures (W&M) certification.

4.14 All parameter setting shall be password protected. Facility of change of password also to be provided to enhance the security of password.

4.15 Car Dispensers shall be designed for handling flow rate of more than or equal to 15 kg/min. flow capacity with turn down of not less than 50:1.

4.16 The batch accuracy of dispensed gas shall be within ± 1.5% or better.

4.17 Bidder shall indicate overall flow coefficient Cv of dispenser from inlet to the dispenser upto outlet of nozzle including mass flow sensor, interconnecting tubing, valves, hose, fill valve etc.

4.18 Normal operating inlet pressure of dispenser shall be 220-250 Kg/cm^{2}g. The dispenser supply to the vehicle shall be positively cut off at outlet pressure of 200 Kg/cm^{2}g.

4.19 Normal operating temperature of wetted parts of dispenser shall be –10 to 55 deg. C.

4.20 Vendor shall confirm that any momentarily flow of gas shall be registered in dispenser totalizer. Vendor shall envisage a temper proof design. Dispenser shall generate error signal in case of passing valve and display on the dispenser LCD.

4.21 After power on, the controller delay time to start filling be such that the mass meter and pressure transmitter are initialized properly to avoid any un-metered gas.

4.22 Complete control loop would be so fast that if the filling is terminated at any point of filling, the flow would stop immediately.

4.23 Reset switch assembly should be suitable for failure free operation and the same shall be supported with proper PTR for CNG duty.

4.24 Controller shall be in reset state for the SOV open signal to be generated. Any departure to this shall stop the dispenser. Dispenser controller shall monitor the status of flow, monitor the status of flow meter / transmitter and in case of any abnormality from set condition the dispenser shall shut down.

4.25 In case the power supply is beyond acceptable limit the dispenser shall not start at all. The controller shall provide an operational alarm with pre-stated error code and it shall be displayed on LCD display.

4.26 Flow meter signal shall be considered as the highest level of interrupt. It shall not be possible to fill any vehicle cylinders by repeated operations of reset switches. Reset time delay is required with adjustable time.

4.27 A Provision shall be available in dispenser unit, which shall be suitable for programmable/changeable filling pressure from 180kg/cm^{2}g to 220kg/cm^{2}g in vehicle. Original filling shall be same as defined elsewhere in data sheet.

4.28 Emergency stop switch is required on both side of the dispenser.

4.29 Overfill protection shall be through electronically programmed hose to terminate the fill after 200 Kg/cm^{2}g. Vendor shall include per hose:

a) One number of pressure limiter (electronics transducer) (with adjustable value upto 250 Kg/cm2 g)

b) One number of mechanical pressure regulator or One number of pressure limiter (electronics transducer) with adjustable value upto 250 Kg/cm2 g.

c) One number additional pressure relief valve may also be provided as final safety to avoid overfilling for both sides.

Note : Relief valve set pressure shall be at 250kg/cm²g with resetting at 245kg/cm²g. Relief valve setting to be adjustable from 225kg/cm²g to 260kg/cm²g with resetting at 220 to 255 kg/cm²g respectively. Calibration certificate shall be provided.

4.30 Electronics

4.30.1 Electronics shall be microprocessor based. The processor shall be the latest available in the field and shall be cable of processing the data faster. All the electronic cards shall be located in flameproof boxes inside the dispenser cabinet. No parts of electronics shall be filled with epoxy resin etc. The controller electronics should have immune to EMI interference and vendor to provide relevant certification in this regard.

4.30.2 The dispenser electronics should have self-diagnostic features and should generate error code accordingly. Vendor should define such error codes in trouble shooting guide and procedure of their rectification. Error code related to operational parameters should also be displayed and defined in trouble shooting guide. Password protection should be provided for entry of critical data through key pad.

4.30.3 The change in setting shall be done either through lap top computer or through hand held configurator through the port provided for this purpose with security lock.

4.30.4 Vendor shall provide suitable electronics for processing both arms dispenser data. Totalizer display and display for both arms in the dispenser shall be shown separately

4.31 Tubing & Fittings

Materials used for the tubing shall be SS 316 fully annealed (Bright annealed) seamless conforming to ASTM A269 with maximum hardness of RB80 or less and suitable for bending and flaring. Open ends on fittings and vents shall be provided with caps/dust plugs.

4.32 Certification:

- Equipment/instrument/systems shall be certified for use by statutory authorities for their use in area of their application.
- For all intrinsically safe/flame proof equipment/instruments/systems, certification by any approving authority like BASEEFA, FM, UL, PTB, LCIE, Petroleum & Explosive safety organization (PESO), India is mandatory.
- The supplier should specify the hazardous area in accordance with the IS 5572 / Australian Re-fuelling Standard AG901 / NZS5425. All electrical equipment cabling, and earthing should be appropriate for the zone in which it is fitted, and all cables passing from the hazardous to safe area should be equipped with appropriate barriers where necessary.
- All Instruments should be suitable for an area classification of "Class 1, Division 1, Group D as per NEC" OR "Zone 1, Group IIA / IIB as per IS 5780 / IEC 6007". All dispensers mounted transmitters & temperature element should be intrinsic safe "Exia" as per IEC 79-11. Solenoid Valves, Switches and related junction boxes should be flame proof "Exd" as per IEC 79-1.
- Other special equipment / instruments, where intrinsic safety is not feasible or available, should be flame proof as per IEC 79-1. Flying leads from any of the instrumentation items are not acceptable. The Electronics of the dispenser shall not be open and shall be provided within a suitable enclosure. A complete dossier of all electrical equipment will be provided, showing area classification and certification of equipment.

4.33 Mass flow meter with local integral display, the mass flow meter signal through the transmitter shall be wired to the mother board used in the dispenser and there shall not be any difference in reading between this integral display unit and non-resettable display in the electronic control unit. If the mass flow meter does not have integral display, then the remote indicator shall be provided other than mother board of the dispenser.

4.34 Dispenser manufacturer is required to submit approval of weight & measure department, Govt. of India. For the dispenser unit or for the mass flow meter installed in the dispenser unit. In future, if any non-conformity or objection is raised by W&M department or if any penalty action is taken against OWNER, vendor shall be fully liable, indemnify OWNER against any liquidity and shall bear all the cost implication, if any.

4.35 The dispenser should be programmed for single/dual pricing even if automation/ site monitor is not implemented. The function of dual pricing can be configured in dispenser through configuration switches
/keypad. Provision for entering real time date and time should be there in dispensers. If keypad is to be used, it should be provided by vendor. Training regarding the same should be provided.

4.36 One no. of non-resettable and non-volatile totalizers per hose of the dispenser i.e. one integral local digital totalizer with display along with mass flow meter transmitter and the second totalizer of liquid crystal backlit display in kg. (99999.99) on the front panel of the dispenser shall be provided. Besides this, an electro-mechanical type totalizer shall also be provided with 7 digits and reading of both the totalizer shall be the same. There shall be a non-resettable & non-volatile totalizer per hose of the dispenser with liquid crystal backlit display in kg. (99999.99) on the front panel of dispenser. Besides this, a 7-digit electro- mechanical totalizer shall also be provided.

4.37 All equipment should be communicated with the common communication protocol. (MODBUS/PROFIBUS/HART)

4.38 All the safety norms to be followed by vendor as per OWNER guidelines.

4.39 All the approvals and certification to be provided by vendor for the hardware, software supply as per OWNER requirements.

4.40 During installation & commissioning vendor will ensure that routine operation of the equipment will not suffer, or vendor will install the equipment as per OWNER guidelines.

4.41 All gas flow from dispenser, flow meter under normal filling conditions must be recorded in electronic totalizer and mechanical (user non-resettable) totalizer

4.42 Any un-intentional flow of gas from dispenser, flow meter (without filling initialization by user) must be recorded in electronic totalizer and mechanical (user non-resettable) totalizer.

4.43 There must be provision to check last completed batch quantity. The previous batch should be accessed by pressing totalizer switch and need to displayed in the display. This would be used in case of power cuts and accidental fills. The communicating port/switch for adjusting flow meter mass/meter factor should not have any other functionalities and parameter controls.

4.44 W&M charges before commercial sales & annual stamping charges to be paid by owner. However necessary liasoning & coordination shall be in vendor's scope. If any other incident/problem occurs during the annual comprehensive maintenance contract period which needs breaking of W&M seal, then Vendor will pay W&M charges and coordinate with W&M department for stamping.

4.45 The name plate should have the W&M and PESO approval details as in case of CNG dispensers

4.46 Provision for sealing the k factor switch should be there with caps.

4.47 All totalizer readings, batch filled reading, transaction details, which are accessible in motherboard should also be accessible in open system architecture/protocol (OPC)/RS 485 for remote monitoring and data acquisition.

4.48 RFID Systems

The dispenser must be compatible with future RFID system suitable for monitoring and control of vehicle/ vehicle on-board cylinder authentication mechanism.

4.49 The dispenser shall have an automatic refueling data recorder unit for the each independent refueling line. The dispenser system shall be capable of storing up to 1,250 refueling transactions data and such data shall be downloaded frequently into another portable computer with compatible Microsoft and Linux software (Software for 03 cities for downloading the data to be provided by Supplier together with the license,) to store the transactions data. This information can either be downloaded as a report from a POS system.

Software shall have preset option, whenever consumer wants gas on money basis/quantity basis.

Feasibility for remote option price changing only may be provided.

Data recorder details to be provided. Future provision of Scada compatibility/ automation with open protocol to be there. The dispenser should have an inbuilt automatic refueling recorder unit for each independent refueling line. Data longer for recording of dispensing transaction with nos. may be there for downloading through laptop or portable computer. This information can either be downloaded as a report from a POS system of the client through RS 485 communication.

4.50 Bidder has to make necessary arrangement for yearly stamping of dispensers as per the requirements of W&M officer/ inspector. Bidder has to consider the same in his scope.

5.0 REQUIREMENT FOR AUTOMATION SYSTEM IN DISPENSER

5.1 It is intended to monitor / control following parameters through automation system:

Vendor shall ensure availability of following parameters at communication port of dispenser to connect with automation system for monitoring & control purpose.

These parameters shall also be checked during inspection at vendor's works.

a. Mass Totalizer from Dispenser Motherboard.

b. Mass Flow per Filling. (note that Gas sale data- the reading which is visible to customer and used for billing purpose is mandatory to be transmitted to server whether it is from flow meter or motherboard or from both)

c. To Read Gas Selling Price from Dispenser.

d. To download the gas selling price into the dispenser from Server system.

e. Mass Flow Meter Status.

f. Tripping Status Dispenser.

g. Reset Switch Operation Status.

h. Dispenser Power Supply Status.

i. Identity of vehicle using RFID (In-built option to be provided).

5.2 In addition to above bidder shall make provision for monitoring and control of following parameters as well

A. Shift Reports

(Shift – A: 6:00 to 14:00)

(Shift – B: 14:00 to 22:00)

(Shift – C: 22:00 to 06:00)

a) Showing Date /Start time/ Finish time of every shift

b) Individual Arm-wise and Dispenser-wise totals.

c) Total sale for each shift in Kgs and Rs.

d) Total sale with variable pricing.

e) Full day report with total Sale for the 24 Hr. period.

B. Remote Price Change facility to facilitate

- Station-wise sortable and selectable
- Time-wise selectable
- Area-wise selectable
- Variable price change in a day

C. Transaction reports

Remotely the following parameters can be viewed in transaction reports

- Station Name and Dispenser serial number.
- Showing Date /Start time/ End time of every filling.
- Individual Arm-wise and Dispenser-wise totalizer at start of filling and end of filling.
- Transaction number totals for individual Arm-wise, Dispenser-wise and Station-wise to count number of fills in selectable particular duration. (Monthly and daily basis)
- Batch reading of fill.

- Sale for each batch in Kgs and Rs.
- Unit price Data.
- Dispenser power ON/OFF count.
- Pressure during last fill
- Vehicle pressure at start of filling
- Vehicle pressure at end of filling
- Temperature during the last fill
- End of sale indicator (Code number showing the reason that the last sale stopped. This is useful if a dispenser stops during a fill for no apparent reason).

5.3 The remote monitoring and automation will consist of reading, transferring and controlling all the data/parameter from the dispensers to RTU and then to any centralized remote server in India as per OWNER requirement.

5.4 The above list is tentative and final list shall be decided during execution phase.

D. MAINTENANCE

6.0 The comprehensive maintenance of all the dispensers is in vendor's scope.

6.1 The start/commencement of the comprehensive maintenance shall be after successful testing, commissioning and commencement of commercial operation of the dispenser.

7.0 REJECTION CRITERIA.

7.1 During the shop test of dispenser, in case the dispenser flow capacity from inlet to dispenser to the outlet of filling nozzle is found below the specified capacity the dispenser shall stand rejected.

7.2 During the shop testing if the dispenser batch accuracy is found beyond ± 1.5% dispenser shall stand rejected.

8.0 deleted

9.0 SPARES

Commissioning and warranty spares to be provided and included in the base offer.

10.0 VENDOR DATA REQUIREMENTS

Vendor data requirement shall be strictly as per Annexure-5 this job specification.

11.0 INSPECTION AND TESTING

11.1 Functional and simulation test for the following shall be carried out at vendor's works and shall be witnessed by OWNER/Third party.

11.2 Control panels along with all instruments mounted in it.

11.3 Following tests shall be carried out by bidder at his works or his sub-vendor's works and test certificates shall be furnished :

a) Calibration/test certificates for all instruments, control valves & safety valves.

b) Seat leakage test for control valve and safety valve.

c) Test certificates for safety valve set pressure and reset pressure.

d) Material test certificates for all line mounted instruments.

e) Sub-vendors conformity certificates.

12.0 ENVIRONMENTAL AND SITE CONDITIONS ARE AS FOLLOWS

:	Minimum Temperature:	1°C
:	Maximum Temperature:	49°C
:	Maximum Shed Temperature:	47.5°C
:	Relative humidity	98% Non-condensing
:	Wind Velocity	160.0 Km/Hr

13.0 LIST OF ATTACHMENTS

Data sheet for CNG Dispenser for Car / Auto

Data sheets formats (along with calibration certificate wherever applicable) for

- Mass flow meter
- Control valve
- Solenoid valve
- Self-actuated control valve
- Pressure relief valve & Pressure Gauge and transmitter

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SECTION: C: ELECTRICAL SPECIFICATION

1.0 GENERAL

1.1 This specification defines the requirements of design, engineering, supply and installation, testing and commissioning of electrical facilities for CNG Dispenser Package

1.2 It is not intended to cover all aspects of design but to indicate the basic requirements only. Vendor shall ensure that the design and installation on the skid is carried out as per good engineering practice to meet the requirements of safety, reliability, ease of maintenance and operation, aesthetics and interchange ability of equipment.

2.0 CODES AND STANDARDS

2.1 All electrical equipment and complete package shall meet the requirement of relevant Publications and Codes of Practice of Bureau of Indian Standards, statutory regulations and good engineering practices. Complete system must conform to the latest revisions of the following:

a. Indian Electricity Act and Rules framed there under.

b. Fire Insurance Regulations.

c. Petroleum Rules and any other regulations laid down by Petroleum & Explosive safety organization.

d. Regulations laid down by local statutory authorities and Electrical Inspectorate.

2.2 Vendor shall provide all assistance required for obtaining approvals from statutory authorities for materials, plant design/drawings and complete installation.

2.3 Where Indian Standards do not exist, the relevant IEC/British/ German (VDE) standards shall apply. Any Other international standard may also be followed provided it is equivalent to or more stringent than the standards specified above.

2.4 In case of any discrepancy/conflict between the specified codes and standards, the following order of decreasing precedence shall govern:

i) Statutory Regulations.

ii) Codes and Standards.

Owner's concurrence shall, however, be sought before taking a decision in the matter.

3.0 AREA CLASSIFICATION AND EQUIPMENT SELECTION

3.1 In case of storage, handling or processing of flammable materials within the battery limits of the package, area classification shall be carried out in line with IS: 5572 & Petroleum Rules and OISD-179 guidelines where applicable.

3.2 Selection of the type of equipment for use in hazardous areas shall be done in accordance with IS: 5571 and other safety regulations as applicable. The electrical equipment shall meet the requirements of relevant IS, IEC or NEC standards. Increased safety type Ex (e) equipment shall not be permitted for use in Zone- 1 areas. For Zone-2 areas, increased safety type Ex (e) or Non-Sparking Type Ex (n) equipment shall be provided as a minimum, subject to the same being acceptable to statutory authorities. Ordinary safe area type electrical equipment shall not be used in Zone-2 areas (even though this may be permitted by NEC for Div.2 areas).

3.3 Electrical equipment for hazardous areas shall be certified by CMRI and approved by PESO (or equivalent statutory authority of the country of origin) for installation and use in the specified hazardous area. Flameproof equipment of indigenous origin shall be BIS marked. Vendor shall furnish the necessary certificates indicating such approvals.

3.4 All the electrical and electronic component shall be in flame/explosion proof housing suitable for

area classification: Hazardous area, Class 1, Division 1, Group D as per NEC or Class 1, Zone 1, Group IIA/IIB as per IS/IEC, Temperature Class T3, and completely enclosed in a securely lockable dispenser cabinet. No component of the dispenser shall be installed outside the cabinet.

Certificate from recognized agency to the effect is required to be produced that equipment supplied and/or installed conforms to above area classification."

4.0 EQUIPMENT SPECIFICATIONS

4.1 Specifications of equipment shall be furnished for review by the owner. All equipment and components shall be new and supplied by approved reputed manufacturers. Equipment requiring specialized maintenance or operation shall be avoided as far as possible and prototype equipment shall not be accepted. All equipment shall be complete with all necessary weather protection including tropicalization to prevent damage due to climate, dust and corrosive vapours.

4.2 Vendor shall be responsible for any damage to the equipment during transit. All packages shall be clearly, legibly and durably marked with uniform block letters giving the relevant equipment material details. Each package shall contain a packing list in a waterproof envelope.

4.3 All electrical components and equipment shall be sized to suit the maximum load under the most severe operating conditions.

4.4 All electrical equipment shall be supplied with approved cable glands, made of nickel-plated brass, tested and certified to be used in zone-1, hazardous area.

4.5 All electrical components should be suitably weatherproof to prevent short circuits, corrosion and should be suitable for installation in Hazardous classification as class I, Division 1, Group D

4.6 Although the supply is being arranged through UPS System, but in some remote occasions, the power supply may be from DG sets with poor regulations and thus power supply available from OWNER may contain harmonics, transients and surges etc. The Electronics shall be compatible to the supply system as no transient, surge or harmonics protection is provided by OWNER. Bidder to include suitable surge protection device/ voltage conditioning unit, as required, in their scope for accurate and safe operation of dispenser.

4.7 Rated voltage and frequency for the equipment shall be indicated

below: Ambient Temp : Max. 49 ºC & Min. 1 ºC
System Voltage: 230V + 10% Single Phase AC
System Frequency: 50 Hz + 3%

System Earthing: Solidly Earthed

We have envisaged solid earthing for the system. However, if specific earthing is required for the system –electronics, the same to be highlighted by bidder; otherwise system earthing including making of earth-pits etc. shall be provided by the successful bidder.

4.8 Name of the manufacturer, type of enclosure protection and certificate no. with name of testing/Certifying agency shall be furnished with bids / for approval.

4.9 General Requirement

- All power supply J.B.'s shall be flame-proof type as per area classification.
- Fill hoses should be conductive type to mitigate the static charges.
- Provision for connecting earth strip at two points inside the dispenser.
- Supply cable entry to dispenser shall be suitable for armoured 2.5sq.mm. 4 cores.

There should be effective static charges (as generated in hoses) mitigation design. All hoses shall be conductive so that auto earthing of static charges (as generated in system) could be ensured. Vendor shall submit the requisite documents/demonstration against the same at vendors shop.

SECTION D: MECHANICAL SPECIFICATION

Hoses:

Two CNG flexible electrically conductive (fill & vent both should be separate) hose, having following specification:

1. Car long hose breakaway to nozzle:

a. Car Dispenser Fill hose (Long)

b. Hose ID- 3/8"

c. OD- 0.77"

d. Length- Side A : 3000 mm *

e. Minimum Bend Radius-4",

f. End SIZE 1:- 9/16"-18 UNF SAE6(M)

g. End SIZE 2:- 1/4 NPTM , in SS 316

h. Nominal Size-3/8",

i. Working Pressure: 5000 PSI (345 Bar),

j. Minimum Burst Pressure: 20000 PSI (1379 Bar),

k. Temperature Range: -40 C to 65 C),

l. Electrically conductive polymer core tube, two or more layers of fiber reinforcement, and abrasion-resistant urethane cover. Cover must be pinpricked for use with CNG. High-strength conductive polymer core tube is required to dissipate static electrical build-up. Thick urethane cover for abrasion and wear resistance.

m. Spring guards must be provided at both ends for the assembly.

n. Hose should conform to NFPA 52 & ANSI / CSA NGV 4.2-2014 / CSA12.52-2014

2. Car short hose dispenser to break away:

a. Car Dispenser Fill hose- (Short),

b. Hose ID- 3/8",

c. OD- 0.77",

d. Length- 1000 mm*,

e. Minimum Bend Radius-4",

f. End Size 1- 9/16"-18 UNF SAE 37* JIC (F) Swivel

g. End size 2- 9/16"-18 UNF SAE6(M) (Both Ends), in SS 316

h. Nominal Size-3/8",

i. Working Pressure :5000 PSI (345 Bar)

j. Minimum Burst Pressure: 20000 PSI (1379 Bar),

k. Temperature Range: -40 deg. C to 65 deg. C

l. Electrically conductive polymer core tube, two or more layers of fiber reinforcement, and abrasion resistant urethane cover. Cover must be pinpricked for use with CNG. High-strength conductive polymer core tube is required to dissipate static electrical buildup. Thick urethane cover for abrasion and wear resistance.

m. Spring guards must be provided at both ends for the assembly.

n. Hose should conform to NFPA 52 & ANSI / CSA NGV 4.2-2014 /CSA .52-2014

Note: Total length of the hose is to be maintained as 4000 mm (Min.), further breakup of Length i.e. Long hose (breakaway to nozzle) and short hose (dispenser to breakaway) is mentioned above, same is indicative and can be varied as per vendor's proven design. Vendor to ensure compliance to the tender specifications and codal requirements. Also same design must have been supplied in past to other CGD entities with proven track record (PTR)

3. **Vent hose:**

a. Vent hose- 3000mm,

b. Hose ID- 1/4",

c. OD- 0.63",

d. Length- 3000 mm

e. Minimum Bend Radius-2",

f. End SIZE 1: - 9/16"-18 UNF SAE6(M)

g. End SIZE 2: - 1/4 NPTM, in SS 316

h. Nominal size - 1/4"

i. Working Pressure: 5000 PSI (345 Bar),

j. Minimum Burst Pressure: 20000 PSI (1379 Bar),

k. Temperature Range: -40 deg. C to 65 deg. C),

l. Electrically conductive polymer core tube, two or more layers of fiber reinforcement and abrasion resistant urethane cover. Cover must be pinpricked for use with CNG. High-strength conductive polymer core tube is required to dissipate static electrical buildup. Thick urethane cover for abrasion and wear resistance.

m. Spring guards must be provided at both ends for the assembly.

n. Hose should conform to NFPA 52 & ANSI / CSA NGV 4.2-2014 / CSA52-2014

Note: *Hose shall be supplied along with Spiral wrap*.

Nozzles:

Both hoses shall be fitted with NGV-I nozzle for filling of vehicles. Specification for NGV 1 nozzle is as follows:

Nozzle Type for Car Side	NGV-1 TYPE 2, CLASS B
Normal working Pressure	PN200 bar
Temperature Range	-20°C to +65°C
Max. Length	Max. 115 mm
Cv minimum	1.15
Max. Weight	1.7 kg
Min. Flow Rate:	1500 SCFM @ 3000 psig

Max nozzle body diameter	2 inches
Filling Line Male Thread	**For Car/Auto End**: UNF 9/16"-18 Female or 1/4" Male NPT

3-way valve:

Vendor shall include the supply of 3-way valve with each hose for filling & venting of gas. Specifications are as follows:

Connection Size	:	¼ "NPT Female
Cv minimum	:	0.75
Pressure Rating	:	5000 PSI (minimum)
Temperature Rating	:	-20 to 65 deg. C
Minimum Life	:	40000 cycles at site conditions (one on & off is considered as one cycle)

Break away: -

Vendor shall also include supply of Breakaway Coupling, suitable for NGV Industry. Vendor shall demonstrate the function of breakaway coupling during performance test.

1. Min Flow Rate: 5500 SCFM @ 3000 psi
2. Temperature: -20° C to +65°C
3. Min. Cv: 0.95
4. MAWP: 5000 psi

DATA SHEETS

CNG DISPENSER FOR CAR / AUTO DISPENSER

SR. NO.	PARAMETER	SPECIFICATION	OFFERED
1.0	Dispenser	Car / Auto	
1.0.1	Frame material	SS 304	
1.1	Make		
1.2	Model		
1.3	Normal Inlet Pressure Kg/cm2 g	250	
1.4	Maximum Fill Pressure Kg/cm2g	200	
1.5	Operating Temperature range of wetted parts	(-) 10 °C to 55°C	
1.6	Metering : Mass Flow Rate	Max. 15 kg/min	
1.7	Nominal flow (kg/min)		
1.8	Minimum flow (kg/min)		
1.9	Overall Cv of dispenser from inlet of dispenser to outlet of fill nozzle		
1.10	Batch accuracy	± 1.5%	
1.11	Electrical Supply	Single Phase AC 230 Volts ± 1% 50Hz ± 1%	
1.11.1	Tolerable value of voltage range for accurate operation		
1.12	Fill Nozzle		
1.12.1	Type	NGV1	
1.12.2	Make	-	
1.12.3	Pressure Rating Kg/cm2 g	250 Kg/cm2 g	
1.13	Flexible fill & vent hose	Both should separate	
1.13.1	Type		
1.13.2	Make		
1.13.3	Pressure Rating Kg/cm2 g		
1.14	Sequential filling	Three banks	
1.15	Mass Flow Meter		
1.15.1	No. of metering lines	Two independents	
1.15.2	Metering principle	Coriolis	
1.15.3	Make		
1.15.4	Model		
1.15.5	Mass Flow accuracy for gas meter (inclusive of linearity, hysteresis, repeatability errors)	± 0.5%	
1.15.6	Repeatability	±.0.25%	
1.16	Temperature compensation	Yes	
1.17	Breakaway coupling	Yes	
NOTE: For all Electrical/Instrumentation items vendor shall provide certificates issued by statutory Inspection Authority confirming suitability of Design/Construction for specified Hazardous Area Classification.			

MASS FLOW METERS (CORIOLIS TYPE) FOR CAR / AUTO DISPENSER

Units:		Flow -> CNG	CNG-Kg/Hr Pressure->	Temperature-> °C	Level /Length->mm
General	1.	Tag No.			
	2.	Line No.			
	3.	Service			
	4.				
Meter	5	Type			
	6	Function			
	7	Conn. Size: Size &Rating,			
		Facing & Finish			
	8	Body Material			
	9	Wetted Parts Material			
	10	Enclosure			
	11	Conduit connection			
	12	Range			
	13	Accuracy			
	14	Pressure Drop			
	15	MTBF (Mean Time Between Failure)			
Convertor	16	Load Resistance – ohms.			
	17	Output			
	18	Power Supply			
	19	Area Classification			
	20	Intrinsically safe /Expl. Proof			
	21	Enclosure			
	22	Conduit connection			
	23	Mounting			
	24	Distance from control room			
	25				
	26				
Options	27	Filter/Mesh Wire			
	28	Mounting Brackets			
	29	Interconnecting			
	30	Special cabling			
	31	Cable glands			
	32	Accessories for hot tap			
	33				
	34				
	35				
Service Conditions	36	Fluid & state			
	37	Maximum Flow			
	38	Minimum Flow			
	39	Normal Flow			
	40	Pressure – Open. Max.			
	41	Temp. C – Open. Max.			
	42	Oper. S.G. Mol. Wt			
	43	Max. order Viscosity mpa . s(cp)			
	44	Max. Allowable Pr. Drop			
	45	Model No. Meter convertor			
	46	Specification Remarks			
	47	Specification Remarks			

ACTUATED VALVES

Units:		Flow -> CNG	CNG-Kg/Hr Pressure->	Temperature-> ºC	Level /Length->mm
General	1	Tag No.			
	2	Inlet Line No.			
	3	Outlet Line No.			
	4	Service			
	5	Line Size Schedule			
	6	Inlet Line I.D. Outlet line ID			
Body	7	Type of Body			
	8	Body Size Port Size			
	9	Guiding No. of Ports			
	10	End Conn: Flgd. Size & Rating			
	11	Facing & Finish			
	12	Body Material			
	13	Bonnet Type			
	14	Packing Material			
	15	Lubricator Isol. Valve			
	16	Trim form			
	17	Trim Mat. Plug. /Disc/Ball & Seat			
	18	Other wetted parts			
	19	Soft seating Materials			
	20	ANSI Leakage Class			
Act.	21	Type			
Uat or.	22	Close at Open at			
	23	Failure Position			
	24	Handwheel & Location			
Position	25	Air Supply Pressure			
	26	Input Output			
	27	Bypass Gauges			
Options	28	Solenoid Valve			
	29	I/P convertor			
	30	Filter with Gauge			
	31	Limit Switch			
	32				
Service Conditions	34	Fluid State			
	35	Flow Liquid Min: Normal: Max			
	36	Flow vapour Min : Normal : Max			
	37	Flow Water Min Normal Max			
	38	Inlet Pr. Nor. Min.			
	39	P @Flow rat Min :Normal : Max			
	40	Pressure Shut Off			
	41	Temp. Open. Max.			
	42	Open S.G. Mol. Wt.			
	43	Cp/Cv Compress Factor			
	44	Flash% visc.mPas (open)			
	45	Deg. Of Superheat % Solids			
	46	Vapour Pr. Critical Pr.			
	47				
Valve Data	48	CV Min. Cv Max.			
	49	CV Nor. Selected CV			
	50	Predicted Sound Level Dba			
	51	Inlet Velocity m/s			
Model Nos.	52	Valve Actuator			
	53	Positioner Solenoid Valve			
	54	IBR Certification			

SOLENOID VALVES

Units:		Flow -> CNG	CNG-Kg/Hr Pressure->	Temperature-> ºC	Level /Length->mm
General	1	Tag No.			
	2	Line No.			
	3	Line Size & Sch.			
	4	Service			
Valve	5	No. of ways			
	6	Size – Body Port			
	7	End Connection			
	8	Material Body			
	9	Material Trim			
	10	Body Rating			
	11	Operating mode NC/NO/Univ.			
	12	Packing			
	13				
	14				
	15	Enclosure			
Electrical	16	Area Classification			
	17	Cable Entry			
	18	Ty. Of Energization Dropout			
	19	Power Supply			
	20	Power Consumption VA/W			
	21	Inrush Current			
	22	Insulation Class			
	23	Voltage – Energizing – Dropout			
	24				
Options	25	Manual reset			
	26	Latching on Energ./De-Energ.			
	27	Bug screen for vent port			
	28	Intrinsically safe			
	29				
	30				
Service Conditions	31	Fluid			
	32	Press. Open / Max.			
	33	Temperature C-Open/ Max			
	34	Maximum Flow			
	35	S.G. at open Temp. Mol. Wt.			
	36	Viscosity mPa.s (cp)			
	37	Allowable Press Frop			
	38	Del. P Shut Off			
	39	Valve CV			
	40				
	41				
	42	Model No.			
	43	Specification Remarks			

SELF ACTUATED PRESSURE CONTROL VALVES

Units:	Flow -> CNG		CNG-Kg/Hr Pressure->	Temperature-> ºC	Level /Length->mm
General	1	Tag. No			
	2	Line No.			
	3	Line Size & Sch.			
	4	Service			
	5				
Valve	6	Ty. Of Regulator: Std/pilot op			
	7	Size: Body Port			
	8	End Conn.:- Size & Rating			
	9	- Facing & Finish			
	10	Body Material			
	11	Trim Material			
	12	Set Point			
	13	Impulse Conn.: Int. / Ext.			
	14	Conn. Size & Type if external			
	15	Material of Diaphragm			
	16	Bonnet Type			
	17	Cv: Min. Max.			
	18	Cv: Normal			
	19	Selected Valve CV.			
	20	Predicted Sound Level (dBA)			
	21	Inlet Velocity			
	22	Packing of Seals			
	23	Lubricator ISO – Valve			
	24	Guiding No. of Ports			
	25				
Accessories	26	Pressure Indicator			
	27	Relief Valve			
	28	Line Stainer			
Service conditions	29	Fluid & State			
	30	Flow - Min. / Max.			
	31	Flow - Normal			
	32	Inlet Pr. - Max. / Min			
	33	Inlet Pr. - Normal			
	34	Del. Pr. – Max. Min			
	35	Del. Pr. - Shut Off			
	36	Temperature ºC - Oper. Max.			
	37	Oper. S.G. Mol Wt.			
	38	Cp/ Cv compress factor			
	39	Flash% | open visc. Mpa. S (cp)			
	40	Deg. Of Superheat % solids			
	41	Vapour Pr. / Critical Pr.			
	42	Model No. Valve / Actuator			
	43				
	44	IBR certificate			
	45	Specification Remarks			

PRESSURE RELIEF VALVES

Units:		Flow -> CNG	CNG-Kg/Hr Pressure->	Temperature-> ºC	Level /Length->mm
General	1	Tag No.			
	2	Line No.			
	3	Vessel Protected			
	4	Safety / Relief			
Valve	5	Type:			
	6	Full Nozzle Full Lift/ Mod Nozzle			
	7	Bonnet Type			
	8	Conv. / Bellows / Pilot Operated			
	9	Inlet Conn.: Size & Rating			
	10	Facing & Finish			
	11	Outlet Conn.: Size & Rating			
	12	Facing & Finish			
	13	Cap Over Adj. Bolt			
	14	Screwed/Bolted			
	15	Lifting Gear – Type			
	16	Test Gag			
	17				
Material	18	Body and bonnet			
	19	Nozzle and Disc			
	20	Spring			
	21	Bellows			
	22	Resilient Seat seal			
Options	23				
	24				
Basis	25	Code			
	26	Basis of selection			
	27				
Service conditions	28	Fluid and state			
	29	Corrosive constituent			
	30	Required flow capacity			
	31	Mol. Wt./ S.G. at Ref Temp.			
	32	Open Pressure			
	33	Open temp C / Ref Temp C			
	34	Valve discharge to			
	35	Back Press. / Const or variable			
	36	Set Pressure			
	37	Cold Bench Test pressure			
	38	% Over pressure/ % blow down			
	39	Cp/cv [compressibility Factor]			
	40	Viscosity At Ref. Temp. mPa s(cp)			
	41	Vess.: Walltemp.C/ Surf Area-m^2			
	42				
Orifice	43	Calculated Area cm^2			
	44	Sel. Area cm^2 / Orifice Design			
	45	No. of valves Reqd. for capacity			
	46	Total Area - cm^2			
	47	Actual Flow Capacity			
	48				
	49	Model No.			
	50				

	51	IBR Certification			

PRESSURE TRANSMITTER

Units: Flow -> CNG CNG-Kg/Hr Pressure-> Temperature-> °C Level /Length->mm

General

1. Function
2. Type: -
3. Case: -
4. Mounting: -
5. Electrical Area Classification
6. Enclosure :
   Enclosure Class
7. Intrinsically safe: -
8. Air Supply
9. Power Supply
10. Cable Entry:
11. Accuracy: -
12. Repeability: -

TRNSMITTER

13. Output
14. Trans. Power Supply Controller
15. Output:-
16. A/M switch:-
    No. of positions:-
17. Set point adjustment
18. Manual Regulator
19. Mode
20. Chart
21. Chart Driver
22. Moving parts matl.; -
23. Chart Speed: -

Measuring Unit

24. Service: -
25. Element : -
26. Body Material: -
27. Element Material
28. Process conn.: -
    process conn. Location
29. Diaphragm seal
    wetted parts materials: -
    other Material
    Process Conn.:
    Size & Rating
    Facing & Finish: -
    Capability Material:-
    Armour Flexible: -
    Armour Flexible Matl.: -
    Capillary length:- mm
    Flushing/filling conn. With
    Miscellaneous
30. Over range protection
31. Options: -
    (a) Intrinsically Safe
    Output meter
    (b) Air Filter Regulator
    (c) Mounting Accessories
    (d) 3-way manifold
    (e) ----------
32. Load Capability:-

TAG NO.	OPERATING PRESSURE	MAXIMUM PRESSURE	MAXIMUM TEMPERATURE	RANGE		CONTROL	SERVICE	OPTIONS
				Span	Set			

PRESSURE GAUGES

Units: Flow -> CNG CNG-Kg/Hr Pressure-> Temperature-> ºC Level /Length->mm

1. Type: -
2. Mounting: -
3. Dial Size: -
   Colour: -
4. Case Matl. :-
5. Bezel Ring :-
6. Window Matl.:-
7. Enclosure : -
8. Pressure Element :-
9. Element Matl.:-
10. Socket Material
11. Accuracy
12. Zero adjustment

13 Connection
connection location: -
14 Movement: -
15 Diaphragm Seal:-
Type
wetted parts material – Element Matl.
Lower Boy Matl.
Non-wetted parts materials :
Process connection: size & Rating
Facing & Finish
Capability Material
Armour – Flexible – Matl.
capability Length
Flushing / filling connection
16 Over Range Protection:-
17 Blow out Protection:-
18 Options: (a) Snubber
(b) Syphon
(c) Gauge Saver
(d) Liquid filled casing
(e)----------

TAG No.	Range	Operating Pressure	Maximum Service Pressure	Maximum Service Tempe.	Fluid	Service	Options

ANNEXURES

ANNEXURE-1: RECOMMENDED VENDOR LIST (REFER COMMON VENDOR LIST)

ANNEXURE-2: VENDOR DATA REQUIREMENT

1.0 DRAWING AND DATA REQUIREMENT

1.1 The following data and information marked "X" shall be furnished by the vendor for Car / Auto Dispenser:

S. No.	Description	With Bid	After Job Award		
			For Review	For Information	Final in Book Form
1	2	3	4	5	6
1.0	GENERAL				
1.1	Filled in Material Requisition Compliance Schedule.	X			
1.2	Filled in Deviation Schedule (No Deviation)	X			
1.3	Duly filled up "Experience Record Schedule". Vendor to note that information furnished by them shall be used to assess the provenances of offered Dispensers and Qualification of vendor, accordingly vendor to furnish references of those cases which are matching with offered Dispensers.	X			
1.4	Installation manual			X	X
1.5	List of components of Dispenser with Make & Specification of components. Vendor shall also submit "Technical Catalogues" of components			X	
1.6	Start-up, operation & maintenance manual showing assembly details and critical tolerances. A copy of all certified drawings & documents to be enclosed.			X	X
1.7	Lubricant list with specification			X	X
1.8	Battery limit (interface) drawing/ information		X		
1.9	Drawing list and submission schedule		X		
1.10	Project implementation schedule, ordering and inspection schedule for long lead and major items		X		
1.11	Pre-commissioning & commissioning procedure		X		
1.12	Performance guarantee test procedure		X		
1.13	Weights & Measures Certificates from the country of origin for offered models of Car / Auto Dispenser unit model/mass flow meter model for dispensing specified mass flow rate at specified overall batch accuracy.	X	X		X
1.14	The "Test Certificate" for mass flow meter.		X		

1.15	Weights & Measures approval from Indian Authorities.		X		
1.16	Type approval for the offered dispenser from Petroleum & Explosive safety organization, Govt. of India	X	X		X
2.0	DESIGN				
2.1	Process flow diagrams (PFDs) and Piping & Instrumentation diagrams (P&IDs) of sub systems and complete system with write-up on operation		X		X
2.2	Data sheets of Car/Auto Dispenser duly filled up.	X	X		X
2.3	Basic design calculations for system design, equipment selection		X		X
2.4	Performance data, vendor literature for equipment selection, performance curves with duty point marked for individual equipment		X		X
2.5	Specification for piping material & valves.		X		X
2.6	Utility requirement		X		X
2.7	Detail of control wiring diagram, interlock/ shutdown/ control scheme with write up on operation. Sizing calculation for instrument items.		X		X
2.8	Dispenser communication port details and requirement information as per specification and list of signals		X		X
3.0	CONSTRUCTIONAL FEATURES				
3.1	G.A. drawing of Dispensers showing maintenance clearances required.	X	X		X
3.2	Cross section drawings of individual equipment/ skid, material & parts list.			X	X
3.3	Termination & Wiring Diagrams			X	X
4.0	SPARES				
4.1	List of spares for 10 years normal operation per Car / Auto Dispenser	X	X		
5.0	Drawings, documents, data as asked under Electrical & Instrumentation specifications of this Material Requisition.		X		

ANNEXURE – A : LIST OF SPARES

* Bidder has to maintained following minimum quantities of spores at each GA location. Same shall be replenished after usage. • The list is indicative only. Actual list of items and quantities may be vary depending upon site usage and OEM recommendations.

Sl No.	Full Description no.	Base stock qty
1	3 Way Seals for stem Leakage 1000 PSIG	2
2	3 Way Seals for end connection extemal leakage 10000 PSIG	2
3	3 Way Seals for handle kit 10000	2
4	3 Way Seals for intemal leakage 10000 PSIG	1
5	Rubber O-nng tn Black for Solenoid Valves/ Regulator valves/ Relief Valves	50
6	Car Receptacle for NGV to NZS Conversion-in SS316 as per aproved sample	2
7	Emergen Stop Button	1
8	Start Button	1
9	NZS nozzle Probe with O-ring In SS316 (As per approved sample)	1
10	Door Lock	1
11	3 way Valve	1
12	3 Way Valve Repair Kit	1
13	NGV Nozzle	1
17	Breakaway coupling	1
20	sov	1
21	Coalescent filter	1

1.2 DOCUMENT DISTRIBUTION SCHEDULE

1.2.1 Documents and drawings under column no. 3 shall be submitted with each copy of the bid.

1.2.2 Documents listed under column 4 are to be submitted in 2 copies

1.2.3 Documents listed under column 5 are to be submitted in 2 copies.

1.2.4 Documents listed in column 6 are to be submitted as hard bound indexed book containing the following details in Two (2) copies to be submitted within 4 weeks of release note/dispatch of materials/ equipment from vendor's works.

1.3 **DETAILS TO BE INCLUDED IN FINAL DOCUMENTS BOOKS**

1.3.1 Copy of P.O. and all amendments.

1.3.2 Copy of Purchase Requisition and all amendments.

1.3.3 Manufacturing Data Book containing all test certificates of components, raw materials, stage manufacturing tests and inspections, final tests & inspection documents including welders' qualification & welding procedure qualification, repairs & reworking carried out in shops. All raw material test certificates must be correlated to the P.O. Item No. & component to which they relate by clear stating on the certificates.

1.3.4 Spares details including assembly drawings, part numbers, delivery, prices and ordering information.

1.3.5 All design calculations carried out by the vendor.

1.3.6 Final Drawing Index and all as-built drawings reduced to A3/ A4 size and wherever reduction is not possible, full size copies duly folded and placed in plastic pockets.

1.3.7 Catalogues/leaflets of sub-vendors/suppliers of various bought out components highlighting the components actually supplied correlated to P.O.Item Numbers.

1.3.8 Operating and maintenance instructions including lubrication schedules with details of suppliers for procurement by OWNER for subsequent needs.

1.3.9 Release Note and Packing List.

1.3.10 Any other documents asked for in the Purchase Requisition.

1.3.11 All final drawings shall also be given to purchaser in digitized form in Pen drive compatible to AUTOCAD software.

1.4 **SPECIAL INSTRUCTIONS FOR SUBMISSION OF DWGS./DOCUMENTS:**

1.4.1 Contractor to forward the drawings and documentation to OWNER (Attention vendor prints control department) clearly specifying purchasers Job no. & Req. No.

1.4.2 The drawing/Document no. with Rev. No. is essential. The number may be upto a maximum of 28 characters in length.

1.4.3 Each Drawing/Document submitted to OWNER must be checked and signed/stamped by contractor before it is submitted to OWNER.

1.4.4 Revision number must change during subsequent submission of vendor document.

1.4.5 Multi-sheet documents other than drawings must be submitted in their entirety in the event of a re-submission even if only a few sheets are revised.

1.4.6 Final submission in bound volumes shall necessarily have a cover page giving project title, Item name, P.O.No. Particulars of owner & vendor and an index giving list of drawings & documents included (with revision no.).

1.4.7 All vendor drawings to be provided with a blank space measuring 75 mm W x 38 mm H for marking of review codes etc. by OWNER.

1.4.8 The review of the vendor drawings shall be done by OWNER, as applicable, under the following review codes:

Review Code 1/A	No comments.
Review Code 2/B	Proceed with manufacture/fabrication as per commented drawings. Revise drawings required
Review Code 3/C	Document does not conform to basic requirements.

1.4.9 Review of vendor drawings by OWNER would be only to check compatibility with basic designs & concepts & would in no way absolve the contractor/vendor of his responsibility to meet applicable codes, specifications & statutory rules/regulations.

1.4.10 Vendor shall submit within 10 days after placement of FOI, the complete list of drawings/ documents with submission dates against each. Critical drawings, only, the list of which will be agreed during kick-off meeting shall be reviewed jointly at OWNER's office.

ANNEXURE-3: DEVIATION SCHEDULE FOR CNG DISPENSER

Vendor:		
S.No.	Vendor to specify Specification number and clause number against which Deviation is sought	Description of Deviation and give reasons in support of Deviation
	----------NO DEVIATION----------	----------NO DEVIATION--------

ANNEXURE- 4: M.R. COMPLIANCE SCHEDULE

Item: CNG DISPENSERS		
Vendor:		
S. No.	Requirements	Compliance By Vendor (To Be Answered By Vendor)
1.0	Confirm compliance individually to following clauses of Specification	
	SECTION: A	
	Clause no 1.0	
	Clause no 2.0	
	Clause no 3.0	
	Clause no 4.0	
	Clause no 5.0	
	Clause no 6.0	
	Clause no 7.0	
	Clause no 8.0	
	Clause no 9.0	
	Clause no 10.0	
	Clause no 12.0	
	Clause no 13.0	
	Clause no 14.0	
	Clause no 15.0	
	Clause no 16.0	
	Clause no 17.0	
	Clause no 18.0	
	Clause no 19.0	

Item: CNG DISPENSERS		
Vendor:		
S. No.	Requirements	Compliance By Vendor (To Be Answered By Vendor)
	Clause no 20.0	
S. No.	Requirements	Compliance By Vendor (To Be Answered By Vendor)
	SECTION B: Instrumentation & Control Specification	
	Clause no 1.0	
	Clause no 2.0	
	Clause no 3.0	
	Clause no 4.0	
	Clause no 5.0	
	Clause no 6.0	
	Clause no 7.0	
	Clause no 8.0	
	Clause no 9.0	
	Clause no 10.0	
	Clause no 11.0	
	Clause no 12.0	
	SECTION C: Electrical Specification	
	Clause no 1.0	
	Clause no 2.0	
	Clause no 3.0	
	Clause no 4.0	
2.0	Confirm that you have filled-up the following Schedules and enclosed these with the Bid	
	Experience Record Schedule for Car / Auto Dispenser	
	Deviation Schedule	

Item: CNG DISPENSERS		
Vendor:		
S. No.	Requirements	Compliance By Vendor (To Be Answered By Vendor)
	Material Requisition Compliance Schedule	
3.0	Confirm that you have filled-up the Dispenser Data Sheet and enclosed with the Bid.	
	Dispenser Data Sheet	
	Mass Flow Meter Data Sheet	
	Control Valves	
	Solenoid Valves	
	Self Actuated Pressure Control Valves	
	Pressure Relief Valve	
	Pressure Instruments	
	Pressure Gauges	
4.0	Confirm that following Documents have been enclosed with Bid.	
	Battery Limit (Interface) drawing/ information.	
	Weights & Measures Certificates from the country of origin for offered models of Car / Auto Dispenser unit model/mass flow meter model for dispensing specified mass flow rate at specified overall batch accuracy.	
	Type approval for the offered dispenser from Petroleum & Explosive safety organization, Govt. of India	
	G.A. drawing of Dispensers showing maintenance clearances required.	

ANNEXURE-5: VENDOR DATA REQUIREMENT (INSTRUMENTATION)

S.No.	Description	Document Category		
		Inf.	Review	As built
1.	Drag and Document Schedule		*	*
2.	Piping and Instrument Diagram		*	*
3.	Instrument Index	*		*
4.	Sub- Vendor List for Instruments and Accessories		*	
5.	Instrument Sizing calculations		*	*
6.	Utility requirements	*		
7.	Level Sketches	*		
8.	Material requisition		*	
9.	Purchase Requisition	*		*
10.	Functional schematic	*		*
11.	Logic diagrams		*	*
12.	Instrument loop drawings	*		*
13.	Control room layout		*	*
14.	Panel front arrangement		*	*
15.	Power Supply Distribution		*	*
16.	Wiring diagram for panels	*		*
17.	Configuration diagram		*	*
18.	I/O assignment	*		*
19	Details of OPC, configuration port, signals details etc		*	*
20.	Instrument Duct/Tray layout	*		*
21	Instrument Cable schedule	*		*
22	Instrument location plans	*		*
23	Instrument installation drawings	*		*
24	Bill of material for installation items	*		*
25	Spare part list for			
	(a) Ten years operation			*
	(b) Start up and commissioning			*
	(C) Spare instruments (10%)		*	*
26	Inspection and test procedures	*	*	
27	Complete catalogues with part list for all vendor supplied instruments, controls etc.	*		*
28	Installation, operation and maintenance manuals			*

Note: This list indicates the minimum drawings and document requirements. However, vendor shall submit a complete list of document and drawing schedule listing all drawings and documents to be submitted by them during the course of execution of the job. The schedule shall list all drawings and documents along with their number and expected date of submission.

ANNEXURE - 6 QUALITY ASSURANCE PLAN

CODING STRUCTURE						Manufacturer
Codes for Extent of Inspection, Tests & Test Certificates				Codes for Documents		
Code	Description	Code	Description	Code	Description	
1	Visual	12	Power failure	D1	Approved GA Drawing	
2	Dimensional	13	Failure of metering	D2	Approved P&ID	
3	Fitment & Alignment	14	Failure of totalizer	D3	Approved data sheet	
4	Physical Test	15	Calibration	D4	Approved Bill of material	
5	Chemical Test	16	Pressure test	D5	Purchase requisition	Customer's Information
6	Running Test	17	Noise & vibration	D6	W&M Certificate from country of origin	Customer: ……
7	Leak Test	18	Enclosure protection test	D7	Calibration certificate of all measuring test / instruments and gauges	Consultant: ….. LOA No.: OWNER/ND/ dated Item : CNG Car Dispenser
8	Dispenser should automatically stop in case of failure of totalizer	19	Paint shade verification			
9	Check for single bank system	20	Test certificate for bought out components			
10	Check for manual shut off	21	Flow capacity test			
11	Batch accuracy test					

DETAILED INSPECTION AND TEST PLAN

EQUIPMENT DETAILS			INSPECTION AND TESTS				SCOPE OF INSPECTION AND TESTS		
Sr. No	Description		RAW MATERIAL AND Stage Inspection		FINAL INSPECTION		Documents for submission to OWNER/PMC/TPI	Acceptance Criteria	Activity by OWNER/PMC/TPI
			MFR	OWNER/ PMC/TPI	MFR	OWNER/PMC/TPI			
1	Dispenser Frame		1.2.3.4.5		1.2.3.	1.2.3	D1, D2, D3, D4	Tech. Specs in PO	Review of documents
2	Mass Flow Meter		1.2.3.4.5.15		1.2.3.15	1.2.3.15	D1, D2, D3, D4, D7	D7 & Tech Specs in PO	Review of documents
3	Actuator Valves		1.2.3.4.5.6.7		1.2.3.6.7	1.2.3.6.7	D1,D2,D3,D4,D7	D7 & Tech Specs in PO	Review of documents
4	Filling hose		1.2.3.4.5.16		1.2.3.16	1.2.3.16	D1, D2, D3, D4	Tech. Specs in PO	Review of documents
5	Totalizer		1.2.3.8		1.2.3.8	1.2.3.8	D1, D2, D3, D4,D7	D7 & Tech Specs in PO	Review of documents
6	Software		9		9	9	D3	Tech. Specs in PO	Witness
7	Pressure Gauge		1.2.3.4.5.15		1.2.3.15	1.2.3.15	D1, D2, D3,D4,D7	D7 & Tech Specs in PO	Review of documents
8	Pressure Transducer		1.2.3.4.5.15		1.2.3.15	1.2.3.15	D1,D2,D3,D4,D7	D7 & Tech Specs in PO	Review of documents
9	Shut off valves		1.2.3.4.5.10		1.2.3.10	1.2.3.10	D1,D2,D3,D4,D7	D7 & Tech Specs in PO	Review of documents
10	Performance Test (using CNG)		11.21		11.21	11.21	D3,D7	D6, D7 & Tech Specs in PO	Witness
11	Dispenser response		12.13.14.17.19 .20		12.13.14.1 7.19.20	12.13.14.17.19.20	D3,D7	D7 & Tech Specs in PO	Witness

Note:

1. The Above Testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per Particular Technical specifications (PTS)
2. Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc. submitted by supplier.
3. All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA/OWNER at the time of Inspection
4. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note & MTC.
5. TPI/PMC/OWNER have right to inspect minimum 10% of all manufacturing activities as specified above

Sr.No	Name of ITEM/Package	Recommended Vendor List
1	**COALESCENT FILTER / REGULATORS**	ASEA BROWN BOVERI LTD.
2	COALESCENT FILTER / REGULATORS	BLUE STAR LTD
3	COALESCENT FILTER / REGULATORS	PLACKA INSTRUMENTS & CONTROLS PVT. LTD
4	COALESCENT FILTER / REGULATORS	SHAH PNEUMATICS
5	COALESCENT FILTER / REGULATORS	SHAVO NORGREN (I) PVT. LTD
6	COALESCENT FILTER / REGULATORS	PARKER
7	COALESCENT FILTER / REGULATORS	WEH
8	COALESCENT FILTER / REGULATORS	V AUTOMAT & INSTRUMENTS PVT. LTD.
9	COALESCENT FILTER / REGULATORS	VELJAN HYDRAIR PVT. LTD.
10	COALESCENT FILTER / REGULATORS	COMPAC NEWZEALAND
11	COALESCENT FILTER / REGULATORS	GASOREX
12	COALESCENT FILTER / REGULATORS	OEM
13	**PRESSURE RELIEF VALVE**	ALSTHOM FLUIDS SAPAG
14	PRESSURE RELIEF VALVE	ANDERSON GREENWOOD CROSBY
15	PRESSURE RELIEF VALVE	BHEL (TRICHY)
16	PRESSURE RELIEF VALVE	DRESSER INC.
17	PRESSURE RELIEF VALVE	FUKUI SEISAKUSHO CO. LTD.
18	PRESSURE RELIEF VALVE	INSTRUMENTATION LTD. (PALGHAT)
19	PRESSURE RELIEF VALVE	NAKAKITA SEISAKUSHO CO LTD.
20	PRESSURE RELIEF VALVE	PARCOL SPA
21	PRESSURE RELIEF VALVE	SAFETY SYSTEMS UR LTD.
22	PRESSURE RELIEF VALVE	SARASIN RSBD
23	PRESSURE RELIEF VALVE	SEBIN VALVES INDIA PVT. LTD.
24	PRESSURE RELIEF VALVE	TAI MILANO SPA
25	PRESSURE RELIEF VALVE	TYCO SANMAR LTD.
26	PRESSURE RELIEF VALVE	TYCO VALVES & CONTROLS INDIA PVT. LTD
27	PRESSURE RELIEF VALVE	SWAGELOK
28	PRESSURE RELIEF VALVE	PARKER
29	PRESSURE RELIEF VALVE	COMPAC NEWZEALAND
30	PRESSURE RELIEF VALVE	ASPRO
31	PRESSURE RELIEF VALVE	NUOVO PIGNONE SPA (ITALY)
32	PRESSURE RELIEF VALVE	FARINOSLA
33	PRESSURE RELIEF VALVE	FAINGER LASER
34	PRESSURE RELIEF VALVE	MERCER
35	PRESSURE RELIEF VALVE	FISHER ROSEMOUNT (EMERSON)
36	PRESSURE RELIEF VALVE	OFE & OE GROUP KEYSTONE VALVES PVT. LTD
37	PRESSURE RELIEF VALVE	HALOL
38	PRESSURE RELIEF VALVE	M/s Nirmal
39	PRESSURE RELIEF VALVE (PRV)	FMC SANMAR LTD.
40	PRESSURE RELIEF VALVE (PRV)	PROTEGO INDIA PVT. LTD.
41	PRESSURE RELIEF VALVE (PRV)	L&T VALVES LTD.
42	PRESSURE RELIEF VALVE (PRV)	MEKASTER (FORMERLY SEBIM) VALVES INDIA PVT. LTD.
43	PRESSURE RELIEF VALVE (PRV)	RMG REGAL + MESSTECH GMBH, GERMANY
44	PRESSURE RELIEF VALVE (PRV)	TYCO VALVES
45	**HOSES**	PARKER

46	HOSES	EATON
47	HOSES	SWAGELOK

Sr.No	Name of ITEM/Package	Recommended Vendor List
48	HOSES	TRANSFER OIL
49	HOSES	M/s. ZEC S.p.A Italy
50	**BREAKAWAY COUPLING**	OPW
51	BREAKAWAY COUPLING	STAUBLI
52	BREAKAWAY COUPLING	WEH
53	BREAKAWAY COUPLING	PARKER
54	BREAKAWAY COUPLING	OASIS
55	**FLAMEPROOF GLANDS**	COMET/OEM MAKE
56	**SURGE PROTECTOR**	PHONEX
57	SURGE PROTECTOR	MTL
58	SURGE PROTECTOR	P&F
59	SURGE PROTECTOR	OEM MAKE
60	SURGE PROTECTOR	MEGGITT AVIONICS
61	SURGE PROTECTOR	GENERAL MONITORS/ MSA
62	SURGE PROTECTOR	SPECTREX
63	SURGE PROTECTOR	DETRONICS
64	SURGE PROTECTOR	HONEYWELL
65	SURGE PROTECTOR	NET SAFETY
66	SURGE PROTECTOR	CROW ON
67	SURGE PROTECTOR	SIEGER
68	SURGE PROTECTOR	ISOLATORS
69	SURGE PROTECTOR	BARRIERS
70	SURGE PROTECTOR	ESP
71	SURGE PROTECTOR	Schneider
72	SURGE PROTECTOR	ASPRO
73	**NGV NOZZLES**	OPW
74	NGV NOZZLES	WEH
75	NGV NOZZLES	STAUBLI
76	NGV NOZZLES	PARKER
77	NGV NOZZLES	COMPAC
78	NGV NOZZLES	SHEREX
79	NGV NOZZLES	OASIS
80	**STATION PIPE**	MAHARASHTRA SEAMLESS LTD.
81	STATION PIPE	INDIAN SEAMLESS METAL TUBES
82	STATION PIPE	SURYA GLOBAL STEEL & TUBES
83	STATION PIPE	INTERFORGE
84	STATION PIPE	HEAVY METAL & TUBES LTD.
85	STATION PIPE	JINDAL SAW LTD.
86	STATION PIPE	MAHA LAKSHMI SEAMLESS LTD.
87	STATION PIPE	RATANAMANI METAL TUBES LTD.
88	**BALL VALVES**	FLOW CHEM
89	BALL VALVES	L&T VALVES LIMITED

90	BALL VALVES	MICROFINISH VALVES PVT. LTD.
91	BALL VALVES	STEEL STRONG VALVES (I) PVT LTD.
92	BALL VALVES	OSWAL INDUSTRIES LTD.
93	BALL VALVES	NILON VALVES PVT LTD.
94	BALL VALVES	PETRO VALVES PVT. LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
95	BALL VALVES	ZED VALVES CO. PVT LTD.
96	BALL VALVES	HAWA ENGINEERING LTD. INDIA
97	BALL VALVES	GM ENGINEERING
98	BALL VALVES	LEADER VALVES LTD.
99	BALL VALVES	VIRGO VLAVES
100	BALL VALVES	AUDCO
101	BALL VALVES	ROTEX
102	BALL VALVES	TUBEFIT
103	**INSULATING JOINTS**	IGP ENGINEERS PVT. LTD., CHENNAI, TAMIL NADU, INDIA
104	INSULATING JOINTS	ADVANCE ELECTRONICS SYSTEM, GUJARAT, INDIA
105	INSULATING JOINTS	NUPROS INC. GUJRAT
106	INSULATING JOINTS	VEE KAY VIKRAM & CO. LLP, AHMEDABAD - 380054 ,GUJARAT, INDIA
107	**GLOBE VALVES**	NSSL
108	GLOBE VALVES	OSWAL INDUSTRIES LTD.
109	GLOBE VALVES	L&T VALVES LIMITED
110	GLOBE VALVES	ZED VALVES CO. PVT LTD.
111	GLOBE VALVES	STEEL STRONG VALVES (I) PVT LTD.
112	GLOBE VALVES	LEADER VALVES LTD.
113	GLOBE VALVES	NILON VALVES PVT LTD.
114	GLOBE VALVES	NITON VALVES PVT. LTD.
115	GLOBE VALVES	PETRO VALVES PVT. LTD.
116	GLOBE VALVES	FLOWCHEM INDUSTRIES
117	GLOBE VALVES	GM ENGINEERING
118	GLOBE VALVES	WEIR BDK VALVES
119	**CHECK VALVES**	ECONO VALVES PVT. LTD.
120	CHECK VALVES	L&T VALVES LTD.
121	CHECK VALVES	OSWAL INDUSTRIES LTD
122	CHECK VALVES	NILON VALVES PVT LTD.
123	CHECK VALVES	WEIR BDK VALVES
124	CHECK VALVES	FLOWCHEM INDUSTRIES
125	CHECK VALVES	NSSL LIMITED
126	CHECK VALVES	LEADER VALVES LTD.
127	CHECK VALVES	NITON VALVES IND. PVT. LTD.
128	**TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES**	**SWAGELOK**
129	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	PARKER
130	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	COMPAC
131	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	HAMLET
132	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	HYLOCK
133	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	SEALEXCEL

134	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	OASIS
135	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	SSP
136	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	DK-LOK
137	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	OASIS
138	**INSTRUMENT SS FITTINGS/ VALVES**	SWAGELOK
139	INSTRUMENT SS FITTINGS/ VALVES	PARKER
140	INSTRUMENT SS FITTINGS/ VALVES	HAMLET
141	INSTRUMENT SS FITTINGS/ VALVES	HYLOK

Sr.No	Name of ITEM/Package	Recommended Vendor List
142	INSTRUMENT SS FITTINGS/ VALVES	DKLOK
143	INSTRUMENT SS FITTINGS/ VALVES	SEALEXCEL
144	INSTRUMENT SS FITTINGS/ VALVES	SSP
145	INSTRUMENT SS FITTINGS/ VALVES	M/s SR Greentech(Manufacturer-BMT SuperLOK)
146	INSTRUMENT SS FITTINGS/ VALVES	ABAC
147	INSTRUMENT SS FITTINGS/ VALVES	STAUFF
148	INSTRUMENT SS FITTINGS/ VALVES	M/s Fluid Controls
149	INSTRUMENT SS FITTINGS/ VALVES	M/s Astec
150	INSTRUMENT SS FITTINGS/ VALVES	M/s DAWSONS-TECH COMPONENTS LLP
151	**SS TUBING**	SANDVIK
152	SS TUBING	FAE
153	SS TUBING	TUBACEX
154	SS TUBING	PARKER
155	SS TUBING	RATANAMANI
156	SS TUBING	JINDAL SAW LTD.
157	**PIPE FITTINGS (SEAMLESS / WELDED)**	TEEKAY TUBE
158	PIPE FITTINGS (SEAMLESS / WELDED)	AMFORGE INDUSTRIES
159	PIPE FITTINGS (SEAMLESS / WELDED)	PIPEFIT ENGINEERS PVT. LTD.
160	PIPE FITTINGS (SEAMLESS / WELDED)	C D ENGINEERING CO. GHAZIABAD
161	PIPE FITTINGS (SEAMLESS / WELDED)	CHW FORGE PVT LTD., GHAZIABAD
162	PIPE FITTINGS (SEAMLESS / WELDED)	SANGHVI FORGING & ENGINEERING, VADODARA
163	PIPE FITTINGS (SEAMLESS / WELDED)	GOOD LUCK ENGINEERING CO. / GOOD LUCK INDIA LTD., GHAZIABAD
164	PIPE FITTINGS (SEAMLESS / WELDED)	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
165	PIPE FITTINGS (SEAMLESS / WELDED)	JINDAL FORGINGS PVT LTD
166	PIPE FITTINGS (SEAMLESS / WELDED)	SHAKTI FORGE INDUSTRIES
167	PIPE FITTINGS (SEAMLESS / WELDED)	A.M. ENGINEERS
168	PIPE FITTINGS (SEAMLESS / WELDED)	KUNJ FORGING (P) LTD GHAZIABAD
169	PIPE FITTINGS (SEAMLESS / WELDED)	VIVIAL FORGE (P) LTD.
170	PIPE FITTINGS (SEAMLESS / WELDED)	PIPEFIT ENGINEERS PVT. LTD.
171	PIPE FITTINGS (SEAMLESS / WELDED)	UNITED FORGE INDUSTRIES
172	PIPE FITTINGS (SEAMLESS / WELDED)	SKY FORGE PVT. LTD.
173	PIPE FITTINGS (SEAMLESS / WELDED)	SAWAN ENGINEERS PVT. LTD.
174	PIPE FITTINGS (SEAMLESS / WELDED)	DEE PIPING SYSTEM (EARLIER DEE DEVLOPMENT ENGINEERS PVT. LTD.)
175	PIPE FITTINGS (SEAMLESS / WELDED)	SIDDHARTH & GAUTAM INDIA
176	PIPE FITTINGS (SEAMLESS / WELDED)	M.S. FITTINGS MANUFACTURING COMPANY PVT. LTD.
177	PIPE FITTINGS (SEAMLESS / WELDED)	GUJRAT INFRA PIPES PVT. LTD.

178	PIPE FITTINGS (SEAMLESS / WELDED)	TOPAZ PIPING INDUSTRIES
179	PIPE FITTINGS (SEAMLESS / WELDED)	COMMERCIAL SUPPLYING AGENCY, MUMBAI
180	PIPE FITTINGS (SEAMLESS / WELDED)	EBY INDUSTRIES, MUMBAI
181	**PIPE FITTINGS (FORGED)**	SIDDHARTH & GAUTAM
182	PIPE FITTINGS (FORGED)	C D ENGINEERING CO. GHAZIABAD
183	PIPE FITTINGS (FORGED)	CHW FORGE PVT LTD., GHAZIABAD
184	PIPE FITTINGS (FORGED)	SANGHVI FORGING & ENGINEERING, VADODARA
185	PIPE FITTINGS (FORGED)	AMFORGE INDUSTRIES
186	PIPE FITTINGS (FORGED)	GOOD LUCK ENGINEERING CO. /GOOD LUCK INDIA LTD., GHAZIABAD
187	PIPE FITTINGS (FORGED)	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
188	PIPE FITTINGS (FORGED)	JINDAL FORGINGS PVT LTD

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189	PIPE FITTINGS (FORGED)	SHAKTI FORGE INDUSTRIES
190	PIPE FITTINGS (FORGED)	A.M. ENGINEERS
191	PIPE FITTINGS (FORGED)	KUNJ FORGING (P) LTD GHAZIABAD
192	PIPE FITTINGS (FORGED)	VIVIAL FORGE (P) LTD.
193	PIPE FITTINGS (FORGED)	PIPEFIT ENGINEERS PVT. LTD.
194	PIPE FITTINGS (FORGED)	UNITED FORGE INDUSTRIES
195	PIPE FITTINGS (FORGED)	SKY FORGE PVT. LTD.
196	PIPE FITTINGS (FORGED)	DEE PIPING SYSTEM (EARLIER DEE DEVLOPMENT ENGINEERS PVT. LTD.)
197	**FLOW TEES**	TECHNOGORGE- ITALY (INTERNATIONAL PIPING GROUP)
198	FLOW TEES	PIPEFIT ENGINEERS PVT. LTD.
199	FLOW TEES	VIVIAL FORGE PVT LTD
200	FLOW TEES	UNITED FORGE PVT LTD
201	FLOW TEES	MULTITEX FILTRATIONS
202	FLOW TEES	SAWAN ENGINEERS PVT. LTD.
203	**FLANGES**	ECHJAY INDUSTRIES PVT. LTD.
204	FLANGES	CD INDUSTRIES
205	FLANGES	CHW FORGE (CHOUDHARY HAMMER WORKS)
206	FLANGES	METAL FORGINS (P) LTD.
207	FLANGES	PUNJAB STEEL WORKS
208	FLANGES	AMFORGE INDUSTRIES
209	FLANGES	JAV FORGINGS PVT. LTD.
210	FLANGES	C D ENGINEERING CO.
211	FLANGES	GOOD LUCK ENGINEERING CO. /
212	FLANGES	GOOD LUCK INDIA LTD., GHAZIABAD
213	FLANGES	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
214	FLANGES	JINDAL FORGINGS PVT LTD
215	FLANGES	SHAKTI FORGE INDUSTRIES
216	FLANGES	A.M. ENGINEERS
217	FLANGES	KUNJ FORGING (P) LTD GHAZIABAD
218	FLANGES	VIVIAL FORGE (P) LTD.
219	FLANGES	J K FORGINGS
220	FLANGES	SANGHVI FORGING & ENGINEERING LTD.
221	FLANGES	PIPEFIT ENGINEERS PVT. LTD.

222	FLANGES	SAWAN ENGINEERS PVT. LTD.
223	**WELDING ELECTRODE**	FOR MAINLINE- LINCOLN / BOHLER MAKE
224	WELDING ELECTRODE	FOR TERMINAL / STATION PIPING- LINCOLN/D&H
225	WELDING ELECTRODE	FOR Mainline/Terminal/Station Piping- M/s. ITW HOBART
226	**NDT AGENCIES**	NDT SERVICES, AHMEDABAD
227	NDT AGENCIES	RTD , MUMBAI
228	NDT AGENCIES	SIEVERT, MUMBAI
229	NDT AGENCIES	X-TECH - VIZAG
230	NDT AGENCIES	GEECY INDUSTRIAL SERVICES PVT. LTD. MUMBAI
231	**FASTENERS**	MULTI FASTENERS PVT. LTD.
232	FASTENERS	PRECISION ENGINEERING INDUSTRIES
233	FASTENERS	PRECISION AUTO ENGINEERS
234	FASTENERS	NITIN FASTENERS
235	FASTENERS	DEEPAK FASTENERS LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
236	FASTENERS	FIX FIT FASTING MFG. PVT. LTD.
237	FASTENERS	PACIFIC FORGING & FASTNERS PVT LTD., MUMBAI
238	FASTENERS	MULTI FASTNERS PVT LTD., VADODARA
239	FASTENERS	AEP COMPANY, ANAND
240	FASTENERS	HARDWIN FASTENERS PVT LTD., MUMBAI
241	FASTENERS	SYNDICATE ENGINEERING INDUSTRIES, MUMBAI
242	FASTENERS	PIONEER NUTS AND BOLTS PVT. LTD., LUDHIANA
243	FASTENERS	MULTI THREAD FASTENERS, VADODARA
244	FASTENERS	PRESIDENT ENGINEERING WORKS, MUMBAI
245	FASTENERS	UDHERA FASTNERS LTD. LUDHIANA
246	FASTENERS	NEXO INDUSTRIES LIMITED, LUDHIANA
247	FASTENERS	CONSOL ENGINEERING & FASTENERS INDUSTRIES, HOWRAH
248	FASTENERS	NIREKA ENGG CO. PVT. LTD.
249	**GASKETS**	GOODRICH GASKETS. PVT. LTD.
250	GASKETS	IGP ENGINEERS PVT. LTD., CHENNAI, TAMIL NADU, INDIA
251	GASKETS	MADRAS INDUSTRIAL PRODUCTS
252	GASKETS	BANCO PRODUCTS (P) LTD.
253	GASKETS	UNI KLINGER LIMITED, NEW DELHI
254	GASKETS	GASKET INDIA PRIVATE LTD., CHENNAI
255	GASKETS	STARFLEX SEALING INDIA PVT. LTD.
256	**HEAT SHRINKABLE SLEEVES**	SHRI NARAYAN IMPAC INDIA LLP (SNI) (HSS and HDD Sleeves)
257	HEAT SHRINKABLE SLEEVES	DENSO GMBH
258	HEAT SHRINKABLE SLEEVES	SEAL FOR LIFE INDUSTRIES HTLP-80 (HSS) & DIREX SLEEVE (HDD)
259	HEAT SHRINKABLE SLEEVES	CYG CHANGTONG NEW MATERIAL CO. LTD., CHINA
260	**COLD APPLIED TAPES**	BERRY PLASTICS CORPORATION, BELGIUM- COVALENCE BRAND
261	COLD APPLIED TAPES	DENSO GMBH
262	COLD APPLIED TAPES	CANUSA-CPS A DIVISION OF SHAWCOR INC.
263	**PUR (TAR-FREE) COATING**	DENSO GMBH
264	PUR (TAR-FREE) COATING	BERRY PLASTICS CORPORATION, OMAN/ HOUSTON- POWERCRETE BRAND
265	**CASING END CLOSURE**	RAYCHEM RPG LIMITED

266	CASING END CLOSURE	SEAL FOR LIFE INDUSTRIES
267	CASING END CLOSURE	RACI, ITLAY
268	**ROCKSHIELD**	RAYCHEM RPG LIMITED
269	ROCKSHIELD	SEAL FOR LIFE
270	ROCKSHIELD	DENSO GMBH
271	**SPACER / INSULATOR**	RAYCHEM RPG LIMITED
272	SPACER / INSULATOR	MALON TECHNICAL PRODUCTS
273	SPACER / INSULATOR	ADVANCE PRODUCTS & SYSTEM INC.
274	SPACER / INSULATOR	RACI, ITLAY
275	**WARNING MAT**	AMBICA PLASTIC INDUSTRIES
276	WARNING MAT	SPARCO MULTIPLAST PVT. LTD.
277	WARNING MAT	SHRI VIJAY WIRE PVT. LTD.
278	WARNING MAT	SINGHAL INDUSTRIES PVT LTD
279	WARNING MAT	BINA ENTERPRISE
280	**GI PIPES**	TATA BSL LTD
281	GI PIPES	SWASTIK PIPE LTD.
282	GI PIPES	JINDAL INDUSTRIES LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
283	GI PIPES	VISHAL PIPES LTD.
284	GI PIPES	INDUS TUBES LTD.
285	GI PIPES	ADVANCE STEEL TUBES LTD.
286	GI PIPES	SURYA ROSHNI LIMITED
287	GI PIPES	RAMA STEEL TUBES
288	GI PIPES	P S STEEL TUBES
289	GI PIPES	M/s Goodluck India Ltd
290	**GI FITTINGS**	SARIN INDUSTRIES LTD.
291	GI FITTINGS	JUPITER METAL INDUSTRIES LTD.
292	GI FITTINGS	JAINSONS INDUSTRIES LTD.
293	GI FITTINGS	JINAN MEIDE
294	GI FITTINGS	GREEN MALLEABLE PVT LTD
295	GI FITTINGS	RAJNESH MALLEABLE LTD., DELHI
296	GI FITTINGS	INDUSTRIAL VALVES & COMPONENTS, DELHI
297	GI FITTINGS	EXCEL METAL & ENGINEERING INDUSTRIES,MUMBAI
298	GI FITTINGS	MODERN STORES & ENGINEERING CONCERN, KOLKATA
299	GI FITTINGS	CHOKHAWALA DISTRIBUTORS (FOR JINAN MEIDE)
300	**FORGED FITTINGS**	JAINSONS INDUSTRIES LTD JALANDHAR
301	FORGED FITTINGS	MODERN STORES & ENGINEERING CONCERN, KOLKATA
302	FORGED FITTINGS	BHARAT FORGE & PRESS INDUSTRIES BARODA
303	FORGED FITTINGS	B M METERS PVT LTD, JALANDHAR
304	**ISOLATION BALL VALVE & APPLIANCE VALVE**	ENOLOGAS BONOMI S.P.A.
305	ISOLATION BALL VALVE & APPLIANCE VALVE	NINGBO ZHIQING INDUSTRIAL CO. LIMITED
306	ISOLATION BALL VALVE & APPLIANCE VALVE	ZHEJIANG VALOGIN TECHNOLOGY CO. LTD.
307	ISOLATION BALL VALVE & APPLIANCE VALVE	UMESH ENTERPRISES
308	ISOLATION BALL VALVE & APPLIANCE VALVE	PARKER HANNIFIN S.P.A.
309	ISOLATION BALL VALVE & APPLIANCE VALVE	CHANDAN ENTERPRISES

310	ISOLATION BALL VALVE & APPLIANCE VALVE	ZHEJIANG YIFAN TECHNOLOGY CO., LTD.
311	**PE (FITTING/VALVES/TRANSITION FITTINGS)**	GEORG FISCHER PIPING SYSTEM
312	PE (FITTING/VALVES/TRANSITION FITTINGS)	KIMPLAS PIPING SYSTEMS
313	PE (FITTING/VALVES/TRANSITION FITTINGS)	INNOGAZ & M/S FRIALEN OF M/S ALIAXIS UTILITIES & INDUSTRY PVT. LTD. (FORMERLY GLYNWED PIPE SYSTEMS)
314	PE (FITTING/VALVES/TRANSITION FITTINGS)	RMG AUTOMETERS GAS TECHNOLOGIES
315	PE (FITTING/VALVES/TRANSITION FITTINGS)	FRIATECH AG, GERMANY (REPRESENTED BY SHERMAN SALES IN INDIA)
316	PE (FITTING/VALVES/TRANSITION FITTINGS)	AL-AZIZ PLASTICS (P) LTD.
317	**STEEL REINFORCED RUBBER HOSE (TYPE-4)**	SUPER SEAL FLEXIBLE HOSE LTD.
318	STEEL REINFORCED RUBBER HOSE (TYPE-4)	SURAKSHA PRODUCTS PVT. LTD.
319	STEEL REINFORCED RUBBER HOSE (TYPE-4)	VANSH INDUSTRIES
320	STEEL REINFORCED RUBBER HOSE (TYPE-4)	T & L GASES
321	**CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)**	KPC FLEX TUBES
322	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	VESTAS HOSE DIVISION
323	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	ALFA HOSES & BELLOWS MFG. CO.
324	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	ALPHA FLEXI TUBES
325	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	CHANDAN ENTERPRISES
326	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	VIKRAM & CO.
327	**MDPE PIPE**	HARI UDYOG PVT. LTD
328	MDPE PIPE	JAIN IRRIGATION SYSTEMS LTD.

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329	MDPE PIPE	ORI PLAST LTD.
330	MDPE PIPE	VISHAKHA IRRIGATION PVT. LTD.
331	MDPE PIPE	DURALINE INDIAN PVT. LTD.
332	MDPE PIPE	KRITI INDUSTRIES (I) LTD., INDORE
333	MDPE PIPE	VEEKAY PLAST
334	MDPE PIPE	M/s Venuka Polymers Pvt. Ltd
335	**COPPER TUBES & FITTINGS**	RAJCO METAL
336	COPPER TUBES & FITTINGS	MEHTA TUBES
337	COPPER TUBES & FITTINGS	JAY BANAS METALS PVT. LTD
338	COPPER TUBES & FITTINGS	PARAS INDUSTRIES LTD. (ONLY FOR FITTINGS)
339	COPPER TUBES & FITTINGS	CHANDAN ENTERPRISE
340	COPPER TUBES & FITTINGS	JANYA EXTRUSIONS PVT LTD.
341	**BRASS FITTINGS**	PARAS INDUSTRIES LTD.
342	BRASS FITTINGS	CHANDAN ENTERPRISES
343	BRASS FITTINGS	PARAS INDUSTRIES LTD.
344	BRASS FITTINGS	OM BRASS ENTERPRISES
345	BRASS FITTINGS	CHOKHAWALA DISTRIBUTORS
346	**THIRD PARTY INSPECTION AGENCY**	AMERICAN BUREAU SERVICES
347	THIRD PARTY INSPECTION AGENCY	TECHNISCHE ULIERWACHUNGS VEREIN (TUV)
348	THIRD PARTY INSPECTION AGENCY	DNV-GL
349	THIRD PARTY INSPECTION AGENCY	MS EDLIPSE ENGINEERING GLOBAL PVT. LTD
350	THIRD PARTY INSPECTION AGENCY	INTERNATIONAL CERTIFICATION SERVICES PVT LTD
351	THIRD PARTY INSPECTION AGENCY	BUREAU VERITAS
352	THIRD PARTY INSPECTION AGENCY	CERTIFICATION ENGINEERS INTERNATIONALLIMITED (CEIL)

353	THIRD PARTY INSPECTION AGENCY	LLOYD REGISTER OF INDUSTRIAL SERVICES
354	THIRD PARTY INSPECTION AGENCY	SGS
355	THIRD PARTY INSPECTION AGENCY	TUV INDIA PVT. LTD. (TUV - NORD)
356	THIRD PARTY INSPECTION AGENCY	TUV-SUD SOUTH ASIA
357	THIRD PARTY INSPECTION AGENCY	M/s. Industrial Inspection & Verification Services (I) Pvt. Ltd
358	THIRD PARTY INSPECTION AGENCY	M/s Hertz Inspection Services pvt. Ltd
359	**HDPE Pipe**	DURALINE INDIA
360	HDPE Pipe	JAIN IRRIGATION SYSTEMS LIMITED
361	HDPE Pipe	KRITI INDUSTRIES INDIA LTD.
362	HDPE Pipe	ORIPLAST LTD.
363	HDPE Pipe	VEE KAY PLAST
364	HDPE Pipe	VISHAKHA IRRIGATION PVT. LTD.
365	HDPE Pipe	HARI PLAST
366	HDPE Pipe	CLIMAX SYNTHETICS (P) LTD., VADODRA
367	HDPE Pipe	SANGIR PLASTICS (P) LTD., MUMBAI
368	HDPE Pipe	HIMALYAN PIPE INDUSTRIES, SOLAN
369	HDPE Pipe	DUTRON POLYMERS LTD.
370	HDPE Pipe	PARIXIT IRRIGATION LIMITED
371	HDPE Pipe	VEEKAY PLAST
372	**HDPE DUCT FOR OFC**	JAIN IRRIGATION SYSTEM LTD
373	HDPE DUCT FOR OFC	KIRTI INDUSTRIES
374	HDPE DUCT FOR OFC	ORIPLAST
375	HDPE DUCT FOR OFC	DURA-LINE

Sr.No	Name of ITEM/Package	Recommended Vendor List
376	HDPE DUCT FOR OFC	VEEKAY PLAST
377	HDPE DUCT FOR OFC	VEDANTA POLYMER PVT LTD
378	HDPE DUCT FOR OFC	HARIPLAST
379	HDPE DUCT FOR OFC	PARIXIT INDUSTRIES LTD
380	HDPE DUCT FOR OFC	PENNWALT AGRU PLASTIC LT
381	**CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)**	HEAVY METAL & TUBES LTD., MEHSANA
382	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	ISMT LIMITED
383	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	JINDAL SAW LTD.
384	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MAHARASHTRA SEAMLESS LIMITED
385	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MAHALAXMI METAL CORPORATION
386	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	SAINEST TUBES PVT. LTD.
387	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	RATNADEEP METAL & TUBES LTD.
388	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	JFE STEEL CORPORATION
389	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MANNESMANN S.A.
390	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA
391	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	SUMITOMO METAL IND.LTD
392	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	NIPPON METAL INDUSTRY CO
393	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	TENARIS
394	**CARBON STEEL PIPES (API 5L GRADE - PSL2)**	RATNAMANI METALS & TUBES LTD. - FOR UP TO 18” ERW PIPES & SAW PIPES OF 18” & ABOVE.
395	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	TATA BHUSHAN STEEL LIMITED- FOR UP TO 18” ERW PIPES
396	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	JINDAL INDIA LTD - FOR UP TO 18” ERW PIPES

397	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	JINDAL SAW – FOR 16” & ABOVE SAW PIPES
398	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	SURYA ROSHINI LTD-- FOR UP TO 16” ERW PIPES & SAW PIPES OF 18” & ABOVE
399	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	MAHARASHTRA SEAMLESS LIMITED - SEAMLESS PIPES, ERW PIPES,
400	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	WELSPUN CORP LTD - ERW PIPES & SAW PIPES
401	**QUICK CONNECT BODY & STEM**	PARKER
402	QUICK CONNECT BODY & STEM	SWAGELOK
403	**QUICK CONNECT BODY & STEM**	PSL LTD.
404	QUICK CONNECT BODY & STEM	JINDAL SAW LIMITED
405	**HOT INDUCTION BEND**	WELSPUN GUJRAT STAHAL ROHERN LTD
406	HOT INDUCTION BEND	SAWAN ENGINEERS PVT LTD
407	HOT INDUCTION BEND	FABRICOM
408	HOT INDUCTION BEND	LALIT ROHR FITTINGS PVT LTD
409	**FLAME ARRESTOR**	FLUIDYNE INSTRUMENTS PVT. LTD.
410	FLAME ARRESTOR	PROTEGO India Pvt. Ltd.
411	FLAME ARRESTOR	NIRMAL INDUSTRIAL CONTROLS PVT. LTD.
412	FLAME ARRESTOR	SUPER SAFETY SERVICES
413	FLAME ARRESTOR	A PLUS PROJECTS & TECHNOLOGY (P) LTD.
414	**ON OFF SS BALL/NEEDLE /NON RETURN VALVE FOR CNG APPLICATION**	PARKER
415	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SWAGELOK
416	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	ABAC
417	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SPIRAX SARCO
418	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	WORCESTER
419	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	WAREE / BAUMER
420	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	STAUFF
421	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SSP
422	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	L&T

Sr.No	Name of ITEM/Package	Recommended Vendor List
423	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SANKEY CONTROLS
424	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	ROTEX
425	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	AUDCO
426	**SPLIT TEES FOR HOT TAPPING**	TD WILLIAMSON
427	SPLIT TEES FOR HOT TAPPING	ADVANTICA
428	SPLIT TEES FOR HOT TAPPING	FURMANITE INTERNATIONAL LTD - UK
429	**QUICK OPENING END CLOSURE**	FORAIN SRL, ITALY
430	QUICK OPENING END CLOSURE	G.D.ENGINEERING
431	QUICK OPENING END CLOSURE	PERRY EQUIPMENT CORPORATION
432	QUICK OPENING END CLOSURE	PIPELINE ENGINEERING
433	QUICK OPENING END CLOSURE	SIIRTEC NIGI S.P.A
434	QUICK OPENING END CLOSURE	GROUPE GENOYER (PHOCEENNE)
435	QUICK OPENING END CLOSURE	ROSEN GROUP
436	QUICK OPENING END CLOSURE	TD WILLIAMSON
437	**PIG SIGNALLER / PIG ALERTS**	G.D.ENGINEERING
438	PIG SIGNALLER / PIG ALERTS	FORAIN S.R.L
439	PIG SIGNALLER / PIG ALERTS	TD WILLIAMSON
440	PIG SIGNALLER / PIG ALERTS	GROUPE GENOYER (PHOCEENNE)

441	**EGP/ INTELLIGENT PIGGING**	ROSEN GROUP
442	EGP/ INTELLIGENT PIGGING	PIPELINE ENGINEERING
443	EGP/ INTELLIGENT PIGGING	SPETSNEFTEGAZ NPO JSC (NGKS), RUSSIA
444	EGP/ INTELLIGENT PIGGING	TD WILLIAMSON
445	**VACCUM DRYING**	CORRTECH INTERNATIONAL PVT. LTD.
446	VACCUM DRYING	TOTALINE, AUSTRALIA
447	**PAINTS FOR INTERNAL COATING**	DUPONT, INDIA
448	PAINTS FOR INTERNAL COATING	PERFORMANCE COATING GMBH
449	PAINTS FOR INTERNAL COATING	COPAN
450	**FIRE EXTINGUISHER**	SAFEX FIRE SERVICES
451	FIRE EXTINGUISHER	BRIJBASI HI-TECH UDYOG
452	FIRE EXTINGUISHER	NITIN FIRE PROTECTION INDUSTRIES LTD.
453	FIRE EXTINGUISHER	SUPERMEX EQUIPMENTS
454	FIRE EXTINGUISHER	KOOVERJI DEVSHI & CO.
455	**HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES**	MINIMAX
456	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	VIJAY FIRE
457	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	NEWAGE
458	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	ZENITH
459	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	NITIN FIRE PROTECTION INDUSTRIES LTD.
460	**HOSES & HOSES ACCESSORIES**	GAYATRI INDUSTRIAL CORPORATION
461	HOSES & HOSES ACCESSORIES	ROYAL INDIA CORPORATION
462	HOSES & HOSES ACCESSORIES	BRIJBASI HI-TECH UDYOG
463	HOSES & HOSES ACCESSORIES	NITIN FIRE PROTECTION INDUSTRIES LTD.
464	HOSES & HOSES ACCESSORIES	ZAVERCHAND MARKETING PVT. LTD.
465	HOSES & HOSES ACCESSORIES	NEWAGE
466	HOSES & HOSES ACCESSORIES	SIMPLEX RUBBER PRODUCTS
467	**CONTRACTORS FOR HDD WORK**	CHERINGTON ASIA (INDIA) PVT. LTD.
468	CONTRACTORS FOR HDD WORK	ESSAR CONSTRUCTION LTD.
469	CONTRACTORS FOR HDD WORK	MERSING CONSTRUCTION AND ENGINEERING SDN BHD., SELANGOR (MALAYSIA)

Sr.No	Name of ITEM/Package	Recommended Vendor List
470	CONTRACTORS FOR HDD WORK	HERRENKNECHT (ASIA) LTD. (THAILAND)
471	CONTRACTORS FOR HDD WORK	MID EAST PIPELINE
472	CONTRACTORS FOR HDD WORK	N.R. PATEL & CO.,
473	CONTRACTORS FOR HDD WORK	TRENCHLESS
474	**CONTRACTORS FOR VACCUM DRYING**	CORRTECH INTERNATIONAL PVT. LTD.
475	CONTRACTORS FOR VACCUM DRYING	TOTALINE, AUSTRALIA
476	**PAINTS FOR OUTER SURFACE**	ASIAN PAINTS LTD.
477	PAINTS FOR OUTER SURFACE	SIGMA PAINTS S.A. LTD.
478	PAINTS FOR OUTER SURFACE	BERGER PAINTS INDIA LTD.
479	PAINTS FOR OUTER SURFACE	KANSAI NEROLAC PAINTS LTD.
480	**VITREOUS CHINA SANITARYWARE**	PARRYWARE
481	VITREOUS CHINA SANITARYWARE	HINDUSTAN
482	VITREOUS CHINA SANITARYWARE	CERA
483	**STAINLESS STEEL SINKS**	AMC
484	STAINLESS STEEL SINKS	NEELKANTH

485	**C.P FITTINGS**	PARCO
486	C.P FITTINGS	GEM
487	**C.P ACCESSORIES, WASTE FITTINGS**	ESS
488	C.P ACCESSORIES, WASTE FITTINGS	LOTUS
489	C.P ACCESSORIES, WASTE FITTINGS	ORIENT
490	**PVC PIPES**	SUPREME
491	PVC PIPES	PRINCE
492	**COMPOSITE PIPES & FITTINGS**	KITEC
493	**GUN METAL VALVES AND LOCKS**	LEADER
494	GUN METAL VALVES AND LOCKS	ZOLOTE
495	**CI DOUBLE FLANGED SLUICE VALVES, NON**	KIRLOSKAR
496	**STONE WARE PIPE AND GULLY TRAPS**	PERFECT
497	**WATER TANKS**	SINTEX
498	**ALUMINIUM HARDWARE**	EARIBIHARI
499	**GLASS**	MODIGUARD
500	GLASS	ATUL
501	**ALUMINIUM DOOR/WINDOW SECTION**	HINDALCO
502	ALUMINIUM DOOR/WINDOW SECTION	ULTRATECH CEMENTS
503	**CEMENT**	AMBUJA
504	CEMENT	ACC
505	CEMENT	BIRLA
506	**PAINTS**	ASIAN
507	PAINTS	BERGER
508	PAINTS	NEROLAC
509	PAINTS	SHALIMAR
510	PAINTS	BOMBAY
511	**CERAMIC/VITRIFILED/VITREOUS TILES**	KAJARIA
512	CERAMIC/VITRIFILED/VITREOUS TILES	JOHNSON
513	CERAMIC/VITRIFILED/VITREOUS TILES	SOMANY
514	STRUCTURAL STEEL	SAIL
515	**REINFORCEMENT STEEL**	TISCO
516	REINFORCEMENT STEEL	SAIL

Sr.No	Name of ITEM/Package	Recommended Vendor List
517	**MIXED METAL OXIDE (MMO) ANODES**	TITANOR COMPONENTS LTD., GOA
518	**SPARK GAP ARRESTOR / SURGE DIVERTER**	DHEN, GERMANY
519	SPARK GAP ARRESTOR / SURGE DIVERTER	MC MILLER
520	SPARK GAP ARRESTOR / SURGE DIVERTER	DAIRY LAND ELECTRICAL INDUSTRIES
521	**CU/CUSO4 REFERENCE CELLS**	MC MILLER, USA
522	CU/CUSO4 REFERENCE CELLS	BORIN, USA
523	CU/CUSO4 REFERENCE CELLS	KRICK
524	**THERMIT WELD MATERIAL**	ERICO EUROPA
525	**PETROLEUM COKE BREEZE**	GOA CARBON , GOA
526	PETROLEUM COKE BREEZE	INDIA CARBON, DURGAPUR(WB)
527	**MG/ZN ANODE**	CORTECH INTERNATIONAL PVT. LTD.
528	MG/ZN ANODE	TITANOR COMPONENT LTD., GOA

529	MG/ZN ANODE	SCIENTIFIC METAL ENGINEERS KARAIKUDI
530	**PIN BRAZING**	BAC
531	PIN BRAZING	SAFETRACK
532	**CABLE LUGS**	ISMAIL, RANCHI
533	CABLE LUGS	DOWELS, MUMBAI
534	**CABLE GLANDS**	FLEXPRO ELECTRICAL PVT. LTD., MUMBAI
535	CABLE GLANDS	FLAMEPROOF EQUIPMENT PVT. LTD., MUMBAI
536	CABLE GLANDS	BALIGA LIGHTING EQUIPMENT LTD., CHENNAI
537	**BACKFILL**	INDIA CARBON
538	BACKFILL	GOA CARBON
539	**POLARIZATION CELL**	MC MILLER
540	POLARIZATION CELL	KRIK ENGINEERING
541	JUNCTION BOX	FLEXPRO
542	JUNCTION BOX	FELP CONTROL GEARS
543	**TEST STATION/ JUNCTION BOX (WEATHERPROOF)**	UNDTS
544	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	CORRTECH INTERNATIONAL
545	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	CCS, MUMBAI
546	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	RAYCHEM RPG PVT LTD
547	**MIXED METAL OXIDE (MMO) ANODES**	TITANOR COMPONENTS LTD., GOA
548	**SOLID STATE DECOUPLER**	KRISTRON SYSTEMS
549	SOLID STATE DECOUPLER	DEHN GERMANY
550	SOLID STATE DECOUPLER	RUSTROL, USA
551	SOLID STATE DECOUPLER	DAIRYLAND ELECTRICALS,USA
552	**GAS OVER OIL ACTUATORS**	BIFFI ITALIA S.R.L, ITALY
553	GAS OVER OIL ACTUATORS	ROTORK FLUID SYTEM S.R.L
554	GAS OVER OIL ACTUATORS	SHAFER ACTUATORS
555	GAS OVER OIL ACTUATORS	SCHUCK
556	GAS OVER OIL ACTUATORS	BETTIS CORPORATION (EMERSON GROUP)
557	GAS OVER OIL ACTUATORS	LEEDEN
558	GAS OVER OIL ACTUATORS	NELES
559	**AIR FILTER REGULATORS**	ASEA BROWN BOVERI LTD.
560	AIR FILTER REGULATORS	BLUE STAR LTD
561	AIR FILTER REGULATORS	DIVYA CONTROL ELEMENTS PVT. LTD.
562	AIR FILTER REGULATORS	PLACKA INSTRUMENTS & CONTROLS PVT. LTD
563	AIR FILTER REGULATORS	SHAH PNEUMATICS

Sr.No	Name of ITEM/Package	Recommended Vendor List
564	AIR FILTER REGULATORS	SHAVO NORGREN (I) PVT. LTD
565	AIR FILTER REGULATORS	VELJAN HYDRAIR PVT. LTD.
566	AIR FILTER REGULATORS	PARKER
567	AIR FILTER REGULATORS	SWAGELOK
568	AIR FILTER REGULATORS	VANAZ ENGINEERS LIMITED
569	PRESSURE RELIEF/SAFETY VALVE	ANDERSON GREENWOOD CROSBY
570	PRESSURE RELIEF/SAFETY VALVE	BHEL (TRICHY)
571	PRESSURE RELIEF/SAFETY VALVE	ASPRO

572	PRESSURE RELIEF/SAFETY VALVE	DRESSER INC.
573	PRESSURE RELIEF/SAFETY VALVE	FUKUI SEISAKUSHO CO. LTD.
574	PRESSURE RELIEF/SAFETY VALVE	INSTRUMENTATION LTD. (PALGHAT)
575	PRESSURE RELIEF/SAFETY VALVE	NAKAKITA SEISAKUSHO CO LTD.
576	PRESSURE RELIEF/SAFETY VALVE	NUOVO PIGNONE SPA (ITALY)
577	PRESSURE RELIEF/SAFETY VALVE	PARCOL SPA
578	PRESSURE RELIEF/SAFETY VALVE	SAFETY SYSTEMS UR LTD.
579	PRESSURE RELIEF/SAFETY VALVE	SARASIN RSBD
580	PRESSURE RELIEF/SAFETY VALVE	SEBIN VALVES INDIA PVT. LTD.
581	PRESSURE RELIEF/SAFETY VALVE	TAI MILANO SPA
582	PRESSURE RELIEF/SAFETY VALVE	TYCO SANMAR LTD.
583	PRESSURE RELIEF/SAFETY VALVE	TYCO VALVES & CONTROLS INDIA PVT. LTD
584	PRESSURE RELIEF/SAFETY VALVE	FARINOSLA
585	PRESSURE RELIEF/SAFETY VALVE	FAINGER LASER
586	PRESSURE RELIEF/SAFETY VALVE	MERCER
587	PRESSURE RELIEF/SAFETY VALVE	FISHER ROSEMOUNT (EMERSON)
588	PRESSURE RELIEF/SAFETY VALVE	OFE & OE GROUP KEYSTONE VALVES PVT. LTD
589	PRESSURE RELIEF/SAFETY VALVE	BARODA SEBIM VALVES PVT. LTD.
590	PRESSURE RELIEF/SAFETY VALVE	HALOL
591	**SUCTION & DISCHARGE FILTER**	BEKO FILTER
592	SUCTION & DISCHARGE FILTER	ULTRA FILTER
593	SUCTION & DISCHARGE FILTER	FILTERATION AND SEPERATION TECHNOLOGY
594	SUCTION & DISCHARGE FILTER	FILTERATION TECHNIQUE
595	SUCTION & DISCHARGE FILTER	PARKER
596	**CARTRIDGE FILTERS**	BEKO FILTER
597	CARTRIDGE FILTERS	FILTERATION & SEPERATION TECHNOLOGY
598	CARTRIDGE FILTERS	ULTRA FILTER
599	CARTRIDGE FILTERS	FILTRATION TECHNIQUE
600	CARTRIDGE FILTERS	ZANDER GMBH (GERMANY)
601	CARTRIDGE FILTERS	GRAND PRIX FAB (PVT.) LTD., NEW DELHI
602	CARTRIDGE FILTERS	MULTITEX FILTRATION ENERGY PVT. LTD.,
603	**AIR COMPRESSOR**	C (IR)
604	AIR COMPRESSOR	ELGI
605	AIR COMPRESSOR	ANESTA IWATA MOTHERSON
606	AIR COMPRESSOR	CHICAGO PNEUMATICS
607	AIR COMPRESSOR	ATLAS COPCO/INGERSOL RAND
608	**CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM**	GINGEKERR
609	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	CEODUEX (ROTAREX)
610	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	KIDDE

Sr.No	Name of ITEM/Package	Recommended Vendor List
611	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	FIKE
612	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	ANSUL
613	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	LPG
614	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	VTI
615	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	ROTEX

616	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	KEW
617	**FLP SWITCH**	BALIGA
618	FLP SWITCH	FCG
619	FLP SWITCH	FPE
620	FLP SWITCH	FLEXPRO
621	**SWITCHES/FUSES/CONTRACTORS**	L&T
622	SWITCHES/FUSES/CONTRACTORS	GEC
623	SWITCHES/FUSES/CONTRACTORS	SIEMENS
624	RTDs	ALTOP
625	**PLUG VALVE**	AIR & NORDSTROM VALVES INC
626	PLUG VALVE	XOMOX
627	PLUG VALVE	SANMAR INDIA LTD, NEW DELHI
628	PLUG VALVE	AIR & NORDSTROM VALVES INC
629	PLUG VALVE	SERCK AUDCO VALVES
630	PLUG VALVE	SUMITOMO CORPORATION
631	PLUG VALVE	FISHER XOMOX SANMAR
632	PLUG VALVE	L&T (AUDCO INDIA LTD, CHENNAI)
633	PLUG VALVE	PARKER
634	PLUG VALVE	STAUFF
635	**GAS ENGINE**	CUMMINS
636	GAS ENGINE	CATERPILLAR
637	**PRESSURE RELIEF/SAFETY VALVE**	SWAGELOK
638	PRESSURE RELIEF/SAFETY VALVE	PARKER
639	PRESSURE RELIEF/SAFETY VALVE	STAUFF
640	PRESSURE RELIEF/SAFETY VALVE	M/s Nirmal
641	**PRESSURE SAFETY VALVE**	BESTOBELL / HEROSE / AUDCO VALVES / FORBES MARSHALL
642	**AIR COMPRESSOR**	EMTEX
643	AIR COMPRESSOR	KPCL
644	**COMPRESSOR MAIN MOTOR**	CROMPTON GREAVES
645	COMPRESSOR MAIN MOTOR	SIEMENS
646	COMPRESSOR MAIN MOTOR	WEG
647	COMPRESSOR MAIN MOTOR	ABB
648	COMPRESSOR MAIN MOTOR	LHP
649	COMPRESSOR MAIN MOTOR	KIRLOSKAR
650	COMPRESSOR MAIN MOTOR	BHARAT BIJLEE
651	**MAIN MOTOR VFD STARTER**	SIEMENS
652	MAIN MOTOR VFD STARTER	SCHNIEIDER
653	MAIN MOTOR VFD STARTER	FUJI
654	MAIN MOTOR VFD STARTER	ABB
655	**SOFT STARTER**	SIEMENS
656	SOFT STARTER	SCHNEIDER
657	SOFT STARTER	ABB

Sr.No	Name of ITEM/Package	Recommended Vendor List
658	SOFT STARTER	FUJI
659	**INSTRUMENTATION**	

660	**FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)**	ABB AUTOMATION LTD.
661	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	FISHER ROSEMOUNT SINGAPORE PTE LTD.
662	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	FUJI ELECTRIC CO. LTD.
663	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	HONEYWELL INC.
664	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	HONEYWELL
665	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	YOKOGAWA ELECTRIC CORPORATION
666	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	YOKOGAWA BLUE STAR LTD.
667	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	ASHCROFT
668	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	MURPHY
669	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	WIKA
670	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	DRUCK
671	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	WAREE
672	**CORIOLIS MASS FLOW METERS**	EMERSON PROCESS MANAGEMENT
673	CORIOLIS MASS FLOW METERS	COMPAC,NEW ZELAND
674	CORIOLIS MASS FLOW METERS	ENDRESS & HAUSER CMBH & COMPANY
675	THERMAL MASS FLOW METER	MAGNETROL
676	THERMAL MASS FLOW METER	PROCESS CONTROL DEVICES (PCD)
677	**PRESSURE GAUGES**	AN INSTRUMENTS PVT. LTD.
678	PRESSURE GAUGES	ALTOP
679	PRESSURE GAUGES	GENERAL INSTRUMENTS CONSORTIUM
680	PRESSURE GAUGES	WAAREE INSTRUMNETS CONSORTIUM
681	PRESSURE GAUGES	GENERAL INSTRUMENTS CONSORTIUM
682	PRESSURE GAUGES	MANOMETER (INDIA) PVT. LTD.
683	PRESSURE GAUGES	WIKA INSTRUMENTS INDIA PVT. LTD.
684	PRESSURE GAUGES	DRUCK
685	PRESSURE GAUGES	BADOTHERM PROCESS INSTRUMENTS B. V.
686	PRESSURE GAUGES	BOURDON HAENNI S.A
687	PRESSURE GAUGES	BRITISH ROTOTHERM CO. LTD
688	PRESSURE GAUGES	BUDENBERG GUAGE CO. LTD.
689	PRESSURE GAUGES	DRESSER INC.
690	PRESSURE GAUGES	NAGANO KEIKI SEISAKUSHO LTD.
691	PRESSURE GAUGES	BAUMER
692	PRESSURE GAUGES	WALCHANDNAGER INDUSTRIES LTD.
693	PRESSURE GAUGES	WIKA ALEXANDER WIEGAND & CO GMBH
694	PRESSURE GAUGES	ASHCROFT /PRECISON MASS
695	PRESSURE GAUGES	H. GURU
696	**TEMPERATURE GAUGE WITH THERMOWELL**	PRECISON MASS
697	TEMPERATURE GAUGE WITH THERMOWELL	AN INSTRUMENTS PVT. LTD.
698	TEMPERATURE GAUGE WITH THERMOWELL	GENERAL INSTRUMENTS LTD
699	TEMPERATURE GAUGE WITH THERMOWELL	WIKA INSTRUMENTS INDIA PVT. LTD.
700	TEMPERATURE GAUGE WITH THERMOWELL	BAUMER TECHNOLOGIES INDIA
701	TEMPERATURE GAUGE WITH THERMOWELL	ALTO INDUSTRIES
702	**RTD WITH THERMOWELL AND SKIN TYPE**	A.N.INSTRUMENTS
703	RTD WITH THERMOWELL AND SKIN TYPE	GENERAL INSTRUMENTS PVT LTD
704	RTD WITH THERMOWELL AND SKIN TYPE	NAGMAN SENSORS PVT LTD

Sr.No	Name of ITEM/Package	Recommended Vendor List
705	RTD WITH THERMOWELL AND SKIN TYPE	PYRO ELECTRIC INSTRUMENTS
706	RTD WITH THERMOWELL AND SKIN TYPE	WIKA
707	RTD WITH THERMOWELL AND SKIN TYPE	WAREE
708	RTD WITH THERMOWELL AND SKIN TYPE	BAUMER
709	RTD WITH THERMOWELL AND SKIN TYPE	ALTOP
710	RTD WITH THERMOWELL AND SKIN TYPE	TEMPSENS INSTRUMENTS INDIA PVT LTD, INDIA
711	RTD WITH THERMOWELL AND SKIN TYPE	THERMO ELECTRIC COMPANY INDIA PVT. LTD, INDIA
712	RTD WITH THERMOWELL AND SKIN TYPE	TECHNO INSTRUMENTS, INDIA
713	RTD WITH THERMOWELL AND SKIN TYPE	TM TECNOMATIC SPA, ITALY
714	RTD WITH THERMOWELL AND SKIN TYPE	THERMAL INSTRUMENT (I) P LTD
715	**PRESSURE/DIFFERENTIAL /TEMP SWITCH**	SWITZER
716	PRESSURE/DIFFERENTIAL /TEMP SWITCH	DELTA
717	PRESSURE/DIFFERENTIAL /TEMP SWITCH	UNITED ELECTRIC
718	PRESSURE/DIFFERENTIAL /TEMP SWITCH	SOR
719	PRESSURE/DIFFERENTIAL /TEMP SWITCH	GAUGE BOURDON
720	PRESSURE/DIFFERENTIAL /TEMP SWITCH	DRESSER
721	PRESSURE/DIFFERENTIAL /TEMP SWITCH	INFOS
722	**ULTRASONIC FLOW METER**	DANIEL MEASUREMENT AND CONTROLS PVT LTD (EMERSON)
723	ULTRASONIC FLOW METER	SICK , INDIA
724	ULTRASONIC FLOW METER	RMG,
725	ULTRASONIC FLOW METER	ELSTER- HONEYWELL
726	ULTRASONIC FLOW METER	KROHNE
727	ULTRASONIC FLOW METER	ENDRESS & HAUSER (E&H)
728	ULTRASONIC FLOW METER	FLEXIM
729	ULTRASONIC FLOW METER	GE
730	**RPD Meter**	DRESSER
731	RPD Meter	ROMET
732	RPD Meter	ELSTER-HONEYWELL
733	RPD Meter	RMG REGEL + MESSTECHNIL GmbH
734	RPD Meter	ITRON
735	RPD Meter	RAYCHEM RPG LTD
736	RPD Meter	CAMERON
737	RPD Meter	FMG
738	**TURBIN FLOW METER**	DRESSER
739	TURBIN FLOW METER	ROCKWIN
740	TURBIN FLOW METER	ELSTER-HONEYWELL
741	TURBIN FLOW METER	RMG REGEL + MESSTECHNIL GmbH
742	TURBIN FLOW METER	DANIEL/EMERSON
743	TURBIN FLOW METER	ITRON
744	TURBIN FLOW METER	VEMTECH
745	**FLOW COMPUTER**	DANIEL/EMERSON
746	FLOW COMPUTER	OMNI
747	FLOW COMPUTER	FMC
748	FLOW COMPUTER	HONEYWELL

749	FLOW COMPUTER	ELSTER
750	FLOW COMPUTER	SCHNEIDER

Sr.No	Name of ITEM/Package	Recommended Vendor List
751	FLOW COMPUTER	ABB
752	**ELECTRONIC VOLUME CONVERTER**	PLUM
753	ELECTRONIC VOLUME CONVERTER	ELGAS
754	**SELF ACTUATED PR. CONTROL VALVE**	DANIEL INDUSTRIES INC
755	SELF ACTUATED PR. CONTROL VALVE	DRESSER PRODUITS INDUSTRIES
756	SELF ACTUATED PR. CONTROL VALVE	ESME VALVES LTD.
757	SELF ACTUATED PR. CONTROL VALVE	FISHER ROSEMOUNT SINGAPORE PTE LTD.
758	SELF ACTUATED PR. CONTROL VALVE	FISHER EXMOX SANMAR LIMTED
759	SELF ACTUATED PR. CONTROL VALVE	GORTER CONTROLS B.V.
760	SELF ACTUATED PR. CONTROL VALVE	INSTROMET INTERNATIONAL NV
761	SELF ACTUATED PR. CONTROL VALVE	KEYE & MACDONALD INC
762	SELF ACTUATED PR. CONTROL VALVE	NUOVO PIGNONE SPA (ITALY)
763	SELF ACTUATED PR. CONTROL VALVE	PIETRO FIORENTINI SPA
764	SELF ACTUATED PR. CONTROL VALVE	RICHARDS INDUSTRIES (FORMERLY TRELOAR)
765	SELF ACTUATED PR. CONTROL VALVE	RMG REGEL + MESSTECHNIK GMBH
766	SELF ACTUATED PR. CONTROL VALVE	COMPAC INDUSTRIES LTD., NZL.
767	SELF ACTUATED PR. CONTROL VALVE	ASPRO
768	SELF ACTUATED PR. CONTROL VALVE	VANAZ
769	SELF ACTUATED PR. CONTROL VALVE	NIRMAL INDUSTRIES LIMITED
770	**SOLENOID VALVES**	ALCON ALEXANDER CONTROLS LIMITED
771	SOLENOID VALVES	JEFFERSONS
772	SOLENOID VALVES	ASCO (INDIA) LIMITED
773	SOLENOID VALVES	ASCO JOUCOMATIC LTD.
774	SOLENOID VALVES	ASCO JOUCOMATIC SA
775	SOLENOID VALVES	PARKER HANNIFIN, USA
776	SOLENOID VALVES	AVCON CONTROLS PVT. LTD.
777	SOLENOID VALVES	BARKSDALE INC.
778	SOLENOID VALVES	BLUE STAR LTD.
779	SOLENOID VALVES	HERION WERKE
780	SOLENOID VALVES	SCHRADER SCOVILL DUNCAN LIMITED
781	SOLENOID VALVES	SEITZ AG
782	SOLENOID VALVES	COMPAC NEW ZEALAND
783	SOLENOID VALVES	ROTEX AUTOMATION LIMITED
784	SOLENOID VALVES	OPERATED VALVES ASCO
785	SOLENOID VALVES	HABONIM VASS
786	SOLENOID VALVES	FESTO
787	SOLENOID VALVES	MICROMECANICA
788	**SPECIAL CONTROL VALVES**	FISHER ROSEMOUNT SIGAPORE PTE. LTD.
789	SPECIAL CONTROL VALVES	FLOWSERVE PTE. LTD. (FORMERLY DURIRON)
790	SPECIAL CONTROL VALVES	HOPKINSONS LIMITED

791	SPECIAL CONTROL VALVES	METSO AUTOMATION PTE LTD. (FORMERLY NELES)
792	SPECIAL CONTROL VALVES	NUOVO PIGNONE SPA (ITALY
793	SPECIAL CONTROL VALVES	SPX VALVES & CONTROLS (FORMERLY DEXURIK)
794	SPECIAL CONTROL VALVES	COMPAC IND. LTD. NZL
795	**REGULATORS**	COMPAC IND. LTD.
796	REGULATORS	FISHER ROSEMOUNT SIGAPORE PTE. LTD

Sr.No	Name of ITEM/Package	Recommended Vendor List
797	REGULATORS	FLOWSERVE PTE. LTD. (FORMERLY DURIRON)
798	REGULATORS	SWAGELOK
799	REGULATORS	PARKER
800	REGULATORS	COMPAC
801	REGULATORS	HAMLET
802	REGULATORS	HYLOCK
803	REGULATORS	DK-LOK
804	REGULATORS	SEALEXCEL
805	REGULATORS	SSP
806	REGULATORS	OASIS
807	**GAS DETECTOR SYSTEM**	DETRONICS
808	GAS DETECTOR SYSTEM	HONEYWELL
809	GAS DETECTOR SYSTEM	NET SAFETY
810	GAS DETECTOR SYSTEM	GENERAL MONITORS/ MSA
811	GAS DETECTOR SYSTEM	CROW ON
812	GAS DETECTOR SYSTEM	SIEGER
813	GAS DETECTOR SYSTEM	ESP SAFETY
814	GAS DETECTOR SYSTEM	SENSITRON
815	GAS DETECTOR SYSTEM	ROSEMOUNT EARLIER KNOWN AS NET SEFETY
816	GAS DETECTOR SYSTEM	DRAEGER SAFETY
817	GAS DETECTOR SYSTEM	EMERSON PROCESS MANAGEMENT INDIA PVT LTD
818	GAS DETECTOR SYSTEM	RESPO PRODUCTS
819	GAS DETECTOR SYSTEM	DET-TRONICS
820	**FIRE DETECTION/ALARM SYSTEM**	APOIIO
821	FIRE DETECTION/ALARM SYSTEM	AGNI PVT LTD
822	FIRE DETECTION/ALARM SYSTEM	ASES/IRIS
823	FIRE DETECTION/ALARM SYSTEM	HONEYWELL
824	FIRE DETECTION/ALARM SYSTEM	RAVEL
825	FIRE DETECTION/ALARM SYSTEM	NEW FIRE ENGINEERS (P) LTD, INDIA
826	**FLAME DETECTOR/ SURGE PROTECTORS**	GENERAL MONITORS/ MSA
827	FLAME DETECTOR/ SURGE PROTECTORS	SPECTREX
828	FLAME DETECTOR/ SURGE PROTECTORS	DETRONICS
829	FLAME DETECTOR/ SURGE PROTECTORS	HONEYWELL
830	FLAME DETECTOR/ SURGE PROTECTORS	NET SAFETY
831	FLAME DETECTOR/ SURGE PROTECTORS	CROW ON
832	FLAME DETECTOR/ SURGE PROTECTORS	SIEGER
833	FLAME DETECTOR/ SURGE PROTECTORS	ESP SAFETY

834	**SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER**	PHOENIX
835	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	P&F
836	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	MTL
837	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	HANS TURCK GMBH & CO. KG INDIA / GERMANY
838	**RELAYS**	OMRON
839	RELAYS	OEN
840	RELAYS	JYOTI
841	RELAYS	PHOENIX
842	**PLC/RTU**	ALLEN BRADLEY

Sr.No	Name of ITEM/Package	Recommended Vendor List
843	PLC/RTU	GE FANUC
844	PLC/RTU	BRISTOL BABCOCK INC.
845	PLC/RTU	HONEYWELL
846	PLC/RTU	SCHNIEDER
847	PLC/RTU	ABB
848	PLC/RTU	SIEMENS
849	PLC/RTU	EMERSON
850	PLC/RTU	SYNERGY
851	PLC/RTU	INVENSYS
852	PLC/RTU	ELECTRONIC CORPORATION OF INDIA
853	PLC/RTU	M/s. Phoenix Contact India Pvt Ltd
854	**MCT**	NEIMEX
855	MCT	SIGNET INTERNATIONAL
856	MCT	G.K Gmbh, GERMANY
857	MCT	ROTEX
858	**OFC**	FINOLEX CABLE
859	OFC	BIRLA ERICSSION OPTICAL LTD
860	OFC	RPG CABLE LTD
861	OFC	TAMILNADU TELECOMMUNICATION LTD
862	OFC	U M Cables
863	OFC	HIMACHAL FUTURISTIC COMMUNICATION LTD
864	OFC	STERLITE INDUSTRIESLTD
865	OFC	KEC INTERNATIONAL LTD,INDIA
866	**ELECTRONIC MARKER AND LOCATOR**	3M
867	ELECTRONIC MARKER AND LOCATOR	MOELLER
868	**FIBER TERMINAL CLOSER (FTC)**	RAYCHEM
869	FIBER TERMINAL CLOSER (FTC)	3M
870	FIBER TERMINAL CLOSER (FTC)	SIEMENS
871	FIBER TERMINAL CLOSER (FTC)	F&G
872	FIBER TERMINAL CLOSER (FTC)	KEPTEL
873	FIBER TERMINAL CLOSER (FTC)	ALCOA FUJIKURLA LTD
874	**INSTRUMENT PANEL**	RITTAL
875	INSTRUMENT PANEL	ACCUSONIC CONTROLS PVT LTD, INDIA
876	INSTRUMENT PANEL	INSTRUMENTATION LTD, INDIA
877	INSTRUMENT PANEL	INDUSTRIAL CONTROLS & APPLIANCES PVT LTD,INDIA

878	INSTRUMENT PANEL	POSITRONICS PVT LTD,INDIA
879	INSTRUMENT PANEL	RADHA KRISHNA CONTROLS,INDIA
880	INSTRUMENT PANEL	ICA SOLUTIONS LTD, U.K
881	INSTRUMENT PANEL	PYROTECH CONTROLS, INDIA
882	INSTRUMENT PANEL	ENCLOTEK, INDIA
883	INSTRUMENT PANEL	CONTROL SYSTEM ENGINEERS
884	INSTRUMENT PANEL	IRIS AUTOMATION PVT. LTD.
885	**JUNCTION BOX**	BALIGA LIGHTING EQUIPMENT (P) LTD, INDIA
886	JUNCTION BOX	FLEXPRO ELECTRICALS PVT.LTD ,INDIA
887	JUNCTION BOX	FLAMEPROOF EQUIPMENT PVT.LTD, INDIA
888	JUNCTION BOX	FCG POWER INDUSTRIES PVT. LTD,INDIA
889	JUNCTION BOX	FCG FLAMEPROOF CONTROL GEARS PVT. LTD, INDIA

Sr.No	Name of ITEM/Package	Recommended Vendor List
890	JUNCTION BOX	SUDHIR SWITCHGEARS PVT.LTD, INDIA
891	JUNCTION BOX	EXPROTECTA
892	**CABLE GLAND/PLUGS**	BALIGA LIGHTING EQUIPMENTS PVT. LTD, INDIA
893	CABLE GLAND/PLUGS	COMET BRASS PRODUCTS , INDIA
894	CABLE GLAND/PLUGS	COMET INDUSTRIES, INDIA
895	CABLE GLAND/PLUGS	FLEXPRO ELECTRICALS PVT.LTD,INDIA
896	CABLE GLAND/PLUGS	FLAMEPROOF EQUIPMENTS (P) LTD, INDIA
897	CABLE GLAND/PLUGS	FCG POWER INDUSTRIES PVT.LTD, INDIA
898	CABLE GLAND/PLUGS	FCG FLAMEPROOF CONTROL GEARS PVT LTD, INDIA
899	CABLE GLAND/PLUGS	STANDARD METAL INDUSTRIES,INDIA
900	CABLE GLAND/PLUGS	SUDHIR SWITCHGEARS PVT.LTD, INDIA
901	CABLE GLAND/PLUGS	KAYSONS TECHNO EQUIPMENT P LTD.
902	CABLE GLAND/PLUGS	STANDARD METAL INDUSTRIES
903	**INSTRUMENT CABLES**	CORDS CABLES INDUSTRIES
904	INSTRUMENT CABLES	ASSOCIATED CABLES
905	INSTRUMENT CABLES	INCAB
906	INSTRUMENT CABLES	UNIVERSAL CABLES LTS/OEM Cables
907	INSTRUMENT CABLES	ASEAN
908	INSTRUMENT CABLES	CCI
909	INSTRUMENT CABLES	FORT GLOSTER
910	INSTRUMENT CABLES	FINOLEX
911	INSTRUMENT CABLES	KEI
912	INSTRUMENT CABLES	POLYCAB
913	INSTRUMENT CABLES	HAVELLS
914	INSTRUMENT CABLES	THERMO CABLES LTD, INDIA
915	INSTRUMENT CABLES	UDEY PYROCABLES PVT.LTD, INDIA
916	INSTRUMENT CABLES	SUYOG ELECTRICALS LTD, INDIA
917	**TELECOM SYSTEM**	COMMTEL NETWORK
918	TELECOM SYSTEM	ECI TELECOM LTD
919	TELECOM SYSTEM	FIBCOM INDIA LTD
920	TELECOM SYSTEM	TEJAS NETWORK LTD
921	TELECOM SYSTEM	ABB LTD

922	**LANSWITCH/ROUTER/FIRE WALL**	3COM
923	LANSWITCH/ROUTER/FIRE WALL	CISCO
924	LANSWITCH/ROUTER/FIRE WALL	NORTEL
925	LANSWITCH/ROUTER/FIRE WALL	DELL
926	LANSWITCH/ROUTER/FIRE WALL	CHECK POINT
927	LANSWITCH/ROUTER/FIRE WALL	PALO ALTO
928	LANSWITCH/ROUTER/FIRE WALL	IBM
929	**CCTV**	PELCO
930	CCTV	AXIS
931	CCTV	SAMSUNG
932	CCTV	PANASONIC
933	CCTV	HONEYWELL
934	CCTV	CP PLUS
935	**CORROSIVE MONITORING SYSTEM (CMS)**	CAPROCO, UK
936	CORROSIVE MONITORING SYSTEM (CMS)	CORRPRO, SHARJA

Sr.No	**Name of ITEM/Package**	**Recommended Vendor List**
937	CORROSIVE MONITORING SYSTEM (CMS)	METAL SAMPLES, USA
938	CORROSIVE MONITORING SYSTEM (CMS)	CORMON, UK
939	CORROSIVE MONITORING SYSTEM (CMS)	ATEL, ITALY
940	CORROSIVE MONITORING SYSTEM (CMS)	KOROSI SPECINDO
941	**VIBRATION SWITCH**	MURPHY
942	VIBRATION SWITCH	METRIX
943	VIBRATION SWITCH	ROBERTSHAW CONTROL
944	**TELEPHONES/EPABX SYSTEM**	ALCATEL
945	TELEPHONES/EPABX SYSTEM	AVAYA
946	TELEPHONES/EPABX SYSTEM	ERICSSION
947	TELEPHONES/EPABX SYSTEM	SIEMENS
948	TELEPHONES/EPABX SYSTEM	PANASONIC
949	TELEPHONES/EPABX SYSTEM	TATA
950	TELEPHONES/EPABX SYSTEM	SAMSUNG
951	**PRESSURE SWITCHES**	ASCO JOUCOMATIC LTD,UK, C/O ASCO (INDIA) LTD, INDIA
952	PRESSURE SWITCHES	DAG PROCESS INSTRUMENTS PVT LTD, INDIA
953	PRESSURE SWITCHES	DELTA CONTROLS LTD, UK
954	PRESSURE SWITCHES	INDFOS INDUSTRIES LIMITED, INDIA
955	PRESSURE SWITCHES	KAUSTUBHA UDYOG, INDIA
956	PRESSURE SWITCHES	PYROPRESS ENGG CO LTD, UK
957	PRESSURE SWITCHES	ROBERTSHAW CONTROLS CO, USA
958	PRESSURE SWITCHES	REGULATEURS GEORGIN S.A, FRANCE
959	PRESSURE SWITCHES	SWITZER INSTRUMENT LTD, INDIA
960	PRESSURE SWITCHES	SOR INC, USA
961	PRESSURE SWITCHES	SIRCO CONTROLS LIMITED, UK
962	PRESSURE SWITCHES	UNITED ELECTRIC CONTROLS CO, USA, C/O UNITED
963	PRESSURE SWITCHES	ELECTRIC CONTROLS CO., INDIA
964	PRESSURE SWITCHES	INDFOS,ASCHCROFT
965	**LEVEL GAUGE GLASSES & COCKS**	BLISS ANAND PVT LTD, INDIA

966	LEVEL GAUGE GLASSES & COCKS	CHEMTROLS SAMIL (INDIA) PVT LTD, INDIA
967	LEVEL GAUGE GLASSES & COCKS	CESARE BONNETTI S.P.A., ITALY, C/O BONETTI WAAREE (I) PVT.
968	LEVEL GAUGE GLASSES & COCKS	GAUGES BURDON (I) PVT. LTD.(GENERAL INSTRUMENTS)
969	LEVEL GAUGE GLASSES & COCKS	JERGUSON GAUGE & VALVE,USA
970	LEVEL GAUGE GLASSES & COCKS	KLINGER SPA, ITALY
971	LEVEL GAUGE GLASSES & COCKS	LEVCON INSTRUMENTS PVT LTD,INDIA
972	LEVEL GAUGE GLASSES & COCKS	NIHON KLINGAGE CO LTD, JAPAN
973	LEVEL GAUGE GLASSES & COCKS	PRATOLINA INSTRUMENTS PVT LTD, INDIA
974	LEVEL GAUGE GLASSES & COCKS	SIGMA INSTRUMENTS CO, INDIA
975	LEVEL GAUGE GLASSES & COCKS	NISAN SCIENTIFIC PROCESS EQUIP. P LTD
976	LEVEL GAUGE GLASSES & COCKS	PUNE TECHTROL PVT LTD
977	LEVEL GAUGE GLASSES & COCKS	PRATOLINA INSTRUMENTS PVT LTD
978	**LEVEL INSTRUMENT**	ABB INC,USA, C/O ABB LTD, INDIA
979	LEVEL INSTRUMENT	EMERSON PROCESS MANAGEMENT INDIA PVT LTD, INDIA
980	LEVEL INSTRUMENT	ENDRESS+HAUSER (I) PVT. LTD, INDIA
981	LEVEL INSTRUMENT	KROHNE MESSTECHNIK GMBH & CO KG, GERMANY
982	LEVEL INSTRUMENT	L & J TECHNOLOGIES, USA, C/O L&J TECHNOLOGIES INC,

Sr.No	**Name of ITEM/Package**	**Recommended Vendor List**
983	LEVEL INSTRUMENT	MAGNETROL INTERNATIONAL
984	LEVEL INSTRUMENT	VEGA GRIESHABER KG, GERMANY, C/O VEGA INDIA LEVEL AND PRESSURE MGMT PVT. LTD, INDIA
985	**Panel mounted 24 V DC Power supply**	SITOP, INDIA
986	Panel mounted 24 V DC Power supply	PHEONIX, INDIA
987	Panel mounted 24 V DC Power supply	WAGO
988	Panel mounted 24 V DC Power supply	COSEL
989	**CABLE – FIRE ALARM & COMMUNICATION CABLES**	CORDS CABLE INDUSTRIES LTD.
990	CABLE – FIRE ALARM & COMMUNICATION CABLES	CMI
991	CABLE – FIRE ALARM & COMMUNICATION CABLES	DELTON CABLES LTD.
992	CABLE – FIRE ALARM & COMMUNICATION CABLES	ELKAY TELELINKS
993	CABLE – FIRE ALARM & COMMUNICATION CABLES	KEI INDUSTRIES LTD.
994	CABLE – FIRE ALARM & COMMUNICATION CABLES	RELIANCE ENGINEERS LTD.
995	**CABLE – LT POWER & CONTROL(XPLE)**	CORDS CABLE INDUSTRIES LTD.
996	CABLE – LT POWER & CONTROL(XPLE)	UNIVERSAL CABLE LTD.
997	CABLE – LT POWER & CONTROL(XPLE)	KEI INDUSTRIES LTD.
998	CABLE – LT POWER & CONTROL(XPLE)	HAVELLS
999	CABLE – LT POWER & CONTROL(XPLE)	DELTON
1000	CABLE – LT POWER & CONTROL(XPLE)	ELKAY TELELINKS
1001	CABLE – LT POWER & CONTROL(XPLE)	EVERSHINE ELECTRICALS
1002	CABLE – LT POWER & CONTROL(XPLE)	ECKO
1003	CABLE – LT POWER & CONTROL(XPLE)	RAVIN
1004	CABLE – LT POWER & CONTROL(XPLE)	RALLISON
1005	CABLE – LT POWER & CONTROL(XPLE)	SUYOG
1006	CABLE – LT POWER & CONTROL(XPLE)	NETCO
1007	CABLE – LT POWER & CONTROL(XPLE)	UNIFLEX

1008	CABLE – LT POWER & CONTROL(XPLE)	PARAMOUNT
1009	CABLE – LT POWER & CONTROL(XPLE)	GLOSTER
1010	CABLE – LT POWER & CONTROL(XPLE)	ASSOCIATED CABLES PVT. LTD.
1011	CABLE – LT POWER & CONTROL(XPLE)	CMI
1012	CABLE – LT POWER & CONTROL(XPLE)	GEMSCAB
1013	CABLE – LT POWER & CONTROL(XPLE)	INDUSTRIAL CABLES
1014	CABLE – LT POWER & CONTROL(XPLE)	NICCO
1015	CABLE – LT POWER & CONTROL(XPLE)	POLYCAB
1016	CABLE – LT POWER & CONTROL(XPLE)	TORRENT
1017	CABLE – LT POWER & CONTROL(XPLE)	FASCO GUARDON
1018	CABLE – LT POWER & CONTROL(XPLE)	Swadeshi Cable
1019	**CABLE – GLAND**	BALIGA
1020	CABLE – GLAND	COMET
1021	CABLE – GLAND	FLEXPRO
1022	CABLE – GLAND	FLAMEPROOF
1023	CABLE – GLAND	FCG
1024	CABLE – GLAND	ELECTRO WERKE
1025	CABLE – GLAND	DOWELS
1026	CABLE – GLAND	CCI
1027	CABLE – GLAND	IVECO GUARDPLUS
1028	**CABLE – LUGS**	DOWELS

Sr.No	Name of ITEM/Package	Recommended Vendor List
1029	CABLE – LUGS	JAINSON
1030	CABLE – LUGS	ISMAL
1031	CABLE – LUGS	IVECO GUARDPLUS
1032	CABLE – LUGS	Guardplus
1033	**CABLE – TRAY**	ERCON COMPOSITES
1034	CABLE – TRAY	YAMUNA POWER & INFRASTRUCTURE LTD.
1035	CABLE – TRAY	IVECO RENO
1036	**EARTHING MATERIALS**	RUKMANI ELECTRICAL & COMPONENTS PVT LTD.
1037	EARTHING MATERIALS	INDIANA GRATING PVT LTD.
1038	EARTHING MATERIALS	JEF TECHNO SOLUTIONS PVT LTD
1039	EARTHING MATERIALS	IVECO-RENO
1040	**FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES**	FCG
1041	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	SUDHIR
1042	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	PROMPT ENGINEERING WORKS
1043	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	FLAME PROOF EQUIPMENTS PVT. LTD.
1044	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	BALIGA LIGHTING EQUIPMENTS PVT. LTD.
1045	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	FLEXPRO ELECTRICALS PVT. LTD.
1046	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	ERGON
1047	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	Equipments Pvt. Ltd
1048	**LIGHTING FIXTURES**	GE LIGHTING PVT. LTD.
1049	LIGHTING FIXTURES	BAJAJ ELECTRICALS LTD.
1050	LIGHTING FIXTURES	CROMPTON GREAVES LTD.
1051	LIGHTING FIXTURES	PHILIPS INDIA LTD.

1052	LIGHTING FIXTURES	HAVELL'S
1053	**LIGHTING FIXTURES (FLAMEPROOF)**	BAJAJ ELECTRICALS LTD.
1054	LIGHTING FIXTURES (FLAMEPROOF)	BALIGA LIGHTING EQUIPMENT PVT. LTD.
1055	LIGHTING FIXTURES (FLAMEPROOF)	CROMPTON GREAVES LTD.
1056	LIGHTING FIXTURES (FLAMEPROOF)	CEAG FLAMEPROOF CONTROLGEAR PVT. LTD.
1057	LIGHTING FIXTURES (FLAMEPROOF)	FLEXPRO ELECTRICALS PVT. LTD.
1058	LIGHTING FIXTURES (FLAMEPROOF)	PHILIPS INDIA LTD.
1059	LIGHTING FIXTURES (FLAMEPROOF)	SUDHIR SWITCHGEARS PVT. LTD.
1060	LIGHTING FIXTURES (FLAMEPROOF)	FCG
1061	**GI-OCTOGONAL POLE**	BAJAJ
1062	GI-OCTOGONAL POLE	TRANSRAIL
1063	GI-OCTOGONAL POLE	WIPRO
1064	GI-OCTOGONAL POLE	IVECO ROSHNI
1065	**LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB**	ABB
1066	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	BCH
1067	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	C&S
1068	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	ELECMECH SWITCHGEAR & INSTRUMENTATION
1069	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	KMG ATOZ
1070	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	L&T
1071	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	PYROTECH ELECTRONICS PVT. LTD.
1072	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	RISHA CONTROL ENGINEERS PVT. LTD.
1073	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	SIEMENS LTD.
1074	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	TRICOLITE ELECTRICAL INDUSTRIES
1075	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	UNILEC ENGINEERS LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
1076	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	VIDYUT CONTROL INDIA PVT. LTD.
1077	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	CONTROL AND SCHEMATIC
1078	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	ZENITH ENGINEERING
1079	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	NATURGY CONTRA
1080	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	EXPERT ENGINEERS
1081	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	SYNERGY SYSTEMS
1082	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	M/S SHOREY E SOLUTION
1083	**MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB**	ABB
1084	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HAGGER
1085	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HAVELL'S INDIA LTD.
1086	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	INDO ASIAN FUSEGEAR LTD.
1087	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	LEGRAND
1088	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	MDS SWITCHGEAR LTD.
1089	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	SCHNEIDER
1090	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	SIEMENS LTD.
1091	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HPL
1092	**MOULDED CASE CIRCUIT BREAKER (MCCBS)**	ABB
1093	MOULDED CASE CIRCUIT BREAKER (MCCBS)	ANDREW YULE
1094	MOULDED CASE CIRCUIT BREAKER (MCCBS)	LARSEN & TOUBRO
1095	MOULDED CASE CIRCUIT BREAKER (MCCBS)	SCHNEIDER

1096	MOULDED CASE CIRCUIT BREAKER (MCCBS)	SIEMENS
1097	MOULDED CASE CIRCUIT BREAKER (MCCBS)	CONTROL & SWITCHGEAR
1098	**INDICATING METERS**	ABB
1099	INDICATING METERS	AMCO
1100	INDICATING METERS	AE
1101	INDICATING METERS	ALSTOM LTD.
1102	INDICATING METERS	CONZERV/SCHNEIDER
1103	INDICATING METERS	ELECON MEASUREMENT PVT. LTD.
1104	INDICATING METERS	HPL ELECTRIC & POWER PVT. LTD.
1105	INDICATING METERS	MECO INSTRUMENTS LTD.
1106	INDICATING METERS	MINILEC
1107	INDICATING METERS	RISHABH INSTRUMENTS PVT. LTD.
1108	INDICATING METERS	TRINITY ENERGY SYSTEM
1109	INDICATING METERS	KAYCEE
1110	INDICATING METERS	SALZER
1111	**CONTRACTORS – AC POWER**	ANDREW YULE
1112	CONTRACTORS – AC POWER	ABB
1113	CONTRACTORS – AC POWER	BHEL
1114	CONTRACTORS – AC POWER	C&S
1115	CONTRACTORS – AC POWER	HAVELL'S
1116	CONTRACTORS – AC POWER	L&T
1117	CONTRACTORS – AC POWER	SCHNEIDER
1118	CONTRACTORS – AC POWER	SIEMENS LTD.
1119	CONTRACTORS – AC POWER	TELEMECHANIQUE
1120	**CONTROL TRANSFORMER**	AE
1121	CONTROL TRANSFORMER	INDUSHREE
1122	CONTROL TRANSFORMER	INTRA VIDYUT
1123	CONTROL TRANSFORMER	KALPA ELECTRIKALS

Sr.No	Name of ITEM/Package	Recommended Vendor List
1124	CONTROL TRANSFORMER	TRANSPOWER INDUSTRIES LTD.
1125	CONTROL TRANSFORMER	SIEMENS
1126	**INDICATING LAMPS**	ALSTOM LTD.
1127	INDICATING LAMPS	BCH
1128	INDICATING LAMPS	L&T
1129	INDICATING LAMPS	SIEMENS LTD.
1130	INDICATING LAMPS	VAISHNO ELECTRICALS
1131	**PROTECTION RELAYS – THERMAL**	BCH
1132	PROTECTION RELAYS – THERMAL	L&T LTD.
1133	PROTECTION RELAYS – THERMAL	SIEMENS LTD.
1134	PROTECTION RELAYS – THERMAL	TELEMENCHANIQUE & CONTROLS (INDIA) LTD.
1135	**PUSH BUTTONS**	BCH
1136	PUSH BUTTONS	ALSTOM LTD.
1137	PUSH BUTTONS	L&T
1138	PUSH BUTTONS	SIEMENS LTD.
1139	PUSH BUTTONS	TELEMENCHANIQUE & CONTROLS (INDIA) LTD.

1140	PUSH BUTTONS	VAISHNO ELECTRICALS
1141	**SWITCHES – CONTROL**	BCH
1142	SWITCHES – CONTROL	EASUM REYROLLE RELAYS & DEVICES LTD.
1143	SWITCHES – CONTROL	ALSTOM
1144	SWITCHES – CONTROL	KAYCEE INDUSTRIES LTD.
1145	SWITCHES – CONTROL	L&T
1146	SWITCHES – CONTROL	SIEMENS LTD.
1147	**SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET**	ANCHOR ELECTRONICS & ELECTRICALS PVT. LTD.
1148	SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET	KINGAL ELECTRICALS PVT. LTD.
1149	SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET	NORTH-WEST SWITCHGEAR LTD.
1150	**SWITCH SOCKET OUTLETS (INDUSTRIAL)**	ALSTOM LTD.
1151	SWITCH SOCKET OUTLETS (INDUSTRIAL)	BEST & CROMPTION ENGINEERING LTD.
1152	SWITCH SOCKET OUTLETS (INDUSTRIAL)	BCH
1153	SWITCH SOCKET OUTLETS (INDUSTRIAL)	CROMPTON GREAVES LTD.
1154	SWITCH SOCKET OUTLETS (INDUSTRIAL)	ESSEN ENGINEERING COMPANY PVT. LTD.
1155	**TERMINALS BLOCKS**	CONNECTWELL
1156	TERMINALS BLOCKS	CONTROLS & SWITCHGEAR CO. LTD.
1157	TERMINALS BLOCKS	ELMEX CONTROLS PVT. LTD.
1158	TERMINALS BLOCKS	ESSEN ENGINEERING CO. PVT. LTD.
1159	**UPS SYSTEM AND INVERTER**	VERTIV (EARLIER DB POWER & EMERSON)
1160	UPS SYSTEM AND INVERTER	APC
1161	UPS SYSTEM AND INVERTER	KELTRON
1162	UPS SYSTEM AND INVERTER	HI-REL
1163	UPS SYSTEM AND INVERTER	DUBAS
1164	UPS SYSTEM AND INVERTER	TOSHIBA CORPORATION
1165	UPS SYSTEM AND INVERTER	FUZI ELECTRIC CO LTD
1166	UPS SYSTEM AND INVERTER	SYNERGY SYSTEMS
1167	UPS SYSTEM AND INVERTER	IVECO PLUS
1168	UPS SYSTEM AND INVERTER	BPE
1169	UPS SYSTEM AND INVERTER	M/S SHOREY E SOLUTION
1170	**BATTERIES**	AMCO BATTERIES LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
1171	BATTERIES	HBLNIFE POWER SYSTEMS LTD.
1172	BATTERIES	EXIDE INDUSTRIES LTD
1173	BATTERIES	AMARA RAJA
1174	BATTERIES	ERGON GREEN
1175	**CHANGE OVER SWITCH**	CGM
1176	CHANGE OVER SWITCH	L&T
1177	CHANGE OVER SWITCH	SIEMENS
1178	**SOLAR STREET LIGHTING**	TATA BP SOLAR (I) LTD.
1179	SOLAR STREET LIGHTING	REIL, JAIPUR.
1180	SOLAR STREET LIGHTING	CEIL, SAHIBABAD.
1181	SOLAR STREET LIGHTING	HBL POWER
1182	SOLAR STREET LIGHTING	NATURGY GREENS
1183	**AVR AND STABLISERS**	JINDAL

1184	AVR AND STABLISERS	ERGON POWER
1185	**CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM**	IVECO RENO
1186	CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM	JEF TECH EARTHINGS
1187	CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM	INDIANA GRATINGS
1188	**GEG SET**	CHROMA-ATOR
1189	GEG SET	MAHINDRA
1190	GEG SET	KIRLOSKAR
1191	**TRANSFORMER**	ABB
1192	TRANSFORMER	GE
1193	TRANSFORMER	CROMPTON GREAVES
1194	TRANSFORMER	SIEMENS
1195	TRANSFORMER	TRANFORMERS & RECTIFIERS INDIA LTD
1196	TRANSFORMER	KIRLOSKAR ELECTRIC
1197	TRANSFORMER	GUJARAT TRANSFORMER
1198	TRANSFORMER	KOTSONS PVT LTD
1199	**AIR CONDITIONING SYSTEM**	CARRIER
1200	AIR CONDITIONING SYSTEM	HITACHI
1201	AIR CONDITIONING SYSTEM	DAIKIN
1202	AIR CONDITIONING SYSTEM	BLUE STAR
1203	AIR CONDITIONING SYSTEM	VOLTAS
1204	**VENTILATION FAN**	ADVANCE VENTILATION PVT LTD.
1205	VENTILATION FAN	CB DOCTOR INDIA PVT.LTD.
1206	VENTILATION FAN	SK SYSTEMS PRIVATE LIMITED
1207	VENTILATION FAN	SARALA (Suburban Industrial Works)
1208	**VENTILATION INTAKE LOUVER, BACK DRAFT DAMPER**	ADVANCE VENTILATION PVT LTD.
1209	VENTILATION INTAKE LOUVER, BACK DRAFT DAMPER	RUSKIN TITUS INDIA PVT. LIMITED
1210	**LNG STORAGE TANK**	INOX
1211	LNG STORAGE TANK	VRV
1212	LNG STORAGE TANK	CHART
1213	LNG STORAGE TANK	TAYLOR WHARTON
1214	LNG STORAGE TANK	CRYOGAS
1215	LNG STORAGE TANK	New Field Industrial Equipment Pvt Ltd
1216	**MANUAL CRYOGENICC GLOBE /CHECK VALVE**	BESTOBELL
1217	MANUAL CRYOGENICC GLOBE /CHECK VALVE	HEROSE

Sr.No	Name of ITEM/Package	Recommended Vendor List
1218	**EP OPERATED CRYOGENIC VALVES**	HEROSE
1219	EP OPERATED CRYOGENIC VALVES	HABONIM
1220	EP OPERATED CRYOGENIC VALVES	BESTOBELL
1221	EP OPERATED CRYOGENIC VALVES	MECAINOX
1222	**ESD VALVES**	BESTOBELL
1223	ESD VALVES	HEROSE
1224	ESD VALVES	MECAINOX
1225	**INSTRUMENT VALVES FITTING, TUBE FITTINGS & AIR MANIFOLD**	SWAGELOK
1226	INSTRUMENT VALVES FITTING, TUBE FITTINGS & AIR MANIFOLD	PARKER
1227	**LEVEL GAUGE**	WIKA

1228	LEVEL GAUGE	CHEMTROL
1229	LEVEL GAUGE	KRONE
1230	**CRYO REGULATOR & PRESSURE REGULATOR**	SAMSON
1231	CRYO REGULATOR & PRESSURE REGULATOR	CASH
1232	CRYO REGULATOR & PRESSURE REGULATOR	BESTOBELL
1233	CRYO REGULATOR & PRESSURE REGULATOR	REGO
1234	**PRESSURE CONTROL REGULATOR**	NIRMAL INDIA
1235	PRESSURE CONTROL REGULATOR	PIETRO FIORENTIN
1236	PRESSURE CONTROL REGULATOR	REGO
1237	**SAFETY VALVE**	HEROSE
1238	SAFETY VALVE	LESSER
1239	SAFETY VALVE	ROCKWOOD
1240	**THERMAL RELIEF VALVE**	HEROSE
1241	THERMAL RELIEF VALVE	REGO
1242	**PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES**	WIKA
1243	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	GENERAL INSTRUMENT
1244	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	WAREE INSTRUMENTS LTD
1245	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	A.N. INSTRUMENTS PVT. LTD
1246	**TEMPERATURE ELEMENTT**	GENERAL INSTRUMENT
1247	TEMPERATURE ELEMENTT	TEMPSEN
1248	TEMPERATURE ELEMENTT	PYROELECTRIC
1249	**PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER**	EMERSON
1250	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	SIEMENS
1251	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	YOKOGAWA
1252	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	HONEYWELL
1253	**JUNCTION BOX**	BALIGA
1254	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.
1255	JUNCTION BOX	EXPROTECTA ELECTRICALS
1256	**FIRE & GAS DETECTION SYSTEM**	DETECTION ELECTRONIC
1257	FIRE & GAS DETECTION SYSTEM	HONEYWELL
1258	FIRE & GAS DETECTION SYSTEM	TYCO
1259	FIRE & GAS DETECTION SYSTEM	CHEMTROL ENGINEERING
1260	**PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL**	ALLEN BRADLEY
1261	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	SIEMENS
1262	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	HONEYWELL
1263	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	YOKOGAWA
1264	**CONTROL CONSOLE**	EVAN

Sr.No	Name of ITEM/Package	Recommended Vendor List
1265	CONTROL CONSOLE	PYROTECH
1266	**SCADA**	HONEYWELL
1267	SCADA	YOKOGAWA
1268	SCADA	SIEMENS
1269	SCADA	ALLEN BRADLEY
1270	**MASS FLOW METER**	EMERSON
1271	MASS FLOW METER	E&H

1272	MASS FLOW METER	SICK
1273	**USM METER**	Daniel/ Insromet International/ Krohne
1274	USM METER	Insromet International
1275	USM METER	Krohne
1276	**LAN SWITCH**	CISCO
1277	LAN SWITCH	NORTEL
1278	LAN SWITCH	MOXA
1279	**LASER JET COLOUR PRINTER**	HP
1280	LASER JET COLOUR PRINTER	Canon
1281	LASER JET COLOUR PRINTER	Epson
1282	**ZENER BARRIERS/ISOLATORS**	MTL
1283	ZENER BARRIERS/ISOLATORS	P & F
1284	**POWER SUPPLY UNIT**	ELNOVA
1285	POWER SUPPLY UNIT	APLAB
1286	**SERVER & HMI**	DELL
1287	SERVER & HMI	HP
1288	**PRIORITY PANEL**	PARKER
1289	PRIORITY PANEL	TULSA
1290	**LEL NG GAS DETECTOR /DETECTION SYSTEM**	CROWCON DETECTION INSTRUMENTS LTD
1291	LEL NG GAS DETECTOR /DETECTION SYSTEM	DETECTION INSTRUMENTS (I) PVT LTD
1292	LEL NG GAS DETECTOR /DETECTION SYSTEM	DETECTOR ELECTRONICS CORPORATION
1293	LEL NG GAS DETECTOR /DETECTION SYSTEM	DRAGER SAFETY AG & CO.
1294	LEL NG GAS DETECTOR /DETECTION SYSTEM	KGAA MSA MINESSAFETY APPLIANCES
1295	LEL NG GAS DETECTOR /DETECTION SYSTEM	OLDHAM FRANCE S.A. HO
1296	LEL NG GAS DETECTOR /DETECTION SYSTEM	HONEYWELL
1297	**EMERGENCY STOP PUSH BUTTON STATION NEAR TANK**	BALIGA/KAYSON/SUDHIR
1298	**ELECTRICAL CABLES**	M/S ASSOCIATED CABLES/
1299	ELECTRICAL CABLES	M/S DELTON CABLES LTD, INDIA /
1300	ELECTRICAL CABLES	M/S KEI INDUSTRIES LTD INDIA /
1301	ELECTRICAL CABLES	M/S - CORDS CABLE INDUSTRIES LTD, INDIA
1302	ELECTRICAL CABLES	M/S POLYCAB WIRES PVT LTD, INDIA
1303	ELECTRICAL CABLES	T. C. COMMUNICATION PVT. LTD., DELHI
1304	ELECTRICAL CABLES	M/S SUYOG
1305	ELECTRICAL CABLES	M/S THERMO CABLES
1306	**CONTROL & INSTRUMENT CABLES**	KEI
1307	CONTROL & INSTRUMENT CABLES	CORDS
1308	CONTROL & INSTRUMENT CABLES	POLYCAB
1309	CONTROL & INSTRUMENT CABLES	DELTON
1310	**CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED**	CRYOSTAR
1311	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	ACD NIKISSO

Sr.No	Name of ITEM/Package	Recommended Vendor List
1312	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	VANZETTI
1313	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	CRYOMECH
1314	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	ICL

1315	**LNG DISPENSER**	CRYOSTAR
1316	LNG DISPENSER	ACD NIKISSO
1317	LNG DISPENSER	CRYOGAS
1318	LNG DISPENSER	INOX
1319	**CNG DISPENSER**	TULSA
1320	CNG DISPENSER	PARKER
1321	**MOTOR**	ABB
1322	MOTOR	SIEMENS
1323	MOTOR	CGL
1324	MOTOR	BBL
1325	MOTOR	MARATHON
1326	**VFD**	ABB
1327	VFD	SIEMENS
1328	VFD	HITACHI
1329	VFD	SCHNEIDER
1330	**FIRE PUMP**	LUBI
1331	FIRE PUMP	KIRLOSKAR
1332	FIRE PUMP	WILO
1333	FIRE PUMP	FLOWMORE
1334	FIRE PUMP	VARAT PUMPS
1335	**HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE**	NEWAGE
1336	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SBJ
1337	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	WINCO
1338	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	VIMAL FIRE
1339	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SUKAN
1340	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SUPREMEX
1341	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	UNITED FIRE
1342	**FIRE EXTINGUISHERS**	MINIMAX
1343	FIRE EXTINGUISHERS	CEASE FIRE
1344	FIRE EXTINGUISHERS	KANEX
1345	FIRE EXTINGUISHERS	SUPREMEX
1346	**FIRE WATER PIPES (MS)**	TATA
1347	FIRE WATER PIPES (MS)	JINDAL
1348	FIRE WATER PIPES (MS)	SURYA ROSHNI
1349	FIRE WATER PIPES (MS)	WELSPUN
1350	FIRE WATER PIPES (MS)	RATNAMANI
1351	FIRE WATER PIPES (MS)	MAHARASHTRA SEAMLESS
1352	FIRE WATER PIPES (MS)	SWASTIK

Sr.No	Name of ITEM/Package	Recommended Vendor List
1353	FIRE WATER PIPES (MS)	ESSAR
1354	FIRE WATER PIPES (MS)	GOODLUCK
1355	**OS & Y GATE VALVES**	KARTAR
1356	OS & Y GATE VALVES	KIRLOSKAR
1357	OS & Y GATE VALVES	HD FIRE
1358	OS & Y GATE VALVES	L&T
1359	OS & Y GATE VALVES	OSWAL
1360	**BUTTERFLY VALVES (FIRE SERVICE)**	TYCO / INTERVALVE / L&T / FOURESS / AV VALVES / ADVANCE / DELVAL / LEADER
1361	BUTTERFLY VALVES (FIRE SERVICE)	INTERVALVE
1362	BUTTERFLY VALVES (FIRE SERVICE)	L&T
1363	BUTTERFLY VALVES (FIRE SERVICE)	FOURESS
1364	BUTTERFLY VALVES (FIRE SERVICE)	AV VALVES
1365	BUTTERFLY VALVES (FIRE SERVICE)	ADVANCE
1366	BUTTERFLY VALVES (FIRE SERVICE)	DELVAL
1367	BUTTERFLY VALVES (FIRE SERVICE)	LEADER
1368	**NON-RETURN VALVES (FIRE SERVICE)**	TYCO
1369	NON-RETURN VALVES (FIRE SERVICE)	L&T
1370	NON-RETURN VALVES (FIRE SERVICE)	WEIR BDK
1371	NON-RETURN VALVES (FIRE SERVICE)	OSWAL
1372	NON-RETURN VALVES (FIRE SERVICE)	FLOTEK
1373	NON-RETURN VALVES (FIRE SERVICE)	STEEL STRONG
1374	NON-RETURN VALVES (FIRE SERVICE)	FLUIDLINE
1375	**STRAINERS (FIRE SERVICE)**	SANT
1376	STRAINERS (FIRE SERVICE)	TELEFLOW
1377	STRAINERS (FIRE SERVICE)	FLAIR
1378	STRAINERS (FIRE SERVICE)	VENUS
1379	STRAINERS (FIRE SERVICE)	LEADER
1380	**FIRE PUMP TEST METER**	TYCO
1381	FIRE PUMP TEST METER	RAPIDROP
1382	**PIPE FITTINGS (FIRE SERVICE)**	UNIK
1383	PIPE FITTINGS (FIRE SERVICE)	ZOLOTO
1384	PIPE FITTINGS (FIRE SERVICE)	VENUS
1385	PIPE FITTINGS (FIRE SERVICE)	FITWELL
1386	PIPE FITTINGS (FIRE SERVICE)	WELDFIT
1387	PIPE FITTINGS (FIRE SERVICE)	JK FORGE
1388	PIPE FITTINGS (FIRE SERVICE)	OMEGA
1389	PIPE FITTINGS (FIRE SERVICE)	HB
1390	PIPE FITTINGS (FIRE SERVICE)	DRP-M
1391	PIPE FITTINGS (FIRE SERVICE)	GREENLINE
1392	PIPE FITTINGS (FIRE SERVICE)	HARDIK FORGING
1393	PIPE FITTINGS (FIRE SERVICE)	METRO METAL
1394	**LEVEL GAUGE FOR FIRE WATER APPLICATION**	LEVCON
1395	LEVEL GAUGE FOR FIRE WATER APPLICATION	SIGMA
1396	LEVEL GAUGE FOR FIRE WATER APPLICATION	CHEMTROL
1397	LEVEL GAUGE FOR FIRE WATER APPLICATION	DK INSTRUMENT

1398	LEVEL GAUGE FOR FIRE WATER APPLICATION	V AUTOMAT
1399	**FLOW DIVERTER**	BESTOBELL

Sr.No	Name of ITEM/Package	Recommended Vendor List
1400	FLOW DIVERTER	REGO
1401	**CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES**	M/S KELTRON CONTROLS LTD
1402	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S ITTAL
1403	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S PYROTECH
1404	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S POSITRONICS PVT. LTD.
1405	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	RITTAL
1406	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	PYROTECH CONTROLS
1407	**INDICATORS**	M/S ABB
1408	INDICATORS	M/S EUROTHERN
1409	INDICATORS	M/S TATA HONEYWELL
1410	INDICATORS	M/S MASIBUS
1411	**LIGHTING FIXTURES (NORMAL)**	HAVELLS INDIA/ GE LIGHTING PVT. LTD/ PHILIPS INDIA LTD/ BAJAJ ELECTRICALS LTD/ CROMPTON GREAVES LTD
1412	LIGHTING FIXTURES (NORMAL)	GE LIGHTING PVT. LTD
1413	LIGHTING FIXTURES (NORMAL)	PHILIPS INDIA LTD
1414	LIGHTING FIXTURES (NORMAL)	BAJAJ ELECTRICALS LTD
1415	LIGHTING FIXTURES (NORMAL)	CROMPTON GREAVES LTD
1416	**DIESEL ENGINE**	CUMMIN
1417	DIESEL ENGINE	GREAVES
1418	DIESEL ENGINE	EICHER
1419	DIESEL ENGINE	KOEL
1420	**VAPORIZER**	CRYOGAS
1421	VAPORIZER	INOX
1422	VAPORIZER	VRV
1423	VAPORIZER	ACD NIKISSO
1424	**DEWATERING PUMP**	CROMPTON
1425	DEWATERING PUMP	KIRLOSKAR
1426	DEWATERING PUMP	LUBI
1427	DEWATERING PUMP	VARAT PUMPS
1428	**STEEL PLATES**	Arcelor Mittal, Romania/ France/ Germany
1429	STEEL PLATES	Azovstahl, Ukraine
1430	STEEL PLATES	Nippon Steel Corporation, Japan [Formerly known as Nippon Steel & Sumitomo Metal Corp. (NSSMC)]
1431	STEEL PLATES	Baoshan Iron & Steel Co. Ltd., Shanghai, China
1432	STEEL PLATES	Dillinger, Germany
1433	STEEL PLATES	Essar Steel, India
1434	STEEL PLATES	Ilva (Riva Group), Italy
1435	STEEL PLATES	JFE Steel, Japan
1436	STEEL PLATES	Jindal Steel & Power Ltd. (upto 20.6 mm)
1437	STEEL PLATES	JSW Steel, USA
1438	STEEL PLATES	Mannesmann Salzgitter Roehrenwerke, Germany
1439	STEEL PLATES	POSCO, South Korea
1440	STEEL PLATES	SAIL, Rourkela Steel Plant (up to 23.8 mm)

1441	STEEL PLATES	Usiminas, Brazil
1442	STEEL PLATES	Voestalpine, Austria
1443	STEEL PLATES	Welspun PCMD, India
1444	**STEEL COILS**	AHMSA (Altos Hornos De Mexico), Mexico
1445	STEEL COILS	Angang Steel Co.Ltd., China

Sr.No	Name of ITEM/Package	Recommended Vendor List
1446	STEEL COILS	Anyang Iron & Steel Group Co.Ltd. China
1447	STEEL COILS	Arcelor Mittal,France/ Germany
1448	STEEL COILS	Baoshan Iron & Steel Co. Ltd., Shanghai, China
1449	STEEL COILS	Benxi Iron & Steel, China
1450	STEEL COILS	Erdemir, Turkey
1451	STEEL COILS	Essar Steel, India
1452	STEEL COILS	Hadeed Saudi Iron & Steel Co., Saudi Arabia/ UAE
1453	STEEL COILS	HBIS Hebei Iron & Steel Group Co.Ltd, China
1454	STEEL COILS	Hunan Valin Lianyuan Steel Co. Ltd. China (Arcelor Mittal Group)
1455	STEEL COILS	Hyundai Steel, South Korea
1456	STEEL COILS	Jiangsu Shagang (Group), China
1457	STEEL COILS	Jinan Iron & Steel Co. Ltd., China
1458	STEEL COILS	JSW steel limited, Dolvi (earlier Ispat (upto X-70, WT-11.7mm)
1459	STEEL COILS	JSW, Bellary India
1460	STEEL COILS	Lloyd Steel, India (upto X-70, WT-11.7mm)
1461	STEEL COILS	Maanshan Iron & Steel Co. Ltd., China
1462	STEEL COILS	Megasteel, Malaysia (upto X-70, WT-10.3mm)
1463	STEEL COILS	POSCO, South Korea
1464	STEEL COILS	SAIL, Bokaro (uptoX-70, WT-11.1mm)
1465	STEEL COILS	Shou-gang Qian Iron & Steel Co. Ltd., China
1466	STEEL COILS	ThyssenKrupp, Germany
1467	STEEL COILS	TISCO (Group) Co. Ltd, China
1468	STEEL COILS	US Steel Kosice, Slovak Republic
1469	STEEL COILS	Wuhan Iron & Steel, China
1470	STEEL COILS	Tata Steel Ltd., Jamshedpur (upto API 5L X-60 & WT upto 9.35 mm)
1471	STEEL COILS	Tata Steel Ltd., Kalinganagar (upto API 5L X-70 & WT upto 16.0 mm)
1472	STEEL COILS	Tata Steel BSL Ltd., Meramandali (upto API 5L X-70 & WT upto 12.7 mm)
1473	**TEMPORARY CATHODIC PROTECTION**	
1474	CATHODIC PROTECTION AGENCY	Corrtech , Ahemdabad
1475	CATHODIC PROTECTION AGENCY	Corrosion Technology Services Pvt. Ltd., Mumbai
1476	CATHODIC PROTECTION AGENCY	Sark EPC, Ahmedadbad
1477	CATHODIC PROTECTION AGENCY	UNDTS, Noida
1478	CATHODIC PROTECTION AGENCY	Mitcorr, Baroda
1479	CATHODIC PROTECTION AGENCY	BSS Tech, Mumbai
1480	CATHODIC PROTECTION AGENCY	Vijaya Engineering
1481	CATHODIC PROTECTION AGENCY	Universal Corrosion Prevention India , Kolkata
1482	CATHODIC PROTECTION AGENCY	AMR Engineering Products , Mumbai
1483	CATHODIC PROTECTION AGENCY	Himoya Corrosion Technology , Kolkata
1484	CATHODIC PROTECTION AGENCY	Consultech ,Baroda

1485	CATHODIC PROTECTION AGENCY	M.Tech Engineers , Surat
1486	CATHODIC PROTECTION AGENCY	Cortigo Technologies Pvt. Ltd , Ahmedabad
1487	CATHODIC PROTECTION AGENCY	AA Projects Cathodic Protection
1488	**JUNCTION BOXES (CLASSIFIED TYPE)**	Flame Proof Equipment Pvt. Ltd.(FEPL), Bombay
1489	JUNCTION BOXES (CLASSIFIED TYPE)	Baliga Lighting, Chennai
1490	JUNCTION BOXES (CLASSIFIED TYPE)	CEAG Flame Proof Control Gears, Bombay
1491	JUNCTION BOXES (CLASSIFIED TYPE)	Flexpro Electricals, Navsari, Gujarat
1492	JUNCTION BOXES (CLASSIFIED TYPE)	Sudhir Switchgear

Sr.No	Name of ITEM/Package	Recommended Vendor List
1493	JUNCTION BOXES (CLASSIFIED TYPE)	FCG flame proof control gears P. Ltd., Daman
1494	JUNCTION BOXES (CLASSIFIED TYPE)	Pepperl & Fuchs manufacturing (I) Pvt. Ltd.,Kanchipuram
1495	JUNCTION BOXES (CLASSIFIED TYPE)	Kaysons Techno equipments Pvt. Ltd., India
1496	JUNCTION BOXES (CLASSIFIED TYPE)	R Stahl Pvt. Ltd. Kanchipuram
1497	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Kristron systems, Mumbai
1498	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Raychem RPG Pvt Limited
1499	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Corrtech International Pvt Ltd
1500	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Sukrit Industries Ahemdabad
1501	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Silverline Integrity Services
1502	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	UNDTS
1503	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	SARK EPC
1504	**CABLES**	Netco Cable
1505	CABLES	KEI
1506	CABLES	Fort Gloster
1507	CABLES	Polycab
1508	CABLES	Universal
1509	CABLES	CCI
1510	CABLES	CMIL
1511	CABLES	Suyog Electricals
1512	CABLES	Victor cables
1513	CABLES	Finolex cables
1514	CABLES	Asian Cables
1515	CABLES	Radiant Cables
1516	CABLES	Icon cables
1517	CABLES	Gemscab
1518	CABLES	Torrent
1519	CABLES	Nicco
1520	CABLES	KEC International
1521	CABLES	Uniflex
1522	CABLES	Havells
1523	CABLES	Crystal Cable Corporation
1524	CABLES	Ravin
1525	**PORTABLE/ PERMANENT REFERENCE ELECTRODES**	Permacell/Harco, USA
1526	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Borin Manufacturer, USA
1527	PORTABLE/ PERMANENT REFERENCE ELECTRODES	M.C.Miller, USA
1528	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Tinker & Rasor, USA

1529	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Ceranoda Technologies, USA
1530	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Telpro USA
1531	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Grouppo De nora, Goa
1532	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Oranzio De nora, Italy
1533	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Silvion, UK
1534	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Harco, USA
1535	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Electrochemical devices, USA
1536	**SURGE DIVERTOR (EX-d type)**	Dehn (Germany)
1537	SURGE DIVERTOR (EX-d type)	OBO Betterman (Germany)
1538	**SOLID STATE POLARISTATION CELL**	Dairyland
1539	SOLID STATE POLARISTATION CELL	Metricorr, Denmark

Sr.No	Name of ITEM/Package	Recommended Vendor List
1540	SOLID STATE POLARISTATION CELL	Rustrol
1541	SOLID STATE POLARISTATION CELL	Dehn, Germany
1542	SOLID STATE POLARISTATION CELL	Kristron Systems, Mumbai
1543	SOLID STATE POLARISTATION CELL	Corrpro system
1544	SOLID STATE POLARISTATION CELL	Caltech
1545	**THERMIT WELDS**	Erico, USA
1546	THERMIT WELDS	Thermoweld, USA
1547	THERMIT WELDS	Erico,Europe
1548	THERMIT WELDS	Bac, UK
1549	**PINBRAZING**	Safe Track
1550	PINBRAZING	Bac, UK
1551	**MAGNESIUM & ZINC ANODES**	Sargam Metal , Chennai
1552	MAGNESIUM & ZINC ANODES	Scientific Metal, Chennai
1553	MAGNESIUM & ZINC ANODES	Shakti enterprises, Ahemdabad
1554	MAGNESIUM & ZINC ANODES	PSL Holding Pvt. Ltd., Mumbai
1555	MAGNESIUM & ZINC ANODES	Cathodic Controls, Bangalore
1556	MAGNESIUM & ZINC ANODES	Impalloy International
1557	MAGNESIUM & ZINC ANODES	Electro protection services, India
1558	MAGNESIUM & ZINC ANODES	Cathodic Control Company Pvt. Ltd., India
1559	MAGNESIUM & ZINC ANODES	Nippon Corrosion, Japan
1560	MAGNESIUM & ZINC ANODES	AFIC, KSA
1561	MAGNESIUM & ZINC ANODES	Platt Bros. and Company, USA
1562	MAGNESIUM & ZINC ANODES	Impalloy International, UK
1563	MAGNESIUM & ZINC ANODES	Corrpro International, Canada
1564	MAGNESIUM & ZINC ANODES	Nakabohtec, Japan
1565	MAGNESIUM & ZINC ANODES	Metal Founder, Mumbai
1566	MAGNESIUM & ZINC ANODES	Corrosion Matters, Hyderabad
1567	**ANODE BACKFILL MATERIAL**	Goa carbon, Goa
1568	ANODE BACKFILL MATERIAL	India Carbon, Kolkata
1569	ANODE BACKFILL MATERIAL	Petrocarbon & Chemical Company, Kolkata
1570	ANODE BACKFILL MATERIAL	Loresco, USA
1571	**PERMANENT CATHODIC PROTECTION SYSTEM**	Corrtech , Ahemdabad
1572	PERMANENT CATHODIC PROTECTION SYSTEM	Corrosion Technology Services Pvt. Ltd., Mumbai

1573	PERMANENT CATHODIC PROTECTION SYSTEM	Sark EPC, Ahmedadbad
1574	PERMANENT CATHODIC PROTECTION SYSTEM	UNDTS, Noida
1575	PERMANENT CATHODIC PROTECTION SYSTEM	Mitcorr, Baroda
1576	PERMANENT CATHODIC PROTECTION SYSTEM	BSS Tech, Mumbai
1577	PERMANENT CATHODIC PROTECTION SYSTEM	Vijaya Engineering
1578	PERMANENT CATHODIC PROTECTION SYSTEM	Cortigo Technologies Pvt. Ltd., Ahmedabad
1579	**TRANSFORMER- RECTIFIER UNITS**	Raychem RPG Pvt Ltd.(Canara Electric), Mumbai
1580	TRANSFORMER- RECTIFIER UNITS	Kristron Systems Mumbai
1581	TRANSFORMER- RECTIFIER UNITS	Cathodic Control Co Pvt. Ltd,
1582	TRANSFORMER- RECTIFIER UNITS	Golconda Corrosion Control Pvt. Ltd., India
1583	TRANSFORMER- RECTIFIER UNITS	Hind Rectifiers Ltd., India
1584	**JUNCTION BOXES (CLASSIFIED TYPE)**	Flame Proof Equipment Pvt. Ltd.(FEPL), Bombay
1585	JUNCTION BOXES (CLASSIFIED TYPE)	Baliga Lighting, Chennai
1586	JUNCTION BOXES (CLASSIFIED TYPE)	Ceag Flame Proof Control Gears, Bombay

Sr.No	Name of ITEM/Package	Recommended Vendor List
1587	JUNCTION BOXES (CLASSIFIED TYPE)	Flexpro Electricals, Navsari, Gujarat
1588	JUNCTION BOXES (CLASSIFIED TYPE)	Sudhir Switchgear
1589	JUNCTION BOXES (CLASSIFIED TYPE)	FCG flame proof control gears P. Ltd., Daman
1590	JUNCTION BOXES (CLASSIFIED TYPE)	Pepperl & Fuchs manufacturing (I) Pvt. Ltd.,Kanchipuram
1591	JUNCTION BOXES (CLASSIFIED TYPE)	Kaysons Techno equipments Pvt. Ltd., India
1592	JUNCTION BOXES (CLASSIFIED TYPE)	R Stahl Pvt. Ltd. Kanchipuram
1593	**JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)**	Kristron systems, Mumbai
1594	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Raychem RPG Pvt Limited
1595	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Corrtech International Pvt Ltd
1596	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Sukrit Industries Ahemdabad
1597	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Silverline Integrity Services
1598	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	UNDTS
1599	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	SARK EPC
1600	**CABLES**	Netco Cable
1601	CABLES	KEI
1602	CABLES	Fort Gloster
1603	CABLES	Polycab
1604	CABLES	Universal
1605	CABLES	Cable Corporation of India
1606	CABLES	CMIL
1607	CABLES	Suyog Electricals
1608	CABLES	Victor cables
1609	CABLES	Finolex cables
1610	CABLES	Asian Cables
1611	CABLES	Radiant Cables
1612	CABLES	Icon cables
1613	CABLES	Gemscab
1614	CABLES	Torrent
1615	CABLES	Nicco
1616	CABLES	KEC International

1617	CABLES	Uniflex
1618	CABLES	Havells
1619	CABLES	Crystal Cable Corporation
1620	CABLES	Ravin
1621	**PORTABLE/ PERMANENT REFERENCE ELECTRODES**	Permacell/Harco, USA
1622	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Borin Manufacturer, USA
1623	PORTABLE/ PERMANENT REFERENCE ELECTRODES	M.C.Miller, USA
1624	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Tinker & Rasor, USA
1625	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Ceranoda Technologies, USA
1626	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Telpro USA
1627	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Grouppo De nora, Goa
1628	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Oranzio De nora, Italy
1629	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Silvion, UK
1630	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Harco, USA
1631	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Electrochemical devices, USA
1632	**SURGE DIVERTOR (EX-d)**	Dehn (Germany)
1633	SURGE DIVERTOR (EX-d)	OBO Betterman (Germany)

Sr.No	Name of ITEM/Package	Recommended Vendor List
1634	**AC CORROSION COUPON**	MC Miller
1635	AC CORROSION COUPON	Farwest Corrosion
1636	**THERMIT WELDS**	Erico, USA
1637	THERMIT WELDS	Thermoweld, USA
1638	THERMIT WELDS	Erico,Europe
1639	THERMIT WELDS	Bac, UK
1640	**PINBRAZING**	Safe Track,Sweden
1641	PINBRAZING	Bac, UK
1642	**ER PROBE**	Rose Corrosion Service, UK
1643	ER PROBE	Metal Samples. USA
1644	ER PROBE	Roharbak Cosasco, USA
1645	ER PROBE	Caproco, UK
1646	ER PROBE	Korosi Specindo, Indonesia
1647	**MMO WIRE ANODE**	Titanor Components Ltd., Goa
1648	MMO WIRE ANODE	Oranzio De Nora, Italy
1649	MMO WIRE ANODE	Eltech System, USA
1650	MMO WIRE ANODE	Ceranode Technologies, USA
1651	MMO WIRE ANODE	Matcor, USA
1652	MMO WIRE ANODE	Covalence, USA
1653	MMO WIRE ANODE	Berry Plastics
1654	MMO WIRE ANODE	Grouppo De nora, Goa
1655	MMO WIRE ANODE	Telpro USA
1656	**MMO TUBULAR /STRIP/RIBBON ANODE**	Titanor Components Ltd., Goa
1657	MMO TUBULAR /STRIP/RIBBON ANODE	Oranzio De Nora, Italy
1658	MMO TUBULAR /STRIP/RIBBON ANODE	Magnetocheme, Holland
1659	MMO TUBULAR /STRIP/RIBBON ANODE	Actel Ltd., UK
1660	MMO TUBULAR /STRIP/RIBBON ANODE	Eltech System, USA

1661	MMO TUBULAR /STRIP/RIBBON ANODE	Ceranode Technologies, USA
1662	MMO TUBULAR /STRIP/RIBBON ANODE	Matcor, USA
1663	MMO TUBULAR /STRIP/RIBBON ANODE	Grouppo De nora, Goa
1664	MMO TUBULAR /STRIP/RIBBON ANODE	Cathodic Control Co Pvt. Ltd, India
1665	MMO TUBULAR /STRIP/RIBBON ANODE	Electro Protection Services India P Ltd
1666	MMO TUBULAR /STRIP/RIBBON ANODE	Emirates Techno Casting, UAE
1667	MMO TUBULAR /STRIP/RIBBON ANODE	Corrosion Matters, Hyderabad
1668	**SOLID STATE POLARISTATION CELL**	Dairyland
1669	SOLID STATE POLARISTATION CELL	Metricorr, Denmark
1670	SOLID STATE POLARISTATION CELL	Rustrol
1671	SOLID STATE POLARISTATION CELL	Dehn, Germany
1672	SOLID STATE POLARISTATION CELL	Kristron Systems, Mumbai
1673	SOLID STATE POLARISTATION CELL	Corrpro system
1674	**HEAT SHRINK CAP FOR ANODE TO CABLE JOINT**	Raychem, USA
1675	HEAT SHRINK CAP FOR ANODE TO CABLE JOINT	Matcor, USA
1676	**MAGNESIUM & ZINC ANODE'S**	Sargam Metal , Chennai
1677	MAGNESIUM & ZINC ANODE'S	Scientific Metal, Chennai
1678	MAGNESIUM & ZINC ANODE'S	Shakti enterprises, Ahemdabad
1679	MAGNESIUM & ZINC ANODE'S	PSL Holding Pvt. Ltd., Mumbai

Sr.No	Name of ITEM/Package	Recommended Vendor List
1680	MAGNESIUM & ZINC ANODE'S	Cathodic Controls, Bangalore
1681	MAGNESIUM & ZINC ANODE'S	Impalloy International
1682	MAGNESIUM & ZINC ANODE'S	Electro protection services, India
1683	MAGNESIUM & ZINC ANODE'S	Cathodic Control Company Pvt. Ltd., India
1684	MAGNESIUM & ZINC ANODE'S	Nippon Corrosion, Japan
1685	MAGNESIUM & ZINC ANODE'S	AFIC, KSA
1686	MAGNESIUM & ZINC ANODE'S	Platt Bros. and Company, USA
1687	MAGNESIUM & ZINC ANODE'S	Impalloy International, UK
1688	MAGNESIUM & ZINC ANODE'S	Corrpro International, Canada
1689	MAGNESIUM & ZINC ANODE'S	Nakabohtec, Japan
1690	MAGNESIUM & ZINC ANODE'S	Metal Founder, Mumbai
1691	MAGNESIUM & ZINC ANODE'S	Corrosion Matters, Hyderabad
1692	**ANODE BACKFILL MATERIAL**	Goa carbon, Goa
1693	ANODE BACKFILL MATERIAL	India Carbon, Kolkata
1694	ANODE BACKFILL MATERIAL	Petrocarbon & Chemical Company, Kolkata
1695	ANODE BACKFILL MATERIAL	Loresco, USA
1696	**INSTRUMENTS, TOOLS AND SPARES**	
1697	HAND HELD DATA LOGGER	ECD, Mumbai
1698	HAND HELD DATA LOGGER	M C Miller, USA
1699	HAND HELD DATA LOGGER	Cath-tech
1700	**GSM BASED DIGITAL DATA LOGGER**	Raychem, USA
1701	GSM BASED DIGITAL DATA LOGGER	M C Miller, USA
1702	GSM BASED DIGITAL DATA LOGGER	Kriston, Mumbai

1703	**CORROSION VOLTMETER**	Rishabh
1704	CORROSION VOLTMETER	MECO
1705	CORROSION VOLTMETER	Fluke
1706	CORROSION VOLTMETER	Yokogawa
1707	**MULTI-COMBINATION METER**	Rishabh
1708	MULTI-COMBINATION METER	MECO
1709	MULTI-COMBINATION METER	Fluke
1710	**CPL SURVEY DATA LOGGER**	MC Miller
1711	CPL SURVEY DATA LOGGER	Roger
1712	**DCVG SURVEY KIT**	DCVG
1713	**HOLIDAY DETECTOR**	Associate Electronics
1714	**PIPE LOCATOR**	Radio Detection
1715	PIPE LOCATOR	Vivax
1716	**ELCOMETER FOR COATING THICKNESS MEASUREMENT**	Olympus
1717	**4 PIN SOIL RESISTIVITY METER**	Tinkor & Rasor
1718	4 PIN SOIL RESISTIVITY METER	Nillson
1719	4 PIN SOIL RESISTIVITY METER	Fluke
1720	**SINCORDER**	MC Miller
1721	**CP SOFTWARE(FOR REMOTE MONITORING)**	Kristron
1722	**ELECTRICIAN TOOL BOX WITH TOOL SET**	Taparia
1723	ELECTRICIAN TOOL BOX WITH TOOL SET	Stanley
1724	**CAT /CAT A FRAME SURVEY EQUIPMENT**	Radio Detection
1725	CAT /CAT A FRAME SURVEY EQUIPMENT	Vivax
1726	**AC/DC INTERFRENCE SURVEY AGENCY**	Jeff Techno Solutions Pvt. Ltd.

Sr.No	Name of ITEM/Package	Recommended Vendor List
1727	AC/DC INTERFRENCE SURVEY AGENCY	Dehn India Pvt. Ltd.

1. Any other vendor(s) apart from as mentioned above may be accepted subject to approval by Owner/Owners representative on submission of refusal letter from the existing approved vendor, non-responsiveness of existing approved vendor, existing approved vendor not complying with the project delivery schedule etc. Evidence of such reasons must be provided with the request and based on past track record (PTR). PTR document shall be submitted by the contractor for review. PTR must contain at least 3 nos. past executed purchase order copy.

2. For the vendors of items not covered in above vendor list, but required for completion of project successfully, supplier shall take approval form Owner/Owners representative for the same during project execution. Bidder shall submit the required certifications, documents, PTR and Performance letters from clients for the same.

3. Refer approved vendor list for applicable items of the subject tender.

Operation and Maintenance of CCDU Packages:

i. The contractor shall deploy adequate number of technicians / supervisors / Engineers / helpers as well as tools, spares, consumables and equipment for smooth and proper maintenance of the Compressor supplied in terms of the contract. In case required to meet operational requirements, the contractor shall augment the same as per direction of Engineer–in-Charge. Contractor to submit a detailed organogram with key person details before starting maintenance of the compressor package.

ii. No operator is required. BGL Intends to operate the booster compressors without operator ensuring package remains in good condition. Therefore, the bidder is required to supply booster compressors that are capable of autonomous operation without the need for operator intervention.

iii. Bidder has to supply the PLC based machine with Internet of Things (IoT) capabilities to access the data through cloud. Bidder has to consider all necessary requirements completely in his scope to run the compressor package on IoT system. BGL shall not pay any additional payment for the operation of compressor package. Bidder has to provide the login details to BGL and access to 03 members from Client side.

iv. The contractor is required to carry out all services as mentioned in the Scope of Services and Schedule of Rates on all the 365 days including Sunday and all Holiday & around the clock.

v. The contractor shall follow Central/State guidelines for labour laws, rules and regulations. However, no work shall be left incomplete/unattended on any holiday/weekly rest. Technicians provided shall have minimum qualification of ITI. Contract in person or his authorized representative shall provide the services on daily basis to interact with Engineer-in-charge and deployed workman.

vi. The work force deployed by the contractor for maintenance service of Compressors, shall be of sound relevant technical professional expertise which is otherwise also essential from the safety point of view of the personnel of the contractor as well as for the installation.

vii. Contractor has to ensure the safety of man and machine all the times. Damages of equipment due to negligence will be recovered as per the decision of Engineer-in-Charge, which will be final.

viii. Regarding work completion, the decision of the Engineer-in-Charge will be final and binding.

ix. The contractor shall make his own arrangements to provide all facilities like boarding and transport etc. to his workmen.

x. All personnel of the contractor entering on work premises shall be properly and neatly dressed and shall wear uniform, badges while working on premises of the Owner including work sites.

xi. Contractor shall maintain proper record of his working employee's attendance and payment made to them.

xii. The contractor's representative/supervisor shall report daily to the Shift-in-Charge for day to day working.

xiii. All the safety rules and regulations prevailing and applicable from time to time at the installations as directed by OWNER will be strictly adhered to by the contractor.

xiv. It will be the responsibility of the contractor to pay as per the minimum wages of the appropriate government applicable under the Minimum Wage Act 1948.

xv. The services shall be provided in terms of shift pattern on the round the clock basis. The contractor is responsible to provide effective and efficient services in all shifts and assure that there is no disruption in the services for want of any resources.

xvi. The contractor shall establish a central control room to operate 24 hours, seven days a week where complaint regarding non-performance of the Compressors in terms of the contract can be lodged. Further, the contractor shall deploy adequate number of technicians/ supervisors / engineers at various site offices in consultation with Engineer-in-Charge to provide trouble free maintenance of the Compressors. Supplier to establish the Control room within 15 days of supply of booster compressors covered in 1st lot, location of control room shall be such that all compressor locations can be catered.

xvii. All arrangements for communication from control room to the contract person working on job under the services shall be the responsibility of the contractor, viz. cell phone / walky-talky.

xviii. The successful bidder shall indemnify the Owner from any claim of the contract labour.

xix. The successful bidder shall comply to all the rules regarding PF, ESI etc. as stated in the tender document

xx. The bidders / contractor who fail to furnish any proof in respect of separate PF Code/No of the concerned RPF Commissioner / Authority their bids shall be liable for rejection.

xxi. All the jobs mentioned under scope of services shall be carried out as per sound engineering practices, work procedure documentation, recommendation of the manufacturer and as per the guidelines/direction of engineer-in-charge of authorized representative.

xxii. Summary of breakdown hour's station wise with analysis shall be submitted to CNG control room on a fortnightly basis both in hard and soft form as per OWNER format.

xxiii. The contractor has to submit the following documents on monthly basis along with the bill:

a) Preventative maintenance compliance report for that month along with the detailed service report.

b) Details of the compressor breakdown, summary of break down hours for that month and the cumulative break down hours along with breakdown response time.

c) Response time is should not be more than 20 minutes and bidder should respond and immediately deploy the team along with required spares to restore the package at the earliest.

d) Compressor parameter log book for the month.

e) Certificate to be given by the bidder stating that they have complied with all the labour regulations and are following the minimum wages act.

xxiv. Maintenance of compressor packages during the warranty period.

xxv. All spares, consumables, lubricating oil, coolant required for carrying out preventive / any type of maintenance shall be in the scope of supplier during the warranty period. The warranty spares shall be supplied by the vendor during the warranty period as per warranty clause.

xxvi. All tools, tackles and fixtures required for carrying out the above maintenance of the compressor shall be in scope of the bidder. The scope will also include handling equipment's like crane, forklift, chain pulley block, etc required during the any maintenances activity.

xxvii. Any correspondence required to be made with the principal company or OEM or various offices shall be made by the bidder or bidder's agent. All arrangements like phone, fax, computer, Internet etc required for above correspondences shall be arranged by the bidder at his own cost.

xxviii. The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. The bidder shall provide the detailed preventative maintenance schedule along with

a) Estimated down time required for each type of maintenance schedule.

b) List of spares and their quantities required for each type of maintenance schedule per compressor.

c) Type and number of man days required for each type of maintenance schedule per compressor.

xxix. The bidder shall plan such maintenances during non-peak hours and in consultancy with the Engineer In Charge (EIC) of OWNER. Any maintenance that needs to be taken up shall be well planned in advance with due approval of the EIC.

xxx. The bidder shall use only OEM's certified spares during maintenances. All spares shall be kept in sealed OEM stamped packages. The packages shall be opened in front of OWNER representative during maintenance. In case, the schedule maintenance of the OEM manual recommends to check and replace parts like valve spring, valve plates, piston rings etc. after certain time interval, same shall replaced or used further only on approval from the OWNER's representative. However any untoward consequences for non-replacement of such parts shall be the responsibility of the bidder and spares, repair required to put back the unit into operation will be to bidders account.

xxxi. All routine and periodic checks / inspections required to be done as per OEM recommendation shall be done by the bidder. Instruments required for above inspection like Vernier calliper, micrometre screw gauge, fill gauges, bore gauge etc shall be in scope of the bidder and these instruments shall be calibrated every year.

xxxii. All parts replaced by the bidder during the above contract period shall be disposed off periodically with permission from OWNER.

xxxiii. The contractor shall submit a copy of the daily / weekly / fortnightly / monthly / bimonthly / quarterly and yearly performance report to the EIC in both soft and hard form. All stationery including the printed material such as compressor parameter log book, complaint log book, service report, break down summary report etc. shall be in scope of the bidder.

xxxiv. All the maintenance / inspection job carried out by the bidder shall be recorded in a service report and the report of the same shall be jointly signed by OWNER representative and submitted immediately after carrying out the maintenance. Service report format shall be approved by OWNER.

xxxv. The EIC will be final authority to take decision with regards to maintenance or replacement of parts or any disagreement between the bidder and OWNER, during the execution of the contract.

xxxvi. The bidder shall carryout calibration of gas detectors and flame detectors every six months or earlier as per requirement or instruction of EIC of OWNER. Also yearly calibration of all instruments such as pressure gauges, transmitters, switches, etc shall be in the scope of the bidder. In addition to the above all safety relief valves shall also be tested and calibrated every year. Zero calibration Mass flow meters is in the scope of the bidder. BGL will provide the FCRI calibrated mass flow meter for cross verification, bidder to check the accuracy of the mass flow meter installed in the package and maintain the accuracy as per OEM recommendation.

xxxvii. Calibration shall be done from government-approved laboratories and shall be carried out at least 15 days prior to the calibration due date.

xxxviii. The bidder shall keep 1 set of safety relief valves in spare for the purpose of calibration.

xxxix. The bidder shall carry out retesting of pressure vessels periodically i.e. every year or earlier as per Gas Cylinder rules 2016 / Static & Mobile Pressure Vessels Rules.

xl. Bidder shall carryout the maintenance of cascade on periodical basis and calibration of pressure gauges on yearly basis, safety valves on half yearly / yearly as per the statutory requirement.

xli. It is the sole responsibility of bidder to carry out the comprehensive maintenance of the CCDU. Bidder shall have to maintain the adequate spares to attend breakdown and preventive maintenance of the CCDU package.

SPECIAL CONDITIONS OF CONTRACT (SCC)

SPECIAL CONDITIONS OF THE CONTRACT (SCC)

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of the Contract. The corresponding clause number of the GCC is indicated in parentheses.

1.0 DEFINITIONS

The Purchaser is: (C&P Department), Bhagyanagar gas Limited having their office at 2nd floor TSIDC buildings, Parishrma bhavan, Basheerbagh, Hyderabad-500004

FOT shall mean sum of Ex-works price including packing and forwarding, TPIA, GST, Transit insurance, transportation, and unloading at site.

2.0 PRICE REDUCTION SCHEDULE (PRS)

Price Reduction Schedule for delay in completion will be applicable separately for:

i)Part A: Supply on FOT site basis

ii) Part B: Installation, testing, commissioning etc. (excluding Price towards Annual operation, repair & comprehensive Maintenance)

The portion of supply completed in all respect which can be used for commercial operation shall not be considered for applying PRS, if delivered within contractual delivery period. The remaining supplies which are completed beyond the contractual delivery shall attract price reduction schedule @½% of the delayed delivery value per complete week of delay or part thereof.

Note: Compressor package shall be considered delivered only after receipt of compressor unit on FOT site/ store, complete in all respect with all required parts & accessories.

Price Reduction Schedule for Installation, testing, commissioning shall be applicable @ ½% of the value of Installation, testing, commissioning per complete week of delay or part thereof.

The maximum value of PRS shall be limited to 5% (five percent) of total order value for supply (Part-A) + Installation, testing, commissioning etc. (excluding Price towards Annual operation, repair & comprehensive Maintenance) (Part-B). For PRS purpose, the above-mentioned contract price shall be excluding GST.

3.0 DELIVERY AND DOCUMENTS

Bidder to note that delivery shall be as per followings:

For Part -: The basis of delivery for all items shall be FOT, BGL Site/OMC site/ Store at Hyderabad GA

Upon delivery of the Goods to the transporters/ carriers, the Supplier shall notify the Purchaser/ Consultant and fax/ mail the following documents to the Purchaser/ Consultant:

(a) LR or GR

(b) Packing List showing weight and dimension of each package

(c) Manufacturer's factory inspection complying the technical specification as per tender.

(d) Inspection release note issued by Purchaser/ Consultant/ TPIA

(e) Cargo Insurance
(f) Dispatch clearance issued by Purchaser/ Consultant.
(g) Likely date of arrival.
(h) Invoice

The above documents shall be received by the Purchaser before arrival of the Goods and, if not received, the Supplier will be responsible for any consequent expenses.
Final original documents for release of payment shall be submitted at BGL, Hyderabad Head Office and transport copy shall be submitted at the time of delivery at BGL designated store/ office.

4.0 SHIPMENT

The Bidder shall make shipment only after obtaining dispatch clearance from Purchaser. For getting dispatch clearance, bidder has to submit inspection release note issued by Third Party Inspection agency/ Purchaser"s authorized representative to the Purchaser.
The bidder shall provide details of adequate coverage of transit insurance along with dispatch documents.

5.0 PAYMENT TERMS

PAYMENT TERMS & MODE OF PAYMENT
[APPENDIX – I TO SPECIAL CONDITION OF CONTRACT]
PAYMENT TERMS & MODE OF PAYMENT
1. PAYMENT TERMS
A. Supply Portion

i. 85 % of the total supply order price (per compressor package) will be paid against receipt of ordered item(s) by
Owner at site upon receipt and acceptance of bills at site against relevant documents as mentioned in order,
payment will be through e-banking (in case of Domestic bidder)

Document Requirement

a. Inspection release note by issued by inspection Agency appointed by owner / consultant.
b. GR / LR.
c. Packing List
d. Insurance cover note covering transit insurance
e. Dispatch Clearance by Owner / Consultant.
f. Documents as specified in the Technical Specifications.
g. Copy of valid Performance Bank Guarantee as per tender terms & conditions
h. Invoice in triplicate (as per GST Act/ Rules)
i. A certificate from manufacturer that the all items/ equipment under supply including its component or raw material used with manufacturing are new and conform to the tender requirement. In case manufacturer is not the contractor this certificate will duly be endorsed by the contractor owning overall responsibility.
j. Indemnity Bond

ii. 15 % of the total supply order price (per compressor package) will be paid within 30 days of successful completion of Installation, Testing, Commissioning and Field Performance test (4 hours) and Field trial run(72 hour) at site and acceptance thereof by Owner and submission of all technical documents as per tender requirement.

However, if erection is not started within 120 days after supply due to non-availability of site / gas, balance payment of 15% of the total supply part shall be processed for release to the successful bidder. In case of delay in receipt of material at site the invoice value shall be reduced to take care of stipulation of PRS clause of the contract.

C. Payment for Maintenance

Monthly Maintenance charges shall be payable from the date of compressors are taken under commercial operation by CLIENT after submission of PBG as per tender terms & conditions.

D. General Notes

i. Invoice shall be raised on the basis of not less than one fortnight interval.
ii. PRS amount pertaining to supply part shall be deducted from 85% of the total supply order price to be paid against Sl. no. i) of Payment Terms.
iii. All efforts shall be made to release the payment within 30 days after receipt of relevant documents complete in all respects.
iv. All bank charges incurred in connection with payments shall be to vendor"s accounts.
v. Unless otherwise specifically stated in bid document, all payments shall be made in the currency quoted.
vi. No interest charges for delay in payments, if any, shall be payable by Owner.
vii. Bidder shall ensure payment of minimum wages, as per Central Govt. or respective State Govt., whichever is higher, to its people engaged in the site activities/ AMC.
viii. Penalty/ deductions for non-performance, if any, shall be applicable as per provisions stipulated in Technical volume (Vol.-II).
ix. The rates quoted for Annual comprehensive repair & Maintenance shall be inclusive of cost of relievers, fulfillment of statutory compliances and meet all the contractual obligation as defined in the bid document.
Comprehensive Annual Comprehensive Servicing, Repair & maintenance charges after successful completion of Warranty Period

Monthly comprehensive maintenance charges shall be paid on pro-rata monthly basis, within 30 days on receipt of correct invoices duly certified by Engineer In-Charge.

6.0 DISPATCH INSTRUCTIONS

Seller shall obtain dispatch clearance from the Purchaser prior to each dispatch.
Copy of Inspection Release Certificate, Dispatch Clearance and Statement showing the name of the vessel / transporter, description and weight of material and shipping marks etc. to be submitted along with the documents.

7.0 REJECTION

Any materials/goods covered under scope of supply, which during the process of inspection by appointed third party, at any stage of manufacture/fabrication and subsequent stages, prior to dispatch is found not conforming to the requirements/specifications of the Purchase Requisition/Order, shall be liable for immediate rejection.
Supplier shall be responsible and liable for immediate replacement of such material with acceptable material at no extra cost or impact on the delivery schedule to OWNER.

8.0 LIMITATION OF LIABILITY

Notwithstanding anything contrary contained herein, the aggregate total liability of Supplier under the Contract or otherwise shall be limited to 100% of contract value. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

The Bidder shall prepare a detailed quality assurance plan for the execution of Contract for the various supplies for approval of BGL/ BGL PMC Consultant.

The Bidder shall establish document and maintain an effective quality assurance system outlined in recognized codes.

The Purchaser, while agreeing to a quality assurance plan shall mark the stages for witness of Tests, review at any or all stages of work at shop/site as deemed necessary for quality assurance.

10.0 INSPECTIONS AND TESTS

Inspection and tests prior to shipment of Goods and at final acceptance shall be as per Technical Specifications, Quality Control Table and approved Inspection & Test Procedure. However, without prejudice to the provisions of technical specifications following shall hold good:

The Purchaser or its representative shall have the right to inspect and/ or to test the material to confirm their conformity to the specifications.

The inspections and tests may be conducted on the premises of the Seller or his subcontractor (s) at point of Delivery and/or at the destination. When conducted on the premises of the Seller or his subcontractor(s), all reasonable facilities and assistance including access to the production data shall be furnished to the Purchaser's representatives at no charge to the Purchaser.

The Purchaser's right to inspect, test and wherever necessary reject the material after the material"s arrival in the Purchaser"s country shall in no way be limited to or waived by reason of the material having previously been inspected, tested and passed by the Purchaser or their representative prior to the material shipment from the country of origin.

Supplier shall hire Third Party Inspection Agency (TPIA) for carrying out the inspection at supplier"s works as per approved ITP. TPIA charges shall be borne by Supplier. Approved TPIA are Moody International (India) Pvt. Ltd., Dr. Amin Controllers Pvt. Ltd., Certification Engineers International Ltd., International Certification Service Pvt. Ltd., Bureau Veritas (India) Pvt. Ltd., Hertz Inspection & Services Pvt. Ltd., Meenar Global Consultant, Quality Evaluation and Systems Team Pvt. Ltd. TUV SUD South Asia, Vincotte International India Assessment Service Pvt. Ltd., TUV India Pvt. Ltd., SGS India Pvt. Ltd. Supplier shall obtain BGL /BGL"s Consultant's approval before finalizing the TPIA.

11.0 REPEAT ORDER

PURCHASER reserves the right, within 06 months of order to place repeat order upto 50% of the original ordered quantity (s) without any change in unit price or other terms and conditions.

12.0 MODE OF PAYMENT

Payment will be released through E-payment as detailed in ITB Taxes & duties (GST) shall be paid in Indian Rupees only. For reimbursement of taxes & duties the currency exchange rate as mentioned in GST Invoice shall be considered.

The payment shall be released within 30 days from the date of receipt of invoice, if found to be in order and duly certified by PMC/EIC.The Payment shall be released through RTGS only.

13.0 DEDUCTION AT SOURCE

Purchaser will release the payment to the Seller after effecting deductions as per applicable law in force.
Purchaser will release payments to the Bidder after offsetting all dues to the Purchaser payable by the Bidder under the Contract.
Notes: - All Invoices shall be raised in line with the GST Act/rules in vogue.

14.0 GUARANTEE/ WARRANTY

Warranty shall remain valid for twelve (12) months from the date of successful commissioning of supplied material or Eighteen (18) Months after the date of receipt of last shipment whichever is earlier. However, if these 18 months" period exceeds due to any defect observed in the supplied material at site in that case supplier to replace the material without any extra cost to owner and the warranty will stand extended for another 12 months from the date of supply of replaced material.

15.0 PACKING

The SCC provisions shall supplement GCC Clause 11.0 as detailed below.
Packing shall be capable of withstanding rough sea weather for a minimum period of 2 to 3 months and shall be commensurate with the best commercial export practice in case of sea freight.
Fragile articles shall be packed with special precaution and shall bear the marking like 'Fragile Handle with Care' and' or 'This side Up' etc. Items shipped in bundle must be securely tied with steel wire or straps at suitable intervals.
All delicate surface on equipment' materials shall be carefully protected and painted with protective paint compound and wrapped to prevent rusting and damage.
Attachments and parts of equipment and small pieces shall be packed in wooden cases with adequate protection inside the case and wherever possible should be sent along with the major equipment. Each item shall be tagged so as to identify it with the main equipment and part number and reference number shall be indicated.
All protrusions shall be suitably protected, and openings shall be blocked by wooden covers.
Wherever required, equipment' material shall be packed in polythene bags and silica gel or similar dehydrating compound shall be put inside the bags for protecting them.

16.0 CONTRACT PERFORMANCE BANK GUARANTEE

FOR SUPPLY: The successful bidder shall furnish the Contract Performance Bank Guarantee (CPBG) equivalent to 05 (Five) % of the total FOT order value exclusive of taxes & duties against supply portion including installation and commissioning within a period of 30 Days from the date of issue of LOI/ Purchase Order/Work Order. The CPBG should initially be kept valid for 90 days beyond the guarantee / warranty/ defect liability period.

FOR CAMC: The successful bidder shall furnish the Contract Performance Bank Guarantee (CPBG) equivalent to 05% of the Annualized Comprehensive AMC value (excluding all taxes and duties) shall be

submitted within 30 Days of start of each comprehensive AMC. The CPBG should be valid for 90 days beyond the expiry of entire Comprehensive AMC period.

Or

Initial security deposit(ISD) @ 2.5% of the annualized Comprehensive AMC value (excluding all taxes and duties) shall be submitted within 30 Days of start of each comprehensive AMC) and deduction @ 2.5% of RA bill subsequently from RA bill till the total amount of security deposit (including ISD and deduction amount) reaches 5% of annualized Comprehensive AMC value.

The CPBG should be valid for 90 days beyond the expiry of entire Comprehensive AMC period

17.0 CORRESPONDING ADDRESS PURCHASER:

C&P Department
Bhagyanagar Gas Limited
2nd floor , TSIDC buildings,
Parishrma Bhavan, Basheerbagh,
Hyderabad-500004

18.0 CONTRACT VALIDITY AND DELIVERY SCHEDULE

The Contract shall be valid for a period of 01 (one) year from the date of issuance of LOI/PO.

Sr.No	Location	Description	Quantity	Delivery schedule
1	Hyderabad,	400 SCMH integrated / CCDU	10	Within 02 (Two) months from the date of Purchase order or as instructed by EIC

19.0 Commissioning shall be carried out within 01 (one) week from the date of EIC's intimation, subject to readiness of the site.

20.0 BGL Intends to operate the booster compressors without operator ensuring package remains in good condition. Therefore, the bidder is required to supply booster compressors that are capable of autonomous operation without the need for operator intervention.

21.0 Bidder has to supply the PLC based machine with Internet of Things (IoT) capabilities to access the data through cloud. Bidder has to consider all necessary requirements for this requirement completely in his scope. Bidder has to provide all necessary requirements for IOT system without any additional expenses to BGL.

22.0 Bank guarantee for O&M shall start from the date of commercial operation by the purchaser which will be 7.5% of total cost of O&M services.

23.0 The installations where job is to carried out are live and have hydrocarbon environment. Bidder shall comply with all safety and security rules and regulations and other rules laid down by purchaser for its operation. It shall be the duty/ responsibility of the bidder to ensure the compliance of fire, safety ,security and other operational rules and regulations by his personnel. Dis regards to these rules by the bidders personnel will lead to the termination of the contract in all respects and shall face penal / legal consequences.

24.0 The bidder shall arrange insurance of all this workers engaged on the job as per the relevant acts, rules and regulations, etc. In case by virtue of provisions of workers compensation Act, or any the law in forces. Purchaser has to pay for compensation for a workman employed by the bidder due to ant cause whatsoever the amount so paid shall be recovered from the dues payable to the bidder and / or security deposit/ Contract performance security guarantee (CPBG).

25.0 BGL shall reserves the right ant any time during the currency of the contract . to terminate it by giving 30 days notice to the bidder, and upon expiry of such notice period the bidder shall vacate the site/office occupied by him immediately.

26.0 The bidder shall ensure and will be solely responsible for payment of wages and other dues latest by 7th of the following month to the personnel deployed by him in the presence of the company's representative.

27.0 The bidder shall be directly responsible for indemnify the company against all charges, claims, dues etc. arising out of disputes relating to the dues and employment of personnel deployed by the bidder.

28.0 The contractor shall maintain the compressors in sound mechanical condition at all times. The contractor shall rectify the defects notified by Client immediately and should submit all the history log sheets and spares availability status along with the report in the format mutually agreed between Client and the bidder.

29.0 **DEFECT LIABILITY PERIOD**

The Contractor / Supplier shall guarantee the Supplies, installation /Work for a period of 12 months from the date of completion of Work i.e. date of commercial operation or commissioning, whichever is earlier , as certified by the ENGINEER IN CHARGE which is indicated in the Completion Certificate. Any damage or defect that may arise or lie undiscovered at the time of issue of Completion Certificate, connected in any way with the equipment or materials supplied by him or in the workmanship, shall be rectified or replaced by the CONTRACTOR/ SUPPLIER at his own expense as deemed necessary by the ENGINEER IN CHARGE or in default, the ENGINEER IN CHARGE may carry out such works by other work and deduct actual cost incurred towards labour, supervision and materials consumables or otherwise plus 100% towards overheads (of which the certificate of ENGINEER IN CHARGE shall be final) from any sums that may then be or at any time thereafter, become due to the CONTRACTOR/ SUPPLIER or from his Contract Performance Security, or the proceeds of sale thereof or a sufficient part on thereof.

30.0 Sub-letting of contract

Sub-letting of contract: The bidder may sub let/ assign the installation and O&M services to an agency having experience of CNG compressor installation and O&M for min two years. However, complete responsibility including composite bank guarantee shall be furnished by the bidder/supplier. Bank guarantee for O&M shall be submitted as per clause no 16 of special conditions of contract.

BhagyanagarGas Limited	**Procurement of 400 SCMH Electric Motor Driven Online CNG Composite/Integrated Dispensing Unit (CCDU) with 5 years of CAMC including warranty period on NPV basis** **Bid Document No. BGL/662/2025-26**	Volume II of II

BHAGYANAGAR GAS LIMITED

SCHEDULE OF RATES

Subject : Procurement of 400 SCMH Electric Motor Driven Online CNG Composite/Integrated Dispensing Unit (CCDU) with 5 years of CAMC including warranty period on NPV basis

TENDER NO: BGL/662/2025-26

Name of Bidder

Sr. No.	Item Description	Qty	Units	1.Unit Price including packing & forwarding charges (such price to include all costs as well as duties and taxes paid or payable on components and raw materials incorporated or to be incorporated in the goods) including cost of Inspection by Third Party Agency, mandatory spares etc. (wherever applicable)-For Supply items 2. UNIT RATE INCLUSIVE OF ALL TAXES, DUTIES, LEVIES, ETC. BUT EXCLUDING GST AS DEFINED IN BID DOCUMENT [IN FIGURES]- For Service items & freight	GST (%)	Total GST Amount in INR (corresponding to total qty)	1.Total Price including packing & forwarding charges (such price to include all costs as well as duties and taxes paid or payable on components and raw materials incorporated or to be incorporated in the goods) including cost of Inspection by Third Party Agency, mandatory spares etc. (wherever applicable) including applicable GST. - For Supply items 2. TOTAL AMOUNT INCLUSIVE OF ALL TAXES, DUTIES, LEVIES, ETC. BUT INCLUDING GST AS DEFINED IN BID DOCUMENT [IN FIGURES]- For Service items & freight
				Amount in INR / No.	%	Amount in INR	Amount in INR
A	B	C	D	E	F	G=C*E*F	H=C*E+G
Group-A.1	400 SCMH Electric Motor Driven Online CNG Composite/Integrated Dispensing Unit (CCDU) Package						

Digitally signed by PRADEEP KUMAR YADAV
Date: 2025.08.08 18:47:38 IST

Part-1	**HYDERABAD**						
1	• Design, Engineering, Manufacture, Shop testing, loading, unloading , transportation and supply of Electric motor driven integrated CNG Composite Dispensing Unit (Compressor + Cascade + Dispenser) with Compressor capacity of 400 SCMH, 450 WL CNG Cascades, Dual hose Car cum Auto Dispensers complete with all items such as air compressor, Co2 flooding and other accessories including erection and commissioning spares, acoustic enclosures etc. Final/Complete Scope shall be as per technical specifications. .Services for Erection, Testing, and Commissioning and performance acceptance testing of compressor as defined in PTS- Motor driven CNG Compressor Packages. • Scope also includes Comprehensive Maintenance for each compressor during warranty period of 01 year and further four years after warranty period, • Final/Complete Scope shall be as per technical specifications. Capacity: 400 SCMH	**1**	**Nos.**			-	-
2	Freight charges per compressor for delivery at site/stores at Hyderabad GA.	**1**	**Nos.**			-	-
3	**INSTALLATION, COMMISSIONING, TESTING**						
4	Installation, commissioning & Field performance test of Compressor Package including all accessories/ equipment(s) i.e. air compressor, CO2 flooding system etc. system at site.	**1**	**Nos.**			-	-
5	**Total amount for supply, installation, testing & commissioning (inclusive of taxes) based on quoted price**						
6	**SERVICES FOR OPERATIONS & COMPREHENSIVE MAINTENANCE**						
7	**ITEMS FOR OPERATIONS**						
8	Operation charges for 1st year i.e. during Warranty period per shift of 8hrs (1 packages X 3 shifts X 365 days) The quoted rate (for 1 No of shift) for this item must be equal to or more than 0.0096% of unit price (sl.no 1) quoted by the bidder.	**1095**	**No of Shifts**			-	-

9	Operation charges for 2nd year i.e. during Warranty period per shift of 8hrs (1 packages X 3 shifts X 365 days) The quoted rate (for 1 No of shift) for this item must be equal to or more than 0.0101% of unit price (sl.no 1) quoted by the bidder.	**1095**	**No of Shifts**			-	-
10	Operation charges for 3rd year i.e. during Warranty period per shift of 8hrs (1 packages X 3 shifts X 365 days) The quoted rate (for 1 No of shift) for this item must be equal to or more than 0.0105% of unit price (sl.no 1) quoted by the bidder.	**1095**	**No of Shifts**			-	-
11	Operation charges for 4th year i.e. during Warranty period per shift of 8hrs (1 packages X 3 shifts X 365 days) The quoted rate (for 1 No of shift) for this item must be equal to or more than 0.0110% of unit price (sl.no 1) quoted by the bidder.	**1095**	**No of Shifts**			-	-
12	Operation charges for 5th year i.e. during Warranty period per shift of 8hrs (1 packages X 3 shifts X 365 days) The quoted rate (for 1 No of shift) for this item must be equal to or more than 0.0115% of unit price (sl.no 1) quoted by the bidder.	**1095**	**No of Shifts**			-	-
13	**Total amount for OPERATIONS (inclusive of taxes) based on quoted price**						
14	**ITEMS FOR COMPREHENSIVE MAINTENANCE**						
15	Lump sum Repair & Comprehensive Maintenance charges (excluding the scope covers under warrantee) per Compressor Package including air compressor for 1st year during warrantee period in all Geographical Areas of BGL inclusive of all manpower, spare parts, lubricants and consumables etc. (1 package X 12 Months) The quoted rate (for 1 Machine Month) for this item must be equal to or more than 0.40% (maximum 1.5%) of unit price (sl.no 1) quoted by the bidder.	**12**	**Machine Months**			-	-
16	Lump sum Repair & comprehensive maintenance charges (including major overhaul) per Compressor Package including air compressor in all Geographical Area's under BGL periphery inclusive of all manpower, spare parts, lubricants and consumables etc. For the below mentioned years (1 package X 12 Months)						

17	For 2nd Year The quoted rate (for 1 Machine Month) for this item must be equal to or more than 0.50% (maximum 1.5%) of unit price (sl.no 1) quoted by the bidder.	**12**	**Machine Months**			-	-
18	For 3rd year The quoted rate (for 1 Machine Month) for this item must be equal to or more than 0.55% (maximum 1.5%) of unit price (sl.no 1) quoted by the bidder.	**12**	**Machine Months**			-	-
19	For 4th Year The quoted rate (for 1 Machine Month) for this item must be equal to or more than 0.61% (maximum 1.5%) of unit price (sl.no 1) quoted by the bidder.	**12**	**Machine Months**			-	-
20	For 5th Year The quoted rate (for 1 Machine Month) for this item must be equal to or more than 0.67% (maximum 1.5%) of unit price (sl.no 1) quoted by the bidder.	**12**	**Machine Months**			-	-
	Total amount for supply, installation, testing & commissioning, Operations & COMPREHENSIVE MAINTENANCE (inclusive of taxes) based on quoted price (without NPV calculation)			**-**		**-**	**-**