BHAGYANAGAR GAS LIMITED

(A JOINT VENTURE OF HPCL & GAIL)

BID DOCUMENT FOR

PROCUREMENT OF 01 NO. 1600 SCMH MOTOR DRIVEN COMPRESSOR PACKAGE WITH 05 YEAR CAMC FOR UPGRADATION OF BGL CNG MOTHER STATION, SHAMIRPET

UNDER OPEN DOMESTIC COMPETITIVE BIDDING

Bid Document No.: BGL/633/2024-25

VOLUME-II of II

SECTION – 8
SCOPE OF WORK

SCOPE OF WORK (SOW)

The scope of work indicates minimum requirement for each 1600 SCMH Motor Driven CNG Compressor package at BHAGYANAGAR GAS LIMITED having at least following CNG equipment's and associated accessories.

a). 1600 SCMH Motor Driven Compressor
b). Air compressor package
c). PLC, Alarms etc.
d). Inlet PRV, Valve, Tubing's, other accessories etc.
e). Electrical Panel & its accessories etc.

The bidder may be required to carry out all related activities that may be required for successful completion of the work at each CNG Station having 1600 SCMH Motor Driven CNG Compressor package, as per directions of the Engineer in Charge (EIC).

1. CONTRACTOR SCOPE

A. SUPPLY, ERECTION, INSTALLATION & COMMISSIONING

Successful Supply, Erection, Installation & commissioning of 1600 SCMH Motor Driven CNG Compressor-01 No. at Site & its accessories including Electrical panel, Air Compressor, Leak detection system, CO2 Flooding system, PLC of compressor Package, CNG Piping, around the compressor area and other auxiliaries with the compressor package etc. The contractor shall provide all necessary tools, tackles, chain-pulley block, hoist, equipments, trolley, fork-lift, pick-up, crane etc which may be necessary required during erection & installation of compressor etc. covered under the contractor scope.

All Type of Cable (Main motor power supply, Panel, Instrument cables) with required flame proof double compression glands Supply, Laying, Testing & Termination of PVC Insulated, PVC Sheathed cables etc, covered under the contractor scope.

B. SCOPE OF SUPPLY & WORK FOR COMPREHENSIVE OPERATION & MAINTENANCE:

Any spare part required during the contract period shall be supplied by contractor free of cost. Further, all the consumable, lubricating oil, coolant, Manpower, DM Water, Housekeeping etc required for carrying out the comprehensive Operation & Maintenance of complete compressor package during the contract period, including periodic/scheduled, breakdown maintenance of continuous and uninterrupted operation of compressor packages shall be in the scope of contractor and shall be kept in stock. Electricity shall be supplied free of cost to the contractor.

C.1. CNG COMPRESSOR OPERATION:

a. Providing services for Round the Clock (24X7) Operation for each 1600 SCMH Motor Driven CNG Compressor Package including - Compressor, Instrument Air Compressor/ dryer, PLC, Valves, Tubing etc, complete to the satisfaction of BGL & as per OEM recommendations in order to ensure smooth operation and minimize downtime of compressor packages.

b. The contractor will deployed well qualified, trained and experienced operators in 8 hourly shift pattern (A, B, C and Reliever Shift) for 365 days of operation per year including closed holidays and Sundays. Operators with **minimum qualification of X + ITI or** Diploma Engineers will be preferred. Operators has to be deployed as per BGL instructions.

c. Logging of equipment running, equipment availability, break down report, shut down report, maintenance report, various reports including logging of vital parameters of CNG compressor such as Oil level, Coolant level, Opening Closing of all Mass Flow Meters, daily inspection reports, gas consumption report, gas dispatch report etc as may be prescribed by BGL from time-to-time.

d. The operation of compressor package including its auxiliaries and daily recording of vital parameters in contractor scope.

e. Observance of Safety Rules and Regulations prevalent in the Gas & Electrical based installations, specifically Compressed Natural Gas, Fire Drills, DCP operation, firefighting, and spreading awareness. Ensure Safety of Man and Machine at all the times.

f. Housekeeping of the compressor area.

g. Close supervision of all operational activities and control.

C.2. COMPREHENSIVE MAINTENANCE

The contractor shall to keep all the spares, consumable, lubricant, coolant, maintenance team required for carrying out periodic, Breakdown, Emergency Maintenance etc of the CNG compressor package including Electrical panel, Air Compressor, Leak detection system, CO2 Flooding system, CNG Compressor, PLC of compressor Package, CNG Piping, around the compressor area and other auxiliaries with the compressor package, Air Compressor etc. so as to minimize the down time of any equipment.

Non availability of compressor package due to unavailability of manpower's/ spares shall be liable for penalty as per SCC clause No. 20.0

a. The contractor shall provide all necessary tools, tackles, chain-pulley block, hoist, equipments, trolley, fork-lift, pick-up etc, which may be necessary required during to carry out maintenance, calibration etc. covered under the contractor scope.

b. Any export service required from principal company Or OEM (of any equipment in the package) shall be arranged by the contractor or his agent at his own risk & cost. All arrangement like phone, fax, computer, Internet etc required for correspondence with above personnel shall be arranged by contractor.

c. Submission of Monthly Preventive, Scheduled and Emergency/ Breakdown maintenance reports to EIC along with the supporting documents.

d. The maintenance team will assist any unplanned/emergency maintenance of equipment installed at CNG Station.

e. The contractor shall use only OEM certified spares during the maintenance. In case the schedule maintenance of the OEM manual recommends checking replacing parts like, valve springs, valve plate, piston, piston rods, piston rings, O-rings, Filters, valve assembly Suction, discharge, replaceable part of packing, valve internals, bearing, belts etc after certain time interval same shall be replaced or used. Any untoward consequences for non- replacement of such part shall be responsible of the contractor.

f. During the preventive maintenance/ handing over of machine, any wear limits of all component of compressor package will be determined/analyzed on pro rata basis from the last date of spares replacement and considering total running hours of machine, Joint decision for replacement of parts will be taken with due consideration to total running hours of package.

g. Painting of the equipment is to be done by the contractor for safety of equipment, as per direction of EIC.

h. A detailed report of all spares & consumable used have to be maintained by the contractor, having details of part No., Qty used expected running hours before replacement etc. The same has to be submitted monthly to BHAGYANAGAR Gas Ltd.

i. All routine and periodic check/ Inspection required to be done as per OEM recommendation shall be done by the contractor. Instrument required for above inspection like Venire Caliper, Micrometer, Screw Gauge, Fill Gauge, Bore Gauge, Vibration Meter etc shall be in the scope of contractor and these instruments shall be calibrated every year.

j. All spares parts to be replaced in the compressor package should be brand new and unused. Inspection of each spares parts to be utilized in the CNG compressor will be carried out by BGL representative.

k. All leak chock/ Inspection of the associated SS tubing, fittings, Valves and hose of the compressor package (i.e. Inlet & Outlet of compressor) shall be done by contractor.

l. The contractor shall ensure that compressor running parameters are recorded in daily log book including all vital parameters and Maintenance record of Preventive, Schedule, Breakdown, Emergency and spares used. The format of log book to be finalized in consultation with EIC in line with OEM specification/ recommendation. All stationary including printed material shall be in the scope of contractor.

m. The contractor shall submit a copy of monthly/ quarterly and yearly performance report to the EIC in the both soft and hard from including condition monitoring and safety Interlock checks. All the stationary including the printed material shall be in scope of contactor

n. The entire maintenance/ inspection job carried out by contractor shall be recorded and report of the same shall be jointly signed by owner representative.

o. The EIC will be final authority to take the decision with regards to maintenance replacement of parts or any disagreement between the contractor and owner during the execution of contract.

p. The contractor shall either maintain master equipments duly calibrated from NABL accredited laboratories within test due life or engage any NABL accredited laboratories for calibration of Instruments (all type) & Contractor shall submit calibration certificates issued by NABL accredited agency.

q. The contractor shall carry out calibration of safety relief valve, Gas Detector, Flame detector every six Months or earlier as per requirement or instruction of EIC. Also yearly calibration of all instruments including Pressure Gauges, Temperature gauges, Transmitters, Switches etc shall be in the scope of contractor.

Calibration shall be done from Govt approved laboratories and shall be carried out 15 days prior to the calibration due date. Incase POP-UP of any valve; the same shall be calibrated immediately.

r. The contractor shall carry out Ultrasonic test (UT) of Pressure vessel on yearly basis.

s. The calibration of Compressor All Mass Flow meter shall be done once in a year through Mass Flow meter OEM or BGL approved agency . (Spare Mass Flow meter to be provided by contractor)

t. The contractor shall carry out Functional test of PRVs on yearly basis.

u. The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. The contractor shall plan such maintenance during non-peak hours and in consultation with EIC. Any maintenance needs to be taken up shall be well planned in advance with due approval of the EIC. The scope shall be including preparation of maintenance schedule for carrying out the maintenance during the contract period.

v. Anything required over and above what is specified for safe & satisfactory maintenance of the equipment package shall be included by the contractor in his scope.

w. In general, the contractor has to carry out full comprehensive Operation & Maintenance of the Motor Driven CNG Compressor Package at the CNG station, thereby making available the equipment in running condition at all times, through the supply of adequate skilled Supervisor/technician, OEM Spares, OEM recommended consumable and any other specialized service.

C.3. SCHEDULED MAINTENANCE

i. All activities required to be carried out as per instruction of EIC.

ii. All kind of machinery, tools, tackles and consumable items required to complete the above job are in the scope of the contractor.

iii. Hourly Maintenance to be planned/carried out as per OEM recommendation with replacement of brand new spares.

iv. De-coupling of starter motor / electrical lockout of starter motor to be done before proceeding.

v. Complete depressurizing of the equipment along with pipe fittings before proceeding with maintenance.

vi. Scheduled maintenance shall be categorized as monthly, Hourly basis. The tasks may be rescheduled based on equipment health as per instruction from EIC and as per OEM recommendation/ schedule.

vii. Vibration condition Monitoring will be carried out in scheduled maintenance.

viii. In addition to the jobs in, the following jobs need to be carried out at each scheduled maintenance.

- Inspection/cleaning/ repair/ replacement of valves, fittings and other piping's.
- Checking of diaphragms, O-rings, gaskets. Replacements if required.
- Adjustment of PRVs.
- Checking the alignment of compressor coupling and performing alignment is required.
- Checking for freeness/ abnormal sounds/vibration monitoring of all rotating/ reciprocating parts.
- Checking for any wear and tear of Internal parts like crank shaft, camshaft, piston
- Maintenance of lubricator assembly, if required.
- Inspection of valves. In case of any damaged parts, necessary steps to be taken as per instruction of EIC.
- Boxing up of dismantled parts & connection of all associate piping with proper gasket & fasteners.
- Maintenance /inspection of all other accessories like instrumentation gauges, pipe fittings, joints, PLC, electrical connections.
- Cleaning/ house-keeping of the equipment including the foundation area.
- The job shall be deemed completed only after successful trial including leak testing.

C.4. ROUTINE MAINTENANCE

Routine maintenance shall include the following in addition to OEM recommended checks

1. Checking for any abnormal sounds, vibration, loose bolts including foundation bolts and attending the problem if required.
2. Checking Engine oil level and quality and oil top up if required. Both Compressor Crankcase oil and lubricator oil to be maintained.
3. Draining of Condensate from blow down vessel daily.
4. Cleaning of filters/strainers, and replacing them if required.

5. Checking for any leaks in pipe fittings and attending the leaks with proper, gaskets, O-rings, PTFE as applicable.

6. Maintaining of Daily LOG Sheets

7. Checking of Co2 flooding system healthiness and other safety equipment healthiness.

2. BHAGYANAGAR GAS LTD OBLIGATIONS

1. Provide working place (having basic utilities including power supply etc) for maintenance team

2. Provide uninterrupted controlled power supply for PLC and other electrical equipments.

3. Dry and clean gas for compressor

4. Public utilities like wash rooms.

3. MAINTAINING SAFETY AT CNG STATION

The contractor shall Providing 2 sets of uniform, Safety shoes - 01 on yearly basis & other personal protective equipments and identity cards to all personnel deployed at the station for the work. Uniform/I - cards for Technician/Operator shall be Sky Blue shirt & Navy Blue Pant with embossing of Bhagyanagar Gas Ltd Logo, Only Cotton**. T-Shirt will not be acceptable**.

SECTION 9
TECHNICAL SPECIFICATION

1.0 GENERAL

1.1 OWNER is responsible for distribution of Natural Gas for household/commercial sectors including setting up CNG refueling stations for vehicles etc.

2.0 SCOPE

2.1 The intent of this tender is to outline minimum requirement for design, engineering, manufacturing, assembly, inspection, testing, packaging, supply, erection & commissioning including performance acceptance test at site along with operation and comprehensive AMC during 1 (one) year warranty period and subsequent 4 (Four) year period including supply of all spares and consumable items for " ELECTRIC MOTOR DRIVEN RECIPROCATING CNG ON-LINE COMPRESSOR PACKAGES " 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 Online compressors have to be installed at the CNG outlets of owner and other oil 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.

2.3 Bidder shall be responsible for supply, erection, commissioning and field trial run. Noise level test and performance test of all packages at sites. The field trial run of the compressor will be for minimum of 4 hours (can be in multiple runs) 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.

2.4 It will be the endeavor of all the parties to get the Performance Acceptance Test (PAT) at site conducted within a period of 20 days from the start of commercial operation of a particular package. The bidder has to keep the compressors operational round the clock in three shifts or as defined by EIC 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 maintain the compressors in sound mechanical condition at all times. 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.

2.5 The bidder shall depute adequate numbers of qualified, experienced and competent persons and supervisors for smooth maintenance of the compressors. The maintenance staffs have to be available round the clock daily throughout the year.

2.6 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.

2.7 The bidder has to maintain an office at site with telephone and fax 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.

2.8 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.

2.9 The work force deployed by the bidder for the maintenance services at the CNG installation in 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.

2.10 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.

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

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

2.13 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.

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

2.15 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.

2.16 The bidder shall arrange to provide 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.

2.17 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-fulfillment 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.

2.18 Receipt at site, storage in warehouse as per manufacturer's recommendation and safety and security from theft and breakage/damage during transportation, handling at site.

2.19 Submission of drawings & documents.

2.20 Erection, O&M and all others relevant manuals for compressor & its accessories, priority panel, electrical motor & all instrumentation.

2.21 All Type of Cable (Main motor power supply, UPS, Panel, Instrument cable) with requires gland Supply, Laying, Testing & Termination of PCV Insulated PVC Sheathed etc. covered under the contractor scope.

2.22 **GENERAL**

The contractor must follow the OPERATION & 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.

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 in terms of shift pattern or the round the clock basis as mentioned in the bid document.

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

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

2.23 OPERATION AND MAINTENANCE OF COMPRESSOR 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. 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.

iii. The contractor shall allow weekly rest and daily working hours to his workmen as per the relevant Act/Law/and Rule made there under. 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 has to ensure the safety of man and machine all the times. Damages to 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 lodging, 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. The contractor's representative/supervisor shall report daily to the Shift-in-Charge for day to day working.

xi. 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.

xii. 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.

xiii. 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.

xiv. 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.

xv. 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.

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

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

xviii. Summary of breakdown hours 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.

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

xx. Preventative maintenance compliance report for that month along with the detailed service report.

xxi. Details of the compressor breakdown, summary of break down hours for that month and the cumulative break down hours along with breakdown response time.

xxii. Compressor parameter log book for the month.

xxiii. 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. All 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.

xxv. 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 any maintenances activity.

xxvi. Any correspondence required to be made with the 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.

xxvii. 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 estimated down time required for each type of maintenance schedule, list of spares and their quantities required for each type of maintenance schedule per compressor, type and number of man days required for each type of maintenance schedule per compressor.

xxviii. 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.

xxix. 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 replace 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.

xxx. 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, micrometer screw gauge, fill gauges, bore gauge etc shall be in scope of the bidder and these instruments shall be calibrated every year.

xxxi. All parts replaced by the bidder during the above contract period shall be properly packed and handed over to OWNER, on replacement.

xxxii. 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.

xxxiii. 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.

xxxiv. 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.

xxxv. 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. Mass flow meters shall calibrate every 12 months or year. In addition to the above all safety relief valves shall also be tested and calibrated every Six Months.

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

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

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

xxxix. All spares, consumables, oil and lubricants required for carrying out the Operation and Maintenance of the complete compressor packages including periodic breakdown and any other materials required for operation and maintenance of the compressor packages, shall be provided by the bidder.

xl. All tools, tackles including special tools and 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.

xli. 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.

xlii. The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. 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. The scope shall include preparation of maintenance schedule for carrying out the maintenance during the contract period.

xliii. 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.

xliv. 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, micrometer screw gauge, fill gauge, bore gauge etc shall be in scope of the vender.

xlv. Bidder to provide Preventive maintenance schedule based on running hours / periodicity of the compressor package.

xlvi. All parts replaced by the bidder during the above contract period shall be properly packed and handed over to OWNER, on replacement.

xlvii. 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.

3.0 CODES AND STANDARDS

The following National & International Codes & Standards of Latest

editions shall be applicable. OISD 179, NFPA-52: 1995 or equivalent

NFPA – 37: STANDARD FOR THE INSTALLATION AND USE OF STATIONARY COMBUSTION ENGINES AND GAS TURBINES

NFPA – 12: STANDARD ON CO2 EXTINGUISHING SYSTEM

IS: 325/ IEC or International standards. : THREE PHASE INDUCTION MOTORS - SPECIFICATION

IS: 6382: CODE OF PRACTICE FOR DESIGN AND INSTALLATION OF FIXED CO2 FIRE EXTINGUISHING SYSTEM

Applicable ANSI, ASTM, NEC, NEMA code.

API – 618: RECIPROCATING COMPRESSORS FOR PETROLEUM, CHEMICAL AND GAS INDUSTRY SERVICES

API – 11P 2nd edition: SPECIFICATION FOR PACKAGED RECIPROCATING COMPRESSORS FOR OIL AND GAS PRODUCTION SERVICES

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.

TEMA – C - Water cooled heat exchangers ASME / ANSI – B-31.3 Code for Process Piping

3.1 Precedence

In case of any conflict among the various documents, 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 CNG compressor packages as per the BEC requirements.

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

(3) Completely filled in Data Sheets of compressor, motor

(4) Deviations if any to this Technical Specification

(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) Data Sheets of compressor, motor, instrumentation & controls

3.2 Ambient Conditions

Complete 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:

i.	Amb. temp min/max0C	:	2 0C / 47.5 0C
ii.	Design wet bulb temp (WBT), 0C	:	27 0C
iii.	Design relative humidity %	:	90
iv.	Altitude above MSL, M	:	650
v.	Wind velocities km/hr (max)	:	160
vi.	Air Cooler discharge Design 0C	:	520C DBT, 270C WBT & 90% RH

Typical Gas Composition Range

	Normal Gas Composition
Nitrogen	0.3505
Methane	94.6591
CO2	0.5502
Ethane	2.3547
Propane	1.0458
i-pentane	0.2135
n-Butane	0.3223
n-pentane	0.1414
n-Hexane	0.2199
GCV	9721
NCV	8775
Specific gravity	0.58-0.625

NOTE: Compressor guaranteed performance shall be estimated for the design gas composition and performance shall be reported for the two extreme gas compositions above.

4.0 SCOPE OF SUPPLY FOR EACH COMPRESSOR PACKAGE

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

i. Design, Engineering, Manufacture, assembly, testing at manufacturer's works, erection, commissioning, field trial runs, Equipment performance test along with associated electricals, instrumentation etc. as per bid document.

ii. 3 nos. mass flow meters to measure the Natural Gas consumption at packages inlet, package discharge (both Coriolis type) and package loss / venting (thermal type) with spool piece for online test arrangement. All 3 no. of mass flow meters should be of same make and should have local display and should be weather proof. The flow meters should be enabled with MODBUS/RS 485 communications.

iii. Instrumentation and control system as specified on data sheets, P&ID including Local panel, Console/Local gauge boards, PLC.

iv. The provision for overhead mounting of cascade [3000 water liter capacity with approximate weight of 7.5 tons] should be there & same should be of enough strength having working space and with ladder arrangement. However Cascade supply and its Mounting on the structure shall be in the scope of purchaser. Structure Stability compliance Certificate of the unit from the manufacturer where cascade will be mounted to be submitted during detail engineering. Cascade drawing will be provided during detailed engineering. However if any modification is required for the structural frame of the compressor on which cascade is to be mounted is to be carried out at site by the bidder during installation of the cascade by the owner Common structural steel skid for the compressor- Motor combination and for all auxiliary systems Air-

cooled heat exchanger for inter stage and discharge gas.

v. 9 line for 1600 SCMH (3 bank) Priority Panel at Package Discharge.

vi. All interconnecting oil, gas, water, air piping within the compressor package.

vii. Impulse and pneumatic piping/Tubing for all valves, fittings as specified & required for mounting the instruments. Block and bleed valves to be provided for Pressure gauges and pressure Transmitters.

viii. Separate junction boxes for different type of signals like intrinsically safe signals, alarm, shutdowns, thermocouples, RTDs etc. for interfacing to local panel.

ix. NRV at final discharge

x. Structural supports within the compressor package for all piping, instruments etc.

xi. One no. relief valve at each stage discharge, first (1st) stage suction and Blow down Vessel.

xii. 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.

xiii. Coupling/V-belts/pulleys.

xiv. Acoustic enclosure for Compressor package, with two number L.E.L detectors and two UV detectors in one enclosure.

xv. Common CO2 extinguishing system consisting of two cylinders, piping, valves and control systems as per details given in this specification.

xvi. Inlet and outlet manual and automatic isolating valves for maintenance & emergency.

xvii. Complete Erection, Testing & Commissioning of compressor packages.

xviii. Run test and Performance acceptance test at site

xix. Supply of all essential spares as specified, erection & commissioning spares.

xx. One set of priced spare parts catalogue along with the priced bid (Commercial bid), as built drawings and Operation & Maintenance catalogue with each compressor package.

xxi. 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 Liters.

xxii. Only air cooled and 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 as required.

xxiii. Priority refueling system outside of the package or as per vendors design.

xxiv. Drive belt, if used shall be anti-static fire retardant type.

xxv. Duplex suction filters to be provided at the inlet of package with Differential

Pressure gauge after Y- type strainer.

xxvi. Two stage filtration at discharge so as to limit oil carryover is to be provided.

xxvii. Three no. Emergency stop button (push type) along with one hooter in office/customer interface room with its required cable.

xxviii. Wires mesh type guard for heat exchanger fan.

xxix. Secondary lubrication system with check valve protector, HP (High Pressure) Filter (for all lubricating points) & DNFT (Digital No Flow Timer) flow switches with standby pump. Secondary lubrication system with divider block shall be provided.

xxx. Erection, O&M and all others relevant manuals for compressor & its accessories, priority panel, electrical motor & all field instruments.

xxxi. Annual Operation and comprehensive maintenance services for a period of 1(one) year during the warranty period, including supply of all spares and consumable items.

xxxii. Annual Operation and comprehensive Maintenance services for a period of 4 (Four) year after the warranty period including supply of all spares and consumable items.

xxxiii. Supply and laying of all required cable (Main cable, UPS cable, PLC cable, Panel cable, ESD cable, Air compressor cable, instrument cable) in bidder scope.

4.1 **Exclusions**

The following are excluded from the scope of the bidder:

i. All civil works and foundation design, however the bidder shall furnish all the relevant data for design of any pedestal if required.

ii. All piping beyond battery limits except from air compressor & air piping for air and piping from CO2 cylinders up to the enclosure.

iii. Three banks Cascades.

iv. CNG Dispensers and Interconnected SS tubes & fittings.

5.0 BATTERY LIMITS

4.1 All customer interface connections (i.e. Gas inlet & gas outlet) shall be brought out to the package edge. Gas inlet shall be terminated in nozzles with isolation valves having flange connections and gas outlet (priority panel outlet connection) shall be terminated through high-pressure ¾" full bore ball valves with 3/4" end connectors.

4.2 As and where specified on the data sheets all vents (i.e. Relief valve, distance piece, packing and starting air) shall be man folded and terminated at skid edge outside the enclosure and vented to safe height (3 M from ground) at package roof. Silencer has to be provided in the starting air vent line.

4.3 All drains from different process equipment's, distance piece and packing shall be man folded 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 compressor package.

6.0 UTILITIES

i. Any auxiliary motor above 10 hp shall be provided with soft starter (three phase controlled) type starter. Single phase motor will be not acceptable above 1 hp rating.

ii. Bidder shall make his own provision for Instrument air if required with an electric motor driven air compressor with a suitably sized receiver & Refrigerant type air drier system. Air Compressor motor should be 415 V squirrel cage motor L&T make DOL / star delta starter having overload protection, single phase preventer.

iii. Oil Drain should be through a common header and discharge to be allowed in pot outside the package (capacity not more than 2.5 liter's) to avoid spillage around the compressor package.

iv. All electrical and instrumentation terminals shall be as specified.

v. Purchaser shall provide 415 V, 3Ph, 50Hz, 4 wire electric power for compressor motor drive at a single point.

vi. Purchaser shall provide the 230V, 50Hz, 1Ph UPS, for LCP at single point in the electrical room.

7.0 GENERAL DESCRIPTION

The CNG Compressor is to be installed at CNG station. The gas will be tapped from OWNER pipeline. The gas composition is as detailed in this document.

A. GENERAL DATA

1.1	Compressor type	
1.1.1	Oil lubricated	
1.2	Type of cooling	Gas cooling and cylinder cooling should be by air only.
1.3	No of compression stages	02
1.4	Cylinders	Horizontal Balanced Opposed design with lined cylinder/ trunk piston
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 Technical Annexure –I
1.7	Maximum motor power	To be indicated with 10 % margin over BKW
1.8	Drive mode	V- belts/Direct coupled. If Belt Driven, idler pulley for tensioning

		of Belts is required. Direct drive (from prime mover to compressor) is preferred over belt driven. Power Transmission should be through 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/Cm2 g at 52 deg. C (Max)	
		Compressor Discharge temperature 52 ºC (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	2.0 0C to 47.5 ºC.	
2.4.2	Maximum relative humidity	90 %	
2.4.3	Elevation		
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/Cm2 g.	Rated Discharge pressure in Kg/Cm2 g and at 43 deg C (MAX.)	Guaranteed capacity at rated suction and discharge pressure in Sm3/hr (SCMH)
	35	255 bar and flow rate should be 2000SCMH	1600

Hereinafter the rated suction pressure, where guaranteed flow is required, will be referred as Rated Suction Pressure, which means 35 Kg/cm^{2}g for 1600 SCMH compressors. Suction pressures will be measured at inlet flange of the 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) No advantage shall be given in case bidder offers compressor with flows higher than as detailed above for various types.

b) 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.

c) Bidder to indicate the capacity and absorbed power of the offered compressors at various suction conditions starting from 32 Kg/Cm2 g to 40 Kg/Cm2 g

(Temperature 40 deg C max.) and 255 Kg/Cm2g and 52 deg. C (max) discharge condition.

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 32 Kg/Cm2 g to 40 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 32 Kg/Cm2g to 40 Kg/Cm2g and at various suction temperatures ranging from 20° to 40° C. Similarly the graphs shall be plotted at various discharge pressures ranging from 200 Kg/Cm2g to 255 Kg/Cm2g, however at 52° C (max) discharge conditions.

d) Bidder to note that the compressor package required shall be suitable for operating at a suction pressure from 32 Kg/Cm2g to 40 Kg/Cm2g at 40 deg. C. Reduction of suction pressure by means of pressure regulating valve (PRV) is to be achieved. Gas inlet pressure regulator of 300# class rating with inlet pressure range of 25 kg/cm2 to 45 kg/cm2 with an outlet discharge range of 30 Kg/Cm2 g to 40 Kg/Cm2 g adjustable.

e) 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

8.0 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) Bidder needs to submit the copy of valid type approval for compressor packages from PESO. The PESO certificate should be valid as on due date of Tender. It will be the responsibility of the successful bidder to keep the PESO approval valid throughout the contract execution period.

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

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

f) 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.

g) Each package ENCLOSURE shall have two nos. (2) LEL detectors (IR Type) and two nos. (2) Ultra Violet (UV) fire detectors to cover the enclosure

effectively as already spelt in the scope of supply.

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

i) 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.

8.1 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) Gas Detection by installation of hydrocarbon gas detector (IR type) with self-check function and transmitter with adjustable alarm levels (0-100% of flammability range) with preset of 10%, 20% and 50%.

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

d) 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.

e) No extra utility as air, inert Gas shall be made available by OWNER/used by the supplier to operate the system other than the UPS.

f) Cylinder should be ISI marked as per IS: 7285 and CCOE approved.

g) 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.

h) Interlock of CO2 Flooding system with compressor as per following sequence:

i) Compressor shall trip on detection of gas at preset level and close the inlet & Outlet valve

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

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

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

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

n) 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.

o) CO2 Cylinders shall be provided outside the package at a safe place/ Safe Distance, 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.

p) Suitable online weight (CO2) loss monitoring/ indication device to be provided to ascertain the health of the CO2 flooding system.

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

r) The system designed by the supplier shall be duly approved by Owner/ Owner's representative.

s) Technical specifications, Operation and Maintenance Manual, CCOE 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.

t) System shall be offered for testing to OWNER 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 OWNER after performance test. If the system fails during testing, subsequent testing and refilling would be at vendor's cost.

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

v) Piping of CO2 flooding system shall be seamless high pressure pipe of Schedule 40 of ½'' 12 mm of appropriate length with a minimum safe distance 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.

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

x) Specifications:

Valve for CO2 High Pressure Hose:

i. As per BIS specifications
ii. Operating Media: CO2
iii. Body Material: Brass, BIS: 319
iv. Ball: SS 316
v. Pin: SS 316
vi. Seal: Teflon (PTFE - Polytetrafluoroethylene)
vii. Working Pr.: 60Bars
viii. Test Pressure: 90 Bars for 1 min
ix. Weight: 70gm
x. Outlet Size: ¾ BSP (British Standard Pipe Parallel) at manifold end --
xi. Inlet Size: ½" BSP (British Standard Pipe Parallel) at CO2 Discharge Hose end
xii. Temp. Range: -29° C to 66° C

Hose Adopter:

i. As per BIS specifications
ii. Operating Media: CO2
iii. Body Material: Mainly Brass
iv. Test Pressure: 250 Bar
v. Max. Working Load: 150 Bar
vi. Temp. Range: -29° C to 66° C

Discharge Nozzle:

i. As per BIS specifications
ii. Operating Media: CO2
iii. Body Material: Leaded Tin Bronze as per BIS: 318:1981
iv. Design Nozzle Pr.: Not less than 20.6 kgf/cm2 at 27° C
v. Test Pressure: 140 kgf/cm2
vi. Marking for Code No. (on the basis of equivalent single orifice dia.): As per BIS: 6382:1982
vii. Temp. Range: -29° C to 66° C

High Pressure Hoses:

i. As per BIS 7285:1974
ii. Operating Media: CO2
iii. Hose Type: Double wire breaded (perforated) rubber covered
iv. Min. Bursting Pr.: 420 kgf/ cm2 at 54° C

v. Length: 40 cm
vi. Cross-section: ½"
vii. End Connection: ½" BSP (F) xW21.614 TPI
viii. End Fittings: Brass
ix. Temp. Range: -29° C to 66° C

8.2 **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"

9.0 BASIC DESIGN OF COMPRESSOR

9.1 Following specification is intended to give the bidder the technical and operating conditions the compressor must fulfill.

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

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

9.4 Cylinders of compressor should be horizontal balanced/ trunk piston design. Vertical blocks are not acceptable. 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.

9.5 Compressor cylinder shall be provided preferably with removable liners.

9.6 Latest technology shall be applied to the piston ring to ensure reliability and oil control with polymer rings fitted to the final stage. The bidder to indicate the life of piston rings of all stages in terms of running hours.

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

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

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

9.10 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.

9.11 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 as per IEC code penalty 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.

9.12 In case of lubricated cylinder & packing design, single plunger 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.

9.13 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.

9.14 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.

9.15 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.

9.16 Level trips of oil & coolant must be provided with wire open alarm.

9.17 All package flow meters 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 readings are observed.

9.18 All cables entries should be from bottom 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.

9.19 All instruments and their cables should be at appropriate distances from the exhaust line/hot parts as per applicable codes & standards

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

9.21 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 should be transparent for easy of inspection during running. Set values should be prominently marked on the gauges.

9.22 Part / Equipment / Accessories to be included

a) Gas tight crankcase.

b) Packing case & pressure packing.

c) Drive motor with pulley/flywheel

d) Inter-stage coolers for all stages.

e) Final cooler.

f) Oil pump, oil filter

g) Oil cooler.

h) Crankcase breather piped back to suction.

i) Oil/moisture separators appropriate for selected cylinder configuration.

j) Automatic condensate drains system for all separators to remove oil / moisture periodically and ease starting.

k) Separator drain valves piped to collection drain block suitable for connection to gas recovery system.

l) Safety relief valve on each stage of compression.

m) Safety relief valve discharges connected to common manifold suitable to allow dispersion of gas via a vent stack and flame arrestor / trap.

n) PRV (Pressure Relief Valve) at the inlet of the system.

o) BDV (Blow down Vessel) at the inlet of the system.

p) Interconnecting piping between cylinders, coolers and separators.

q) Pulsation dampeners.

r) Interconnecting water piping between radiator and compressor.

s) Interconnecting instrumentation piping.

t) Suction & Discharge Mass flow meter

u) Thermal Mass flow meter for vent loss

v) Priority panel with SS tubing

9.23 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. Only lubricated and air cooled compressor block is acceptable.

9.24 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 and mobile cascade reaches 250 barg.

9.25 9 line (3 bank - Cascade) priority fill system, for 1600 to be provided. The priority fill system shall ensure filling as per following sequence:

- **FOR 1600 SCMH (MOTHER STATION): 9 Line**

A : When Compressor is running

i. Priority no. 1: Car dispenser Low bank

ii. Priority no. 2: Car dispenser Medium bank

iii. Priority no.3: Car dispenser High bank

iv. Priority no.4: Bus dispenser (Single bank filling)

v. Priority no.5: High bank of storage Cascade

vi. Priority no.6: Medium bank of Storage Cascade

vii. Priority no.7: Low bank of storage cascade

viii. Priority no.8: Mobile cascade mounted on Light commercial Vehicle (Single bank filling)

ix. Priority no.9: mobile cascade-2

B : When Compressor is not running

When the compressor is not running, the valves of priority panel shall take the position so that gas available in the stationary car cascade and bus cascade can be dispensed. The priority of dispensing from car cascade shall be as follows

i. Priority no.1: Low bank of storage cascade

ii. Priority no.2: Medium bank of Storage Cascade

iii. Priority no.3: High bank of storage Cascade

9.26 Priority system should be designed so that the gas flow from stationary cascade to dispenser is possible even with the Compressor shutdown & de-energized

Compressor shall be designed to ensure flow capacity as follows:

S r. No.	Suction Pressure	Flow Capacity
1.	Minimum flow capacity as on-line compressor at suction pressure of 35 bar at 35 Degree C.	Min. 1600 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 75dBA at 1m from the compressor package enclosure at any point.

9.27 Framework shall be mounted on a suitable skid type base, external-lifting lugs shall be provided at each corner. For 1600 scmh, bidder should quote their most optimized footprint area package. PLC can be placed separately (outside of the canopy) for optimization of the foot print area. Maximum footprint of compressor Package shall be as under,

a) For 1600 SCMH, the foot print of the package shall be limited to 10m2.

9.28 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.

9.29 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 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 (40 bar) of the operating pressure (35 bar to 40 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.

9.30 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 VFD/ Soft Starter 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.

9.31 Motor Specification (To be provided separately for 1600 SCMH)

i. 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 however winding temperature limited to class B

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 starts of motorminimum 4 per hours

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

ii. 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 (IE# 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 50 degrees package ambient temperature. Motor shall be suitable for VFD starter/ soft starter. Service factor shall not play any role in finalizing the rating of motor.

2) Main Motor Starter: Variable Frequency Drive (Heavy Duty) with input line and DC choke, along with other safety measures.

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

4) VFD 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) Appropriate cable (wrt: size, material, and shielding) to be used for VFD drive.

6) Routing of VFD and power cable shall be separated from control supply/ instrument cables.

7) 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

iii. Cooling system

a) 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 C.

b) 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.

c) 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.

d) 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.

9.32 Oil Filter

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

Contractor 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 during the entire life cycle of compressor package operation.

9.33 Gas recovery system

If required, the Contractor 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.

9.34 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:

a) Seamless SS Tubing

b) Material of construction Stainless Steel 316L

c) Tube hardness shall be less than 80 RB

d) Sizes : Metric system (inch)

e) Max Working Pressure : 350 barg

SS FITTINGS & VALVES SPECIFICATIONS:

a) Material of construction Stainless Steel 316

b) Sizes : Metric/SI

c) Standard : ASTM/ ASME/ DIM

d) End connections : Single or Double ferrule Compression type / NPT

e) Max Working Pressure : 350 barg

f) PSV Vent Line to be extended above the package to safe height.

g) Dedicated Air compressor of adequate capacity

9.35 Electrical System

a) 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.

b) OWNER 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.

c) The electrical power supply distribution panel, switch gear panel and starter shall meet the requirement for the specified area classification in which they are installed, including instrumentation leads.

d) Semiconductor fuses to be provided, where applicable.

e) All illumination fittings should be single phase AC supply based.

f) All wire/ cable to be used in compressor and panel shall be of copper conductor and FRLS type through proper cable tray conduit etc.

g) Compressor package should always start on NO-LOAD of compressor 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.

h) Sufficient space to be provided for Motor JB for cable glanding work.

i) 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).

j) Multifunction meter also required for fan motor electrical parameters monitoring.

k) Bidder to ensure that spares and service support of all switchgears, VFD, instruments, soft starter or meter etc used in package/ panel, shall be available in Indian market.

l) The power factor (PF) of the whole electrical system should not be below 0.95. Motor feeder shall be provided with energy meter, heavy duty switch, HRC link type with single phase presenter fuses, contactor (AC-3 Duty), bi-metal relay switch fuse unit, voltmeter, push buttons, earth leakage relays, indication lamps for start/stop/trip/ etc.

m) Ammeters shall be provided for all motors above 3.7. KW rating. Stop push buttons shall be lockable and have stay put except in case of critical devices such as lube oil pumps etc.

9.36 Earthling System

The design & installation of earthling 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 earthling 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.

9.37 Phase sequence preventer (Current based) shall be provided

9.38 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.

10.0 INSTRUMENTATION & CONTROLS

10.1 All the instruments and control shall be suitable for area Class I, Group D, Division1

10.2 All package mounted transmitters & temperature elements 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. All pressure gauges shall have an accuracy of +/- 1% of FSD (full scale division) and 100mm / 63mm dial size. Pressure sensing elements shall be minimum of SS316 and movement of SS304. All pressure gauges on process lines having range more than 40kg / cm2g shall be with two isolation valves or needle valve.

10.3 There shall be provision of two; Coriolis based mass flow meters inside the compressor package one for suction and one for discharge. Flow meters shall be suitably installed and clamped as per OEM guidelines/ recommendations to avoid measurement errors due to external vibration. Relevant calibration certificates to be provided. Flow meters must have integral display to show instantaneous values of mass flow. The totalizer readings from the flow meter should be communicated to PLC and PLC shall record the flow readings. Shift wise, day wise and month wise flow totalizer readings should be available in PLC display.

10.4 The temperature gauge shall be generally mercury in steel field type. Capillary tubing shall be min. SS304 with SS flexible armoring. The gauge shall have an accuracy of +/-1% FSD and 100mm dial size. The range shall be 1.5 times of operating temperature. Skin type temperature gauges shall not be used. In PLC pressure process values should be taken from pressure transmitters and should be independent from pressure gauges installed on local gauge panel. Temperature process values should be taken from temperature transmitters and should be independent from temperature gauges installed on local gauge panel. The compressor package instrumentation & control is to be configured for manual as well fully automatic control system including starting, shutdown as

applicable for unattended operation.

10.5 Individual (2/3 core) cabling is required for each field instrument from field JB to avoid multiple JB's and multicore cables in field for easy trouble shooting & replacement.

10.6 Each cable shall be neatly tagged & dressed for each instrument with ferrule.

10.7 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 either single or double channel in place of multichannel for easier replacement.

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

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

10.10 Suitable bypass for interlocks shall be provided for start-up.

10.11 Compressor package shall be provided with the following indicators:

i. Pressure indicator at 1st stage suction & discharge and other stage discharge.

ii. Oil pressure indicator on each pressure lubrication system

iii. Oil levels indicator, field mounted

iv. Hour meter

v. Non- resettable electromechanical hour meter on local control panel.

vi. Compressor jacket water coolant temperature indicator on local gauge panel

vii. Hydraulic oil cooler inlet & outlet temperature on local gauge panel (if required)

viii. Hydraulic oil pressures each stage on local gauge panel (if required) The Compressor package shall be provided with the following trip devices:

a. Low oil level protection devices

b. High oil temperature devices

c. Low suction pressure protection devices

d. High discharge temperature protection device

e. Coolant flow low devices

ix. Flame detection

x. Gas detection

xi. Emergency stop devices

xii. Fail safe/ wire break alarm for safe operation

xiii. Interlocking provision in PLC program for tripping of machine

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

a) On high oil temperature

b) On low suction gas pressure

c) On high discharge pressure

d) On high discharge gas temperature

e) On coolant flow low

f) On fire detection

g) On gas detection

h) On pressing manual sop button at local control panel

i) On pressing emergency stop devices

10.12 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 button

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

10.14 Junction box shall be of explosion proof type with 10-20% extra terminal strip & cable gland shall be of double compression type.

10.15 Gas detectors and flame detectors should be mounted within the canopy.

10.16 ESD button (5 Nos.) with require cables shall be provided by bidder (Customer Interface room, locally mounted on package, electrical JB and Panel room). A separate hooter for customer interface room shall be provided with annunciation window alarm of individual protection device.

10.17 Emergency shutdown devices.

The emergency shutdown (ESD) system is also in scope of vendor. This shall be in accordance with NZS 5425. 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.

10.18 Local Control Panel

a) There shall be three independent ports available in the PLC with all the parameters available on each individual port.

b) Out of three ports, from first port there shall be an arrangement to retrieve the data in external storage device such as memory card/ pen drive. Data may be required in suitable format as per OWNER engineer in charge discretion. This will include critical temperature, pressure, flow, running hour information etc. Depending upon

the parameters calculation of gas loss, efficiency, normalized efficiency etc. is also required.

c) Second port shall be for remote monitoring of the parameters. Besides PLC display, all the parameters which are measured should be monitored on a HMI/ MMI for remote monitoring as well as of remote operation. Data should be stored at 2 places simultaneously, in case of failure of one device data can be retrieved from second device. Trends, alarms, events should be logged for at least 3 months on day/ hour/ minutes/ basis. HMI shall be provided with touch screen and operating system software (with minimum all the features of operator panel of min.10" graphic display of Siemens/Schneider)

d) PLC shall have facility to store the data & event upto to 15 days in case of communication break between PLC & SCADA system. All the stored data shall be downloaded in SCADA system automatically with time stamping after establishment of communication.

e) Third port shall be available for any third party interface which shall be OPC compliant for networking or SCADA. The recorded data or part of the data may be required to transmit to remote locations over open/ secured network through internet/ Ethernet using local cable/ data card/ sim card (GPRS/LTE). Modem/ router or any other medium to transmit the data should be available. Vendor shall provide protocol details to OWNER and also provide necessary support for third party interface for remote data connectivity.

f) Redundancy in PLC is required. PLC shall incorporate all process parameters (specified elsewhere) and status of compressor, engine & priority panels and shall be modular in construction with 100% redundancy with respect to CPU, Power supply, Interface. PLC components/ system shall be tropicalized, MIL standard adopted with complete wiring and necessary terminals. Wiring to be color coded with cross ferruling in position. PLC shall be capable of carrying out on line routines for at least ten separate loops without affecting the scan, cycle & updating time etc. PLC shall be configured as a remote terminal unit of supervisory computer and data acquisition system complete with GPRS and Ethernet connectivity. One card for transferring and accessing data from minimum twenty devices with RS485 port shall be provided. In case of failure of master/ active controller/ CPU, standby controller/ CPU should take over the control in seamless and bump less manner. All values & data should be available through both the controllers immediately, i.e. there should be no data loss.

g) Successful bidder to include in scope live demonstration of remote monitoring of all PLC logged parameters in one machine at his works. OWNER may ask for the same. However, this may be required to be demonstrated at site.

h) PLC based logic circuits shall be used for control & interlock of the compressor package with RS485 SCADA Connectivity as per details in Annexure-IX.

i) Local control panel shall be furnished with annunciation window alarm of

individual protection device and a common hooter for audible alarm.

j) Local panel should have separate push button for start, stop, emergency stop, alarm acknowledge, alarm rest & test button for checking healthiness of annunciation system.

k) PLC shall be housed inside flameproof IIA/ IIB (Ex'd'). Local operator panel shall also be provided on the flameproof enclosure. The operator panel is provided for parameterization, indication, monitoring, and alarms and first out sequence of the system. PLC system shall have memory modules for storing user programs, symbol lists, program comments and should facilitate debugging/ trouble shooting without the application program. Program shall be as per IEC 61131 and communication shall be in English for each run. Program should have signal/ parameter tags as labels for easy identification/ troubleshooting. Each section of the program whether it is in the form of rung or page or network should have comment to classify the interlock being executed. A soft copy of the program should be sent by email/ portable hard disc/pen drive.

l) PLC & electronic shall be housed in flameproof control panel & shall be mounted on compressor skid itself. Main cable entry shall be bottom to up. Also control panel shall have 2 nos. spare 2.5 sq mm slots with copper gland arrangement.

m) Bidder to quote for complete package with all relevant panels required for the compressor to perform as desired. The electric panel shall consist of electric MCC, switchgear, contractors, power supply distribution panel etc. and shall be located in hazardous area. The compressor package with control panel (including PLC and other controls) and other electric/ electronic instruments etc. shall meet hazardous area classification of Class I, Division I, Group D as per NEC or Zone I, Group IIA/ IIB as per IS/ IEC.

10.19 Priority fill system

Contractor shall supply 3-bank of cascade (9 line for 1600 scmh) priority fill system with compressor top-up facility inclusive of regulating valves, check, bypass valves & liquid filled pressure gauges all mounted in a stainless-steel panel. All fittings and tubes used in priority system shall be of stainless steel 316 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 stationery cascade and mobile cascade are filled to a pressure of 250barg.

10.20 Documents to be provided with package (02 Copies)

a. Operation and Maintenance Manual (In English) – 02 Copies
b. Calibration certificates of all instruments & devices
c. P&ID Diagrams

d. Interlock Block Diagrams

e. Bill of Material with Tag No & Technical Specifications

f. Wiring Diagram of Electrical & Instrument Panel

g. Electrical Power & Control Diagram

h. Specifications of Electric Motor & Characteristic Curves

i. Foundation Drawings

j. Capacity vs. Suction Pressure curve

k. Capacity vs. Energy Consumption curve

l. List of spares for nine years of operation and maintenance. The list of spares should include ordering specification and manufacturer's catalogues and price.

m. List of special tools & tackles to be provided along with the bid.

11.0 SKID AND ENCLOSURE

11.1 Each compressor module shall be housed within a purpose built SS 304 acoustic enclosure or in case of mild steel the surface shall be treated with anti-rust coatings followed by UV resistant epoxy paint for durability and rust protection. The units shall incorporate a rigid framework with a combination of fixed and removable panels. Filling of Class A melamine self-extinguishing polyurethane (PU) foam specifying the maximum burn extent, with UL certification or better shall be used in acoustic enclosure.

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

11.3 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.

11.4 The maximum temperature within the enclosure shall be limited to ambient + 80C. Adequate ventilation fans shall be provided to meet the above and also to account heat dissipation of the coolers/ all other components.

11.5 Enclosures shall be engineered to give a noise level of maximum 75+3 dBA measured at 1 meter as standard, utilizing Melamine filled self-extinguishing, low smoke Polyurethane (PU) foam. 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.

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

11.7 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.

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

11.9 External emergency stop push-button shall be fitted to wall of enclosure close to main access door. Total 3 Nos. of Emergency shut off push buttons with hooter. One to be provided local at package mounted area, one in panel room 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 OWNER with no extra cost.

11.10 Enclosure shall have gas detection & Fire detection system consisting of 2 nos. Infrared type LEL detectors and 2 nos. 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.

11.11 Adequate fixed flameproof lighting (minimum at 2 locations) shall be provided inside the enclosure.

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

11.13 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.

11.14 For handling of all heavy parts for maintenance purpose suitable lifting arrangement shall be provided i.e. beam fitted with chain hoist arrangement. 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.

11.15 The bidder shall also provide 1 nos. monkey ladder for safe climbing on the top of the canopy along with hand railing on the top for ease of maintenance and operation.

11.16 Jack arrangement required for alignment of the motor.

11.17 All FLP lighting inside enclosure should have LED lamp.

11.18 The bidder shall be providing a degree of protection equivalent to IP44 as defined in AS 1939.

11.19 All the pressure temperature & level indicators shall be visible from outside of enclosure.

11.20 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.

11.21 The provision for overhead compressor mounted mounting of min.3000 water liter cascade (with approximate weight of 7.5 tons) shall be envisaged & same shall be of enough strength having working space and ladder arrangement. Mounting of cascade on structure shall be in the scope of bidder. However, cascade shall be provided by purchaser. Structure Stability Certificate of the unit where cascade will be mounted to be during detailed engineering.

12.0 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.

Painting of Internal process piping should be as per international colour coding standard, e.g- Gas line-Yellow, Water line- green, Airline-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.

13.0 INSPECTION & TESTING

a) For all the shop inspection & tests specified to be witnessed by approved TPI and OWNER or OWNER'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. The bidder shall arrange approved TPI on his own cost.

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.

13.1 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 2 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).

i. Vibration levels measured on cylinders and frame

ii. Bearing temperature

iii. Oil cooler inlet and outlet temp

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

v. Bore & other parts by opening a valve

vi. Piston & cylinder clearance

vii. 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.

13.2 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 Owner's representatives (or a third party as arranged by Bidder and approved by Owner). 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. At least 25% of the package lot ordered shall be string tested. String test on N2 or air is not acceptable. It shall be on natural gas.

13.3 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 arrange crane and transport package from BGL MS/Store to site/foundation.

The bidder shall ensure integrity of compressor package and safety of electrical supply system available at back end while testing package, at site.

13.4 Field Trial Run

Bidder shall conduct a field trial run of each compressor package for 72 hrs. (can be in multiple runs) at CNG Station as per QAP in which satisfactory

operation of complete package together with all accessories/auxiliaries controls shall be established for specified operating conditions without any major breakdown prior to the start of operation and maintenance period as defined in the contract. During the field trial run the bidder will be allowed a maximum of THREE attempts to complete the above specified test i.e. only for reasons not attributable to the vendor. The Equipment shall be considered commissioned after the successful completion of Field Trial Run. All punch points raised by OWNER should be completed before performing the FTR. The bidder shall record data of field trial run

13.5 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.

13.6 Performance Acceptance Test (PAT)

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

Compressor Package Performance test at sites shall be carried out as per ASME PTC9. 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.

14.0 GUARANTEE, LOADING AND PENALTY CRITERIA

The bidder shall furnish the guaranteed value for the following:

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

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

c) Motor Power Output of the prime mover (KW)

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

Compressor Capacity (As applicable for 1600 SCMH)

a) Bidder shall guarantee 1600 SCM/hr capacity (as the case may be) of compressor with design case gas composition, at suction pressure of 35 kg/cm2g, suction temperature of 35°C, discharge pressure of 255 kg/cm2g with the negative tolerance for errors in instruments and measurements.

b) Since the compressor suction pressure varies from 32 kg/cm²g to 40 kg/cm²g the compressor shall be sized / selected for specified capacity of 1600 SCMH at 35 kg/cm²g and 2000 SCMH at 43 kg/cm²g (with no -ve tolerance) whereas the driver shall be selected on the basis of compressor B kW with either 32 kg/cm²g or 43 kg/cm²g whichever is higher.

c) For calculation purpose 1kg of CNG =1.3614 SCM

d) The same shall be used to establish the capacity at test bed during package performance test.

14.1 LOADING AGAINST ENERGY CONSUMPTION:

The compressor package shall be designed in such a way that Energy Consumption (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 will be loaded as per following formulas:

For 1600 SCMH Compressor

F = (G-140) x H x I x N

Where,

F = Loading amount in Rs.

G = Bidder's Energy consumption rate quoted in KWH for producing 1600SCMH of CNG

G- = Bidder's energy consumption rate over and above 140 KWH

H = Cost of Energy INR 10/- per Kwh

I = Factor towards lifecycle in hours @ 7300 hours per year

N = Number of machines

Note: Bidder shall not be given any advantage/credit for quoting power consumption below 140 KWH for 1600 SCMH.

14.2 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. If package loss is quoted more than 1% of suction capacity of gas consumption, then bid shall be rejected. This quoted figure will be used for evaluation and total quoted price for all compressors towards supply, special tools and tackles, erection and commissioning will be loaded as per following formulas:

F = (G-0) x H x I x N x W

Where,

F = Loading amount in Rs.

G = Vent/Leakage rate quoted in percentage

(G-0) = Bidder's vent /leakage rate above 0%

H = Cost of Natural Gas per Kg – Rs. 52.00 /- per kg

I = Factor towards lifecycle in hours @ 7300 hours per year

N = Number of Machines

W = 1164 kg for 1600 SCMH

Note: Loading amount in INR. will be loaded with Price bid prior to RA, however, the loaded value will not be subject to decrement during RA.

14.3 **PENALTY TOWARDS EXCESS GAS LOSS:**

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

Following calculations shall be used for deduction towards excess gas loss: F = [G- {(Q/ 1164 (for 1600 SCMH)) * D}] * H

Where,

F = Penalty in Rupees to be deducted from O&M bill

G = Monthly Vent/Leakage loss observed during O&M period in KG

Q = Vent / Leakage loss quoted in Percentage

H = Cost of Natural Gas/Kg – Rs. 52/- per Kg

D = Production during the month (Discharge Meter)

considering:

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

Note: - Accuracy of Mass Flow Meter considers as per OEM Guideline and bidder may submit the same.

14.4 **PENALTY TOWARDS EXCESS ENERGY CONSUMPTION**:

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

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

F = (G-Q) x H

Where,

F = Monthly Penalty in Rs.

G = Monthly Actual power consumption (KWH)

Q = Guaranteed consumption rate quoted by supplier for every 1164 Kg of CNG

1164 (for 1600 SCMH respectively)

X

CNG produced during the month

H = Cost of power Rs. 10/Kwh

14.5 **PENALTY TOWARDS PACKAGE EFFICIENCY LOSS**

This penalty shall be imposed on compressor blocks not capable of delivering rated capacity of 1600 SCMH Following calculations shall be used for penalty towards package efficiency loss:

F = 2 x {(1600 x H x RD x AD) – M}

Where,

F = Penalty Amount in Rupees

H = Hours clocked in a month

RD = Average Relative density for the month using GC Data

AD = Air Density = 1.22541

M = Discharge mass flow during the month in Kgs

Note:

1) Gauge Pressure at Station Inlet shall be used as benchmark for imposition of penalties and not suction pressure being displayed at the PLC.
2) Pressure regulator shall not be used to reduce the pressure at the compressor block inlet below 34 Kg/Cm^2.
3) In case pipeline pressure at the station itself is less than 34 Kg/Cm2, then the penalty shall be imposed if the package delivery falls below discharge values corresponding to the station pressure.

14.6 **Penalty for Non-Performance during Period of Operation & 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 equipment is available for operation for minimum 22 hours per day and on an average the equipment availability has to be 98% in a month.

ii. If the equipment is down for more than 4 hours on any day, Penalty would be applicable as follows:

- 4 to 06 hours: Rs. 20,000/-
- Beyond 06 hours: Rs. 40,000/- per day.

In case of daily availability is 22 hrs. but monthly average availability is below 98%. Then penalty @ of 10,000 per % or part thereof shall be applicable.

Note: If there is carry-over of breakdown from previous month to next month (for example if machine breaks down on last day of a month and is not operational till next month) then the penalty will be calculated on cumulative basis & the invoice for the final bill will be paid once the machine is operational.

b. On schedule maintenance day:

i. The party would be required to carry out the recommended schedule/preventive maintenance of the equipment for which the party has to indicate the time required for each type of schedule maintenance.

ii. If the equipment is down for more than 4 hours & up to 06 hours beyond the time indicated for the agreed schedule maintenance, the party would be penalized Rs. 20,000/- and for more than 06 hours Rs. 40,000/- per day.

iii. In any case, the maximum penalty imposed in a month for non-performance of the equipment turns out be 50% or more of the amount of O&M charges to be paid to the party per month per compressor (a complete cost break up of O&M charges need to be furnished by the bidder during bid), OWNER will take necessary actions as per terms and conditions of

the contract for such non-performance.

15.0 SPECIAL TOOLS AND TACKLES

15.1 Special tools & tackles for erection and commissioning and for operation & maintenance are required to be arranged by successful bidder.

15.2 Vendor shall maintain sufficient spares to fulfill the warranty & subsequent nine years 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 part.

16.0 DOCUMENTATION

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

a. Drawing documents to be supplied with the bid.

b. Drawing /document to be submitted for approval (After award of work).

c. Drawing/document to be submitted for information (After award of work).

ii. The bidder shall submit list of drawings, which shall be submitted by them in above three categories. All drawing /document shall be submitted in 6 sets of soft copy in pen drive/hard drive

iii. Title block of each drawing shall contain at least following information: Name of the Owner :

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 :

iv. 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, operation and maintenance manuals for all types of relays/components used,

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

vi. Approval of drawings by Owner.

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

viii. 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.

ix. The Bidder shall submit all the drawings/documents in six (6) 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.

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

i. "APPROVED"

ii. "APPROVED SUBJECT TO INCORPORATION OF COMMENTS"

iii. "NOT APPOVED"

iv. "FOR INFORMATION ONLY"

xi. 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.

xii. 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.

xiii. 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,

xiv. 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.

xv. 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, troubleshooting repair, and maintenance and testing of equipment etc.

xvi. 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).

xvii. All drawings submitted to Owner for approval information

xviii. Equipment manufacturing drawings submitted for information of Owner.

xix. Equipment drawings required for operation and maintenance.

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

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

xxii. As built drawings incorporating all site modifications.

xxiii. Instruction manuals

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

ANNEXURES

(BIDDER TO SUBMIT FILLED UP ANNEXURES FOR 1600 SCMH)

ANNEXURE – I: GUARANTEED PARAMETERS (1600 SCMH MOTOR DRIVEN)

For Basis of loading and penalty

Sr. No.	Parameter	Bidder's Data	Unit
1	Compressor Capacity at suction pressure @ 35kg/cm2 (g) (1600SCMH) (basis for penalty)	1600	SCMH
2	Power consumption of package in KWH for 1600 SCMH delivery (basis for loading and penalty)		KWH
3.	Gas loss as % of production, including loss from SRV, due to oil top ups and idling (basis for loading & penalty)		%

Guaranteed General Package Data

Sr. No.	Parameter	Bidder's Data	Unit
4	Compressor BKW in KW @ Rated Conditions (No + ve tolerance)		**KW**
5	Compressor BKW in KW @ RV Set Conditions (No + ve tolerance)		**KW**
6	Net of all auxiliaries/package ventilation loads in KW		**KW**
7	Site rated BKW of Electric Motor (No – ve tolerance)		**KW**
8	Noise level @ 1 meter from enclosure (required 75 ± 3 DBA)		**DB**
9	Footprint area of compressor package (10 SQMtr)		**M X M**

Note:

- Bidder to quote the data in the above table.
- Bidder shall quote the guaranteed parameters for suction pressure of 35kg/cm2 and temperature 35degc, discharge pressure of 255 Kg/cm2 at maximum temperature of 52deg C.
- Conversion factor for Kg to SCM is 1 kg = 1.375 SCM
- Bidder has to guarantee that offered compressor package will deliver minimum 1600 SCMH under the condition described above. Delivery of less than 1600 SCMH is not acceptable and will be summarily rejected.
- Bidder to submit separate table for 1600 SCMH compressor package offered.

ANNEXURE – II: COMPRESSOR DATA SHEET FOR 1600 SM3/HR

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: As per SOR
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)	:	34-43 Kg/cm² Gauge	
2.10	Discharge Temperature (°C)	:	Maximum 52°C After Cooler	
2.11	Discharge Pressure (Kg/cm², G)	:	255Kg/cm² (Gauge)	
2.12	Required Capacity (SM³/hr.) : 1600			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 – 650 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'
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 34 kg/cm2g	
			Ist Stage	IInd 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			
	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 43 Kg/ Cm2g	
			Ist Stage	IInd 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			
	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
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	Yes	Yes	Yes	
9.2	Suction Strainer	Temporary Mesh Size			
9.3	Volume Bottles / Pulsation Dampers		1st Stage	2nd 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		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	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: Yes	

9.6	Gas Recovery vessel	Capacity:
9.6.1	Max allowable Pr (kg/cm2g)	
9.6.2	ASME / IBR CODE STAMP	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	Remarks
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						
		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	Star / delta
		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
		Thermistors	--
G.	TESTS TO BE WITNESSED		
		Type Tests	CMRS test certificate to be furnished
		Routine Tests	As per IS:325
H.	ACCESSORIES		
		Anti-condensation Heaters	Yes
		PTC Thermistors	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	85 dB
I.	CABLES		
	1.	Type & Size	
		- Motor	Vender to furnish
		- Space Heater	Vender 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)

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	REQUIREMNT
1.	Fluid	Compressed Natural Gas
2.	Measuring Principle	Coriolis Principle
3.	Operating Pressure	**45 (max.) bars ,36 (Normal) bars, 30 (min.) bars**
4.	Molecular Weight	17 – 22
5.	Ambient Temperature	0 – 50 ^{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	1600- 2000 SCM/HR
8.	Accuracy	± 0.5% of indicated flow accepted (over the whole operating range on gas)
9.	Rangeabiliy for specified accuracy (Min.)	50:1
10.	Line Size	2.0 "(Flange type),300# WNRF (Material: 316 L)
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	To suit the line size(2.0") , Flange connections
15	Power supply (nominal)	230±10% V, 50±2 Hz, 1 □ 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 Protocol	**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	1600- 1800 SCM/HR (1200 - 1400 KG/HR)
8.	Accuracy	± 0.5% of indicated flow accepted (over the whole operating range on gas)
9.	Rangeabiliy for specified accuracy (Min.)	50:1
10.	Line Size	0.5 "(TUBE END)
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	To suit the line size(0.5") ,
15	Power supply (nominal)	230±10% V, 50±2 Hz, 1 □ UPS
16	Outputs (Active)	
16.1.	4 – 20 mA dc	Reqd.
16.2.	Frequency	Reqd.
16.3.	RS 485	Reqd.
17	Outputs Information	•
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 Protocol	**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	0.5"
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)	230 ± 10% V, 45-65 Hz UPS
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
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	CCOE

SPECIFICATION SHEET FOR FLAME DETECTORS

Flame detector Type:	UV and IR Detector
Wave Length	UV radiation over the range of 185 to 260 nanometers (1850 to 2600 angstroms)
	IR radiation in the 4.35 micron range
Field of View	120° cone of vision (or) Better.
Sensitivity	Approved Performance Specification-50 feet (15.2m) distance for a 1 sq. ft (0.092m2)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 supply current:	400 mA during COPM only
Typical current:	80 to 150 mA Depends on relays ETC
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 and Modbus with RS485
	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,CSA, FM, ATEX, HART Registered, and AMS Aware Class 1, Div 1, groups B, C, and D (-40°C to +65°C),Type 4X, Exd iic,T5
SIL	SIL 3/SIL 2
CCOE	CCOE approval Must
	IP66/67, NEMA 4
Reliability	IEC 61508
AMS Aware:	Certified by AMS
RFI/EMI Protection:	Complies with EN 50130-4, EN 61000-6-4
WARRANTY	2 year warranty against sensor and electronics for the supplied product.
	ONSITE SERVICE TO BE PROVIDED DURING WARRANTY PERIOD
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 Sunshade/ Deluge protection, Strombaffle, Weather protection, Dust barrier, Gassing Cap, etc as applicable protection against dust particles.
	2 No's Cable Glands(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)	Operation, 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	(BOTH ZERO AND SPAN) FOR THE MODEL QUOTED TO

PROCEDURE	BE PROVIDED IN DETAIL

SPECIFICATION SHEET FOR GAS DETECTORS

Type	Infrared sensor with Transmitter, with Local Display or Indicator
Measurement Range	0-100% LEL
Operating Medium	Natural Gas.
Operational and Certified Temperature Range	65 °C Maximum
Power Supply	18 to 32Vdc(24Vdc nominal)
Power Consumption	< 4.5W max
Current Demand	< 235 mA at 18V
	< 190 mA at 24V
	< 155 mA at 32V
Output Signals :-	**mA, Relay, Hart**
(all 3 below mentioned outputs must be available in separate connectors/ ports)	
1.Analog (mA):	4-20mA,Non-Isolated,Current Source or Sink.(Default Configuration is Current Source).
Maximum 4-20mA Loop Resistance	600 Ohms
Measuring Range (0-100% FSD)	4-20 mA
Inhibit	1 to 3mA(Default 2mA)
Warning	0 to 6mA(Default 3mA)
Fault	0mA
Over-Range	20 to 21.5mA(Default 21 mA)
2.Contact output:	Relay output: (High alarm, Low alarm,Trip, Fault) Contact rating: 2 A, 230 VAC/24 VDC
3. HART	
protocol	HART protocol & Modbus RS485
	External HART Port connector (without opening of Housing cover of Gas Detector) is required in transmitter for calibration and parameter accessing.
Status Indicator:	Status indication: LED indication OR Local Display. Separate indication for No gas leak, Low alarm, High alarm, optics failure and calibration in progress shall be available
Vibration	As the detector shall be vibrations arising mounted inside CNG compressor canopy, the same shall be capable of withstanding from reciprocating compressor.
Accuracy	± 5 % LEL through-out the range
Response Time	T90<15sec or Better
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 Sunshade/ Deluge protection, Strombaffle, Weather protection, Dust barrier, Gassing Cap, etc. as applicable protection against dust particles.
	2 No's Cable Glands(3/4" Double compression)

WARRANTY	2 year warranty against sensor and electronics for the supplied product.
	ONSITE SERVICE TO BE PROVIDED DURING WARRANTY PERIOD

Safety Approval / Certificate	**For both sensor, Transmitter and Terminal box / Junction Box**
ATEX/UT/UT/CSA/FM/CCOE	ATEX: BAS992259X II 2GD EEx d IIC T100°C (Tamb -40°C to +55°C) T135°C (Tamb -40°C to +65°C)
	UL / CSA Class 1, Div 1, groups B, C, and D (-40°C to +65°C) GOST and SAA
	CE, IEC, EEC, EMC, CENELEC AND Eexd.
	IP66/67, NEMA 4
CCOE	CCOE approval Must
SIL	SIL 2/SIL3
Performance Approval	EN61779 EXAM, BVS 03 ATEX G 016 X, CSA,FM C22.2 152
EMC COMPLIANCE SOFTWARE	EN 50270 ; EN 50271
Manuals (soft and Hard Form)	Operation, 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.
GAS DETECTOR CALIBRATION	Must be inbuilt or else calibration device must be supplied along with GD at free of cost.
CALIBRATION PROCEDURE	(BOTH ZERO AND SPAN) FOR THE MODEL QUOTED TO BE PROVIDED IN DETAIL

SPECIFICATION FOR KWH METER

1	**Meter type**	3Phase 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 ±3%
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 Microfiber Fabric coated with polypropylene photopolymer 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: VENDOR LIST

Item code / Description	AIR FILTER REGULATORS
VENDOR NAME	**Remark**
ASEA BROWN BOVERI LTD.	
BLUE STAR LTD	
DIVYA CONTROL ELEMENTS PVT. LTD.	
PLACKA INSTRUMENTS & CONTROLS PVT. LTD	
SHAH PNEUMATICS	
SHAVO NORGREN (I) PVT. LTD	
VELJAN HYDRAIR PVT. LTD.	
PARKER	
SWAGELOK	
VANAZ ENGINEERS LIMITED	
ITEM CODE / DESCRIPTION	**COALESCENT FILTER / REGULATORS**
VENDOR NAME	**REMARK**
ASEA BROWN BOVERI LTD.	
BLUE STAR LTD	
PLACKA INSTRUMENTS & CONTROLS PVT. LTD	
SHAH PNEUMATICS	
SHAVO NORGREN (I) PVT. LTD	
V AUTOMAT & INSTRUMENTS PVT. LTD.	
VELJAN HYDRAIR PVT. LTD.	
COMPAC NEWZEALAND	
ITEM CODE / DESCRIPTION	**FIELD INSTRUMENTS (P, DP, F,L,T)**
VENDOR NAME	**REMARKS**
ABB AUTOMATION LTD.	
ASHCROFT	
BROWN BOVERT LTD.	
MURPHY	
CCS	
WAREE	
FISHER ROSEMOUNT INDIA LIMITED	
FISHER ROSEMOUNT SINGAPORE PTE LTD.	
FUJI ELECTRIC CO. LTD.	
HONEYWELL INC.	
TATA HONEYWELL	
YOKOGAWA ELECTRIC CORPORATION	
YOKOGAWA BLUE STAR LTD.	
WIKA	
DRUCK	
BEKO	
FILTRATION TECHNIQUE	
ITEM CODE / DESCRIPTION	**PRESSURE GAUGES**
VENDOR NAME	**REMARKS**
AN INSTRUMENTS PVT. LTD.	
BADOTHERM PROCESS INSTRUMENTS B. V.	

BOURDON HAENNI S.A	
BRITISH ROTOTHERM CO. LTD	
BUDENBERG GUAGE CO. LTD.	
DRESSER INC.	
GENERAL INSTRUMENTS CONSORTIUM	
MANOMETER (INDIA) PVT. LTD.	
NAGANO KEIKI SEISAKUSHO LTD.	
WAAREE INSTRUMNETS CONSORTIUM	
BAUMER	
WALCHANDNAGER INDUSTRIES LTD.	
WIKA ALEXANDER WIEGAND & CO GMBH	
WIKA INSTRUMENTS INDIA PVT. LTD.	
DRUCK	
ASHCROFT	
BEKO	
FILTRATION TECHNIQUE	
ITEM CODE / DESCRIPTION	**TEMPERATURE GAUGES**
VENDOR NAME	**REMARKS**
AN INSTRUMENTS PVT. LTD.	
GENERAL INSTRUMENTS LTD	
WIKA	
ASCHCROFT	
BAUMER	
ITEM CODE / DESCRIPTION	**PRESSURE RELIEF/SAFETY VALVE**
VENDOR NAME	**REMARKS**
ALSTHOM FLUIDS SAPAG	
ANDERSON GREENWOOD CROSBY	
BHEL (TRICHY)	
ASPRO	
DRESSER INC.	
FUKUI SEISAKUSHO CO. LTD.	
INSTRUMENTATION LTD. (PALGHAT)	
NAKAKITA SEISAKUSHO CO LTD.	
NUOVO PIGNONE SPA (ITALY)	
PARCOL SPA	
SAFETY SYSTEMS UR LTD.	
SARASIN RSBD	
SEBIN VALVES INDIA PVT. LTD.	
TAI MILANO SPA	
TYCO SANMAR LTD.	
TYCO VALVES & CONTROLS INDIA PVT. LTD	
SWAGELOK	
PARKER	
COMPAC NEWZEALAND	
FARINOSLA	

FAINGER LASER	
MERCER	
FISHER ROSEMOUNT (EMERSON)	
OFE & OE GROUP KEYSTONE VALVES PVT. LTD	
BARODA SEBIM VALVES PVT. LTD.	
HALOL	
ITEM CODE / DESCRIPTION	**SUCTION & DISCHARGE FILTER**
VENDOR NAME	**REMARKS**
BEKO FILTER	
ULTRA FILTER	
FILTRATION TECHNIQUE	
PARKER	
ITEM CODE / DESCRIPTION	**VIBRATION SWITCH**
VENDOR NAME	**REMARKS**
MURPHY	
METRIX	
ROBERTSHAW CONTROL	
ITEM CODE / DESCRIPTION	**CARTRIDGE FILTERS**
VENDOR NAME	**REMARKS**
BEKO FILTER	
ULTRA FILTER	
FILTRATION TECHNIQUES	
ZANDER GMBH (GERMANY)	
GRAND PRIX FAB (PVT.) LTD., NEW DELHI	
MULTITEX FILTRATION ENERGY PVT. LTD.,	
ITEM CODE / DESCRIPTION	**AIR COMPRESSOR**
VENDOR NAME	**REMARKS**
INGERSOL RAND (IR)	
ELGI	
ANESTA IWATA MOTHERSON	
CHICAGO PNEUMATICS	
ITEM CODE / DESCRIPTION	**SELF ACTUATED PR. CONTROL VALVE**
VENDOR NAME	**REMARK**
DANIEL INDUSTRIES INC	
DRESSER PRODUITS INDUSTRIES	
ASPRO	
ESME VALVES LTD.	
FISHER ROSEMOUNT SINGAPORE PTE LTD.	
FISHER EXMOX SANMAR LIMTED	
GORTER CONTROLS B.V.	
INSTROMET INTERNATIONAL NV	
KEYE & MACDONALD INC	
NUOVO PIGNONE SPA (ITALY)	
PIETRO FIORENTINI SPA	

RICHARDS INDUSTRIES (FORMERLY TRELOAR)	
RMG REGEL + MESSTECHNIK GMBH	
VANAZ	
NIRMAL INDUSTRIES LIMITED	
COMPAC INDUSTRIES LTD., NZL.	
ITEM CODE / DESCRIPTION	**SOLENOID VALVES/ACTUATOR**
VENDOR NAME	**REMARK**
ALCON ALEXANDER CONTROLS LIMITED	
ASCO (INDIA) LIMITED	
JEFFERSONS	
ASCO JOUCOMATIC LTD.	
ASCO JOUCOMATIC SA	
AVCON CONTROLS PVT. LTD.	
BARKSDALE INC.	
BLUE STAR LTD.	
HERION WERKE	
SCHRADER SCOVILL DUNCAN LIMITED	
SEITZ AG	
ROTEX AUTOMATION LIMITED	
OPERATED VALVES ASCO	
PARKER HANIFEN	
HABONIM VASS	
FESTO	
COMPAC NEW ZEALAND	
MICROMECANICA	
ITEM CODE /DESCRIPTION	**SPECIAL CONTROL VALVES**
VENDOR NAME	**REMARK**
FISHER ROSEMOUNT SIGAPORE PTE. LTD.	
FLOWSERVE PTE. LTD. (FORMERLY DURIRON)	
HOPKINSONS LIMITED	
METSO AUTOMATION PTE LTD. (FORMERLY	
NELES)	
NUOVO PIGNONE SPA (ITALY)	
SPX VALVES & CONTROLS (FORMERLY DEXURIK)	
COMPAC IND. LTD. NZL	
ITEM CODE /DESCRIPTION	**TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES**
VENDOR NAME	REMARK
SWAGELOK	
PARKER	
DK LOK	
HYLOK	
OASIS	

ITEM CODE /DESCRIPTION	**FLAME DETECTOR/ SURGE PROTECTORS**
VENDOR NAME	**REMARK**
MEGGITT AVIONICS	
GENERAL MONITORS/ MSA	
SPECTREX	
DETRONICS	
HONEYWELL	
NET SAFETY	
CROW ON	
SIEGER	
ISOLATORS	
BARRIERS	
ESP SAFETY	
PHOENIX	
P&F	
MTL	
ASPRO	
ITEM CODE /DESCRIPTION	**GAS DETECTOR (IR TYPE)**
VENDOR NAME	**REMARK**
DETRONICS	
HONEYWELL	
NET SAFETY	
GENERAL MONITORS/ MSA	
CROW ON	
SIEGER	
ESP	
AMBETRONICS	
ITEM CODE /DESCRIPTION	**PLC**
VENDOR NAME	**REMARK**
SIEMENS	
SCHNEIDER	
ALLAN BRADLEY, ROCKWELL	
ROCKWELL AUTOMATION	
LHP	
ABB	
PHOENIX	
ITEM CODE /DESCRIPTION	**COMPRESSOR MAIN MOTOR**
MAKE	**REMARK**
CROMPTON GREAVES	
SIEMENS	
WEG	
ABB	
LHP	
KIRLOSKAR	
BHARAT BIJLEE	
ITEM CODE /DESCRIPTION	**MAIN MOTOR VFD STARTER**
MAKE	**REMARK**

SIEMENS	
SCHNIEIDER	
FUJI	
ABB	
ITEM CODE /DESCRIPTION	**SOFT STARTER**
MAKE	**REMARK**
SIEMENS	
SCHNEIDER	
ABB	
FUJI	
ITEM CODE /DESCRIPTION	**CO2 CYLINDER VALVE WITH ACTUATOR FOR CO2 FLODDING SYSTEM**
VENDOR NAME	**REMARK**
GINGEKERR	
CEODUEX (ROTAREX)	
KIDDE	
FIKE	
ANSUL	
LPG	
VTI	
ROTEX	
KEW	
ITEM CODE / DESCRIPTION	**SS TUBING**
VENDOR NAME	**REMARK**
SANDVIK	
FAE	
TUBACEX (SCHOELLER-BLECKMNN)	
PARKER	
RATNAMANI	
ITEM CODE / DESCRIPTION	**SS FITTINGS/ VALVES**
VENDOR NAME	**REMARK**
SWAGELOK	
PARKER	
DKLOK	
HYLOK	
ITEM CODE / DESCRIPTION	**MASS FLOW METERS**
VENDOR NAME	**REMARK**
EMERSON PROCESS MANAGEMENT	**CORIOLIS TYPE**
ENDRESS & HAUSER CMBH & COMPANY	**CORIOLIS TYPE & THERMAL MASS TYPE**
MAGNETROL	**THERMAL MASS TYPE**
PROCESS CONTROL DEVICES (PCD)	**THERMAL MASS TYPE**
ITEM CODE / DESCRIPTION	**FLP SWITCH**
VENDOR NAME	**VENDOR NAME**
BALIGA	

FCG	
FPE	
FLEXPRO	
ITEM CODE / DESCRIPTION	**SWITCHES/FUSES/CONTRACTORS**
VENDOR NAME	**REMARK**
L&T	
GEC	
SIEMENS	
ITEM CODE / DESCRIPTION	**CABLES & WIRES**
VENDOR NAME	**REMARK**
CORDS CABLES INDUSTRIES	
ASSOCIATED CABLES	
INCAB	
UNIVERSAL CABLES LTS/OEM Cables	
ASEAN	
CCI	
FORT GLOSTER	
FINOLEX	
KEI	
POLYCAB	
HAVELLS	
ITEM CODE / DESCRIPTION	**PRESSURE TRANSMITTERS**
VENDOR NAME	**REMARK**
DRUCK	
WIKA	
HONEY WELL	
ABB	
ROSMOUNT	
WAREE	
ITEM CODE / DESCRIPTION	**RTDs**
VENDOR NAME	**REMARK**
GENERAL INSTRUMENTS PVT LTD	
NAGMAN SENSORS PVT LTD	
PYRO ELECTRIC	
WIKA	
SIEMENS	
BAUMER	
WAREE	
ALTOP	
ITEM CODE / DESCRIPTION	**PLUG VALVE**
VENDOR NAME	**REMARK**
AIR & NORDSTROM VALVES INC	
XOMOX	
SANMAR INDIA LTD, NEW DELHI	
AIR & NORDSTROM VALVES INC	
SERCK AUDCO VALVES	
SUMITOMO CORPORATION	
FISHER XOMOX SANMAR	

L&T (AUDCO INDIA LTD, CHENNAI)	
PARKER	
STAUFF	
ITEM CODE / DESCRIPTION	**ON OFF BALL/NEEDLE VALVE**
VENDOR NAME	**REMARK**
PARKER	
SWAGELOK	
ABAC	
SPIRAX SARCO	
WORCESTER	
WAREE	
BAUMER	
STAUFF	
SSP	
L&T	
SANKEY CONTROL	
ROTEX	
AUDCO	
ITEM CODE / DESCRIPTION	**PRESSURE & TEMPERATURE SWITCH**
VENDOR NAME	**REMARK**
INFOS	
SWITZER	
CCS	
ITEM CODE /DESCRIPTION	**REGULATORS**
VENDOR NAME	**REMARK**
COMPAC IND. LTD.	
FISHER ROSEMOUNT SIGAPORE PTE. LTD.	
FLOWSERVE PTE. LTD. (FORMERLY DURIRON)	

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			
2	DULY FILLED-IN "CHECKLIST FOR COMPLETENESS OF BID"	YES		
3	DULY FILLED-IN "CHECKLIST FOR SCOPE OF SUPPLY"	YES		
4	DEVIATION LIST (IF ANY) TO THE APPLICABLE SPEC., DATASHEETS	YES		
5	UTILITIES REQUIREMENT SUMMARY	YES		YES
6	FLANGE DETAILS OF PIPING CONNECTION WITH CONNECTION AT BATTERY LIMIT		YES	
7	DULY FILLED IN EXPERIENCE RECORD PROFORMA	YES		
8	GUARANTEE PARAMETERS AS SPECIFIED	YES		YES
9	TENTATIVE LOAD DATA FOR FOUNDATION DESIGN			YES
10	LIST OF SUB-VENDORS FOR ALL BOUGHT OUT ITEMS INCLUDING ELECTRICAL & INSTRUMENTATION ITEMS		YES	
11	LEAFLET, CATALOGUES FOR ALL ITEMS		YES	
12	O & M MANUAL		YES	
B	**COMPRESSOR**			
1	DATASHEETS FOR THE FOLLOWING	YES		YES
A	- COMPRESSOR	YES		YES
B	- HEAT EXCHANGERS	YES		YES
C	- PRESSURE VESSELS	YES		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

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
B	- SUCTION VALVE			YES
C	- DISCHARGE VALVE			YES
D	- PISTON ROD GLAND PACKING & PISTON RINGS			YES
E	- LUBE OIL PUMP			YES
4	V-BELT & PULLEY WITH SELECTION CHART & CALCULATION			YES
5	COOLER DATA / DRG WITH THERMAL & MECH DESIGN CALCULATION		YES	
6	DESIGN CALCULATION, GA DRGS FOR PULSATION DAMPNER		YES	
7	PIPING & INSTRUMENTATION DIAGRAMS FOR THE FOLLOWING		YES	
A	- PROCESS GAS		YES	
B	- LUBE OIL		YES	
C	- COOLING WATER		YES	
8	TORQUE ANGLE DIAGRAM, PISTON ROD LOAD VS CRANK ANGLE		YES	
9	TORQUE SPEED CHARACTERISTICS		YES	
10	ACOUSTIC / MECHANICAL EVALUATION REPORT		YES	
11	ITEMIZED PRICE LIST OF ESSENTIAL SPARES		YES	YES
12	ITEM LIST OF SPARES WITH PRICE FOR 10 YEARS		YES	YES
13	DRG. FOR TESTING ARRANGEMENT & TEST PROCEDURE TO BE ADOPTED		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			

S. NO	DESCRIPTION	PRINTS WITH BID	CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER	
			FOR REVIEW	FOR RECORDS
A	MECHANICAL RUNNING S		YES	
B	PERFORMANCE TEST / PACKAGE TEST		YES	
C	NOISE LEVEL TEST YES		YES	
17	LIST OF SPECIAL TOOLS & TACKLES FOR INSTALLATION & MAINTENANCE	YES		YES
C	**ELECTRIC MOTOR**			
1	MOTOR DATA SHEET	YES	YES	
2	TECHNICAL LITERATURE / CATALOGUE, SELECTION CHARTS, NOMOGRAPHS ETC.		YES	YES
3	GA DRAWING		YES	
4	TERMINAL BOX ARRANGEMENT DRAWING		YES	
5	MOTOR CHARACTERISTIC CURVES		YES	
6	TORQUE SPEED CURVES		YES	
7	CURRENT TIME CURVES		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		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 LIST7		YES	
8	WIRING DIAGRAM / INTER		YES	
S. NO	**DESCRIPTION**	**PRINTS WITH BID**	**CERTIFIED INFORMATION REQUIRED AFTER PURCHASE ORDER**	
			FOR REVIEW	**FOR RECORDS**
	CONNECTING PIPING			
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	
12	LOAD CONTROL PANEL LAYOUT		YES	
13	TERMINATION DIAGRAM, PANEL WIRING DETAIL		YES	
14	LOOP SCHEMATIC		YES	
15	INTER CONNECTING DIAGRAM		YES	
16	CABLE SCHEMATIC		YES	
17	BILL OF MATERIAL		YES	
18	TEST / INSPECTION CERTIFICATE		YES	
19	LIST OF RELIEF VALVES WITH SETTINGS		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	

ANNEXURE – VIII: DEVIATION SCHEDULE FOR CNG ON-LINE 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 : M.R. COMPLIANCE SCHEDULE

Item: CNG ON-LINE COMPRESSOR PACKAGE		
Vendor:		
S. No.	**Requirements**	**Compliance By Vendor (To Be Answered By Vendor)**
1.0	Confirm compliance individually to following clauses of Job 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	
	Clause no 13.0	
	Clause no 14.0	
2.0	Confirm that you have filled-up the following Schedules/ Annexures and enclosed these with the Bid	
	Guarantee Parameters	
	Gas Composition	
	Mandatory Spares	
	Vendor List	
	Vendor Data Required	
	Experience Record Schedule for CNG Compressors Package	

	Deviation Schedule	
	Material Requisition Compliance Schedule	
	SCADA requirements	
3.0	Confirm that you have filled-up the Data Sheet and enclosed with the Bid.	
	Compressor Data Sheet	
	Inter cooler 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.	
	List of components of CNG Compressor with Make & Specification of components along with Technical Catalogues of components.	
	Battery Limit (Interface) drawing/ information.	
	Process flow diagrams (PFDs) and Piping & Instrumentation diagrams (P & Ids) of sub systems and complete system with write-up on operation	
	Utility requirement	
	Detail of control wiring diagram, interlock/shutdown/ control scheme with write up on operation. Sizing calculation for instrument items.	

ANNEXURE –X: EXPERIENCE PROFORMA RECORD

A) EXPERIENCE RECORD PROFORMA OF ON-LINE COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 1600 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 or non-lubricated			
	Nos of stages			
	Max stage temperature ºC (150ºC)			
	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 as per IEC code 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	Average Flow capacity (overfull range of suction pressure from 34 barg to 40 barg varying on continuous basis)			

A) EXPERIENCE RECORD PROFORMA OF ON-LINE COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 1600 sm3/h**		
B	Minimum Flow capacity corresponding to suction pressure of 35 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 ON-LINE COMPRESSOR PACKAGE

SR. NO	DESCRIPTION	INFORMATION OFFERED COMPRESSOR		INFORMATION OF EXISTING COMPRESSOR
	REQUIREMENT AS PER TENDER	**Min.: 1600 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 – 2 no. each comp			
	Make and model fire detector – 2 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			
	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 ON-LINE COMPRESSOR PACKAGE				
SR. NO	**DESCRIPTION**	**INFORMATION OFFERED COMPRESSOR**		**INFORMATION OF EXISTING COMPRESSOR**
	REQUIREMENT AS PER TENDER	**Min.: 1600 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 and IoT system. Accordingly bidder should supply the compressor package suitable to operate through IoT. Accordingly all necessary requirements to be considering required cables, instrumentation parts, etc. required

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.

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.

Memory Mapping, Data Type & Parameter Information:

A. Digital Parameters:

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

B. Analog Parameters:

Parameter	Register details			
	Engineering Range and Unit	GC Register	Register Format	
Density	Kg/m3			
Pressure				
Temperature				
Mass Flow Rate				
Totalized mass flow				
Yesterday's Total Mass flow				
Today's Total Mass Flow				
Corrected volumetric Flow rate				
Yesterday's Total corrected Volumetric Flow				
Totalized Mass Flow at 6 AM (Snapshot of cumulative)				

ANNEXURE – XII

QUALITY ASSURANCE PLAN

Sr. No	Description	Quantum of Check	Reference Document	Acceptance Norms	Format Of Records	Inspection By			Remarks
						Vendor	TPIA	Owner/ Owner's Representative	
1.1	Hydrotest of Cylinder, Press. Vessels, Heat Exchangers		Technical Specification	Technical Specification	Test Report	W	W	W	
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)	**10% Witness**	Technical Specification	Technical Specification	Test Report	R	W	W	
1.7	Barring Over to check Cylinder End Clearance And Piston Rod Runout		Technical Specification	Technical Specification	Test Report	W	W	W	
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	W	
1.13	Functional / HV / Continuity Test for Control Panel (at Sub Vendor's Works)		Technical Specification	Technical Specification	Test Report	W	W	W	

1.14	Mechanical String Test for 4 Hours, 10% of Package Lot for CNG Compressor	10% of Each Package Lot	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.
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 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	**VFD/ soft starter**		
5.	Phase	**THREE**	Connection – **VFD Starter/ soft starter**	No. of terminal – **6**
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		Overall	Under Armour	Over Armour
	Below 3.7 KW	4	3.5			
	3.7	6	3.5			
	5.5	10	3.5			
	7.5	10	3.5			
	11.0	16	3.5			
	15.0	16	3.5			
	18.5	16	3.5			
	22.0	16	3.5			
	30.0	25	3.5			
	37.0	25	3.5			
	45.0	35	3.5			
	55.0	50	3.5			
	75.0	95	3.5			
	90.0	120	3.5			
	110.0	2x95	3.5			
	125.0	2x120	3.5			
	132.0	2x120	3.5			
	160.0	2x120	3.5			

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-PVC insulated, FRLS-PVC extruded inner sheath armoured with overall FRLS-PVC sheath.

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./ cm2g)		
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 SHELL, REINFORCEMENT PADS	SA 516 GR 60/70	
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.

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 in 4 copies

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

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. All design calculations carried out by the vendor.

2.6. 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.

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

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

2.9. Release Note and Packing List.

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

2.11. All final drawings shall also be given to purchaser in digitized form on CD-ROM compatible to AUTOCAD software.

2.12. Final documents including operation and maintenance manual should be submitted, one copy per package plus one original.

2.13. Operation and 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. Fold all prints to 216 MM x 279 MM size & roll transparencies.

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

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

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

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

3.6. 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.

3.7. 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.).

3.8. 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.

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

Review Code 1	No comments.
Review Code 2	Proceed with manufacture/fabrication as per commented drawings. Revise drawings required
Review Code 3	Document does not conform to basic requirements.

3.10. 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.

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.

SECTION 10
SPECIAL CONDITION OF CONTRACT

SPECIAL CONDITIONS OF CONTRACT [SCC]

1.0 Payment Terms:

SUPPLY PORTION:
90% (GST Compliant Invoice value with taxes and duties) of the total supply order price (per Compressor package) will be paid against receipt of ordered item(s) by owner at site within 30 days of receipt and acceptance of bills at site against relevant documents as mentioned in order:

1. Inspection release note by Purchaser or by his approved TPI Agency.
2. LR/GR in original.
3. Packing List.
4. Proof of customs clearance including payment of custom duty for imports permitted in the contract.
5. Proof of receipt at store.
6. 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, the contractor owning Overall responsibility will duly endorse this certificate.
7. Dispatch instructions clearance by purchased.
8. Performance Bank Guarantee(s) of 10% of Order Value. If already submitted, a copy of the same.
9. Documents/drawings as specified in Vendor Data Requirement in Material.

10% of the total supply order price (per Compressor package) will be paid within 30 days of successful completion of erection, testing, commissioning and field performance test and acceptance thereof by owner and submission of final document, as built drawings and completion in all respects or upon submission CPBG of equivalent amount shall be valid for a period of warranty period + 03 months from the date of supply.

In case erection and commissioning is delayed beyond 03 months from receipt of package at site, 10% Balance payment will be released within 30 days to the vendor. However, bidder has to commission the package with his own cost as per tender terms and conditions as when BGL intimates for commissioning.

INSTALLATION AND COMMISSIONING:
100% within 30 days on successful testing, commissioning and handing over to owner.

2.0 Delivery Schedule:

04 months from the date of placing the LOI/ FOA/work order.

3.0 General:

2.2 Special Conditions of Contract shall be read in conjunction with the General Conditions of Contract, Scope of Work, Deliverables, Specifications, SOR, and any other documents forming part of this Contract, wherever the contract so requires.

2.3 Notwithstanding the sub-divisions of the document into these separate sections and volumes, every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.

2.4 Where any portion of the Special Conditions of Contract is repugnant to or at variance with any provisions of the General Conditions of Contract, then unless a different intention appears, the provision(s) of the Special Conditions of Contract shall be deemed to override the provision of the General Conditions of Contract only to the extent such repugnance or variations in the Special Conditions of Contract as are not possible of being reconciled with the provisions of General Conditions of Contract.

2.5 Wherever it is mentioned in the specification that the CONTRACTOR shall perform certain work or provide certain facilities, it is understood that the CONTRACTOR shall do so at his own cost and the contract price shall be deemed to have included the cost of such performances and provisions, so mentioned.

2.6 The materials, equipment, design and workmanship shall satisfy the applicable Indian and International Standards, specifications contained herein and codes referred to. Where the Technical Specifications stipulate requirements in addition to those contained in the Standard Codes and Specifications, those additional requirements shall also be satisfied.

2.7 In general, this contract is intended for full comprehensive operation & maintenance of the 1600 SCMH Motor Driven compressor packages at Bhagyanagar gas Ltd CNG Stations, thereby the contractor making available the equipment in running condition at all the times, through the supply of adequate skilled technician, OEM spares, OEM recommended consumable, tools tackles, any other specialized service etc. the services are to be provided on per CNG package basis, which shall be including the entire Motor Driven CNG Compressor package at each station.

2.8 If the quantities of any items change to any extent due to any reason whatsoever, the contractor shall be bound to be execute them at the rates quoted by him. Bhagyanagar Gas Ltd also reserves the right to split the work in full or in part without assigning any reason thereby. The decision of EIC shall be final & binding on contractor in this regards.

2.9 The work shall be executed to the satisfaction of EIC/Owner and the contract rates shall include any incidental & contingent work charges as to complete the work in all respect in prompt, efficient and workmanlike manner.

4.0 DEFINATION:

2.1 The EIC means the Engineer in-Charge nominated by Bhagyanagar Gas Ltd and shall Include any person acting as in charge on his behalf for CNG station.

2.2 Authorized representative shall mean any officer/supervisor/consultant/staff of Bhagyanagar Gas Ltd authorized by EIC/Head of Deptt.

2.3 Where any portion of the general condition of contract is pregnant to or at variance with any provision of special condition of contract, the provision of special condition of contract shall be deemed override the provision of general condition of contract and shall to the extent of such repugnancy of variation prevail.

2.4 CNG Compressor package: The CNG compressor package include the CNG compressor, all other associated equipment like Air Compressor, Air Volume bottle, Co2 Flooding System, Gas filter,

Interconnecting pipes, UPS etc.

5.0 SITE INFORMATION:

3.1 Location of Site:

The contract shall apply for all locations in and around the City of Bhagyanagar and the awarded rates shall be applicable for any/ all locations within the Bhagyanagar District.

3.2 Site Conditions:

The Contractor shall fully familiarize with the Site/ City Conditions before quoting for the tender and conduct thorough studies of the site as regards local conditions, available infrastructure, sale, consumer base, traffic, climate, services' availability, power, water, material and equipment availability, transport, communication facilities, office within the city, residential quarters and all other factors and facilities and things whatsoever necessary or relevant for performing the work.

6.0 INTERPRETATION

4.1 The several documents forming the Contract are to be read together as a whole and are to be taken as mutually complementary.

4.2 Should there be any doubt or ambiguity in the interpretation of the Contract Documents or error, omission or contradiction therein or in any of them, the Contractor shall, prior to commencing the related work, apply in writing to the Engineer-in-Charge for his decision in resolving the issue, ambiguity or contradiction or correction of the error or omission, as the case may be. Should the Contractor fail to apply to the Engineer-in Charge for his decision, as aforesaid prior to commencing the related work, the Contractor shall perform the said work at his own risk.

4.3 The decision of the Engineer-in-Charge on any application under clause 3.2 hereof shall be in writing and shall be final and binding on the Contractor in this behalf.

4.4 No verbal agreement, assurances, representations or understanding given by any employee or officer of BGL or so understood by the Contractor, whether given or understood before or during or after the execution of the Contract, shall anyway bind BGL or alter the Contract Documents unless specifically given in writing and signed by Engineer-in-Charge on behalf of BGL and given as an agreed variation to the relative term(s) in the Contract Documents.

4.5 Clause headings given in this or any other Contract Document are intended only as General guide for convenience in reading and segregating the general subject of various Clauses.

7.0 TERMS OF PAYMENT.

5.1 The payment shall be released by the owner against submission of monthly bills. The payment will become due and payable By BGL within 15 working days from the date of receipt of Contractor's bill/ invoice by BGL. The Contractor shall prepare the monthly invoice with all the required supporting documents - proof of payment through e-banking to all the employees as per contract duly signed by each workmen in original, Electronic Challan cum Return (ECR)/ Electronic Challan along with online Upload list of contract

workers/members for the proof of remittance of Provident Fund (PF) and Employee State Insurance (ESI) contributions with respective authorities for the contract workers engaged by him/them in contract, Professional Tax receipt, Reports- Maintenance including PM, BD, SM, Overhauling, Running Hours, Spares Consumption etc and submit the said invoice to Engineer-in Charge for certification of the work.

5.2 The operation & Maintenance service charges: Monthly payment as per SOR as certified by EIC shall be made against the invoice raised.

5.3 The Monthly bills, maintenance report, breakdown report & all other services will be on CNG Compressor package wise basis. The bill and its certification will also be done compressor wise basis.

5.4 In case any amount has been disbursed wrongly the Contractor or any other amount is due from the Contractor to BGL, BGL may without prejudice to it's rights, recover such amount from any claim/ payment due to the Contractor. At the same time, the Contractor shall have the right to receive the payment that has been omitted in previous invoice by mistake on the part of BGL or the Contractor.

5.5 BGL shall not be responsible or obliged for making any payment or any other related obligations under this Contract to the Contractor Sub-Contractor/ Personnel or Vendors. The Contractor shall be fully liable and responsible for meeting all such obligations and all payments to be made to its Sub-Contractors/ Personnel / vendors and any other third Contractor engaged by the Contractor in any way connected with the discharge of the Contractor's obligations under the Contract and in any manner whatever.

5.6 Payment shall be made in the Indian Rupees only as indicated in the price schedule. Payment shall be made by crossed account payee cheque or electronically transferred to the Contractors account.

5.7 BGL will not absorb any Foreign Exchange fluctuations

5.8 The prices/ rates shall remain firm till the expiry of the Contract and shall not be subjected to any escalation.

5.9 The Price Schedule shall be deemed to include and cover the cost of all royalties, rent and claims on the articles, equipments, processes, protected by letters patent or otherwise incorporated in or used in connection with the works.

8.0 COMPREHENSIVE OPERATION & MAINTENACE SERVICES:

The contractor must follow the maintenance requirement as stated below of special condition of contract, but not limited to and ensure to provide trouble free services to the satisfaction of the owner.

9.0 ACCOMMODATION/ TRANSPORTATION / MEDICAL.

The contractor shall make his own arrangements for the accommodation of his personal at respective locations and subsequent transportation arrangement for them from their place of residence to work place

or any other place as required and company shall have no obligation in this respect. The company shall not be responsible for providing any medical assistance to the contractor's Personnel.

10.0 DISCIPLINE

The contractor shall be responsible for the discipline and good behavior of all his personnel deployed in the service 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.

11.0 GATE PASS

The contractor shall arrange to supply/ renew identity card & police verification of his work force at his own cost for security or for any other reasons. Those contractor’s personnel shall be required to carry their respective identity card at all times while on duty and produce on demand.

12.0 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.

13.0 SUB-LETTING OF CONTRACT

Sub-letting of contract is strictly not permitted. However, Sub-letting of the contract may be permitted subject to due approvals from Bhagyanagar Gas Ltd for operations, however, the overall responsibility of the contract will remains with the Main contractor.

14.0 COMMPLIANCE OF LAWS

The Contractor shall have to obtain license from appropriate licensing authority' if required the Contractor (which shall include the contracting firm I company) shall be solely liable to obtain and to abide by all necessary licenses from the concerned authorities as provided under the various labour laws legislation's including labour license from the competent authority under the contract labour (regulation & abolition) act 1970 and acts made therefore.

The Contractor shall be responsible for necessary contributions towards PF, family pension, ESIC, insurance, E-banking transfer or any other statutory payments to Government agencies as applicable under the laws in respect of the contract and personnel deployed by the Contractor for rendering services to OWNER and shall deposit the required amount with the concerned statutory authorities on or before due dates’ The contractor shall obtain a separate PF number from the concerned regional provident fund commissioner and submit necessary proof of having deposited the employees as well as the employer's contribution to the provident fund.

The Contractor shall not engage deploy any person of less than 18 years under this contract and the persons to be deployed should be physically and mentally fit.

The installation where job is to be carried out is alive and have hydrocarbon environment Contractor shall comply with all safety and security rules and regulations and other rules laid down by owner for its

operation. It shall be the duty/responsibility of the contractor to ensure the compliance of fire, safety, security and other operational & maintenance rules and regulations by his personnel. Disregard of these rules by the contractor's personnel will lead to the termination of the contract in all respects and shall face panel legal consequences. The Contractor shall arrange for insurance of all works engaged on the job as per the relevant acts, rules and regulations etc. in case by virtue of provisions of workers compensation act, 1923 or any other law in force. Contractor has to pay compensation for a workman employed by the due to any cause.

15.0 PERIOD OF MOBILIZATION & DEPLOYMENT OF MANPOWER:

a. The CONTRACTOR shall mobilize all his resources within 15 (Fifteen) Days from the date of written advice by Email/Fax/letter from the Engineer-in-Charge (EIC).

b. The contractor shall provide and maintain all requisite personnel of qualified, trained, experienced, well behaved, neatly dressed and physically fit – engineer/supervisor, operators, technicians etc. for operation and maintenance work.

c. Workmen deployed by the contractor should be non-alcoholic and non-smoker. Chewing pan, pan-masala, gutka, tobacco etc. and spitting by deployed personnel is strictly banned in BGL CNG Stations. They should have good track record and shall have no criminal antecedent. The contractor should submit police verification certificates for the manpower deployed in this contract for character verification as directed by EIC.

d. The contractor shall manage, at his cost, uniform/ dress for all its personnel deployed for the work Design and material of the dress shall be as approved by the Engineer-in Charge Workmen deployed by the contractor shall be desired to be neatly dressed, while working at CNG Station.

e. The contractor shall provide, at his own cost, Identity Card to his personnel deployed for the work. All workmen shall be required to bear their identity cards on their chest while on duty. No workman shall be allowed entry to BGL premises/ installation without I card. Sky Blue Shirt & Navy Blue Pant Dress with embossing of Bhagyanagar Gas Ltd Logo.

f. The contractor shall make arrangement for – (i) the accommodation of his personnel at respective locations, (ii) to and fro transportation/ conveyance arrangement for them between their residence to work place and any other place as may be required and (iii)medical assistance/ treatment at his own risk and cost. BGL shall have no obligation towards providing accommodation transportation and medical assistance to the contractor personal.

g. The contractor shall provide all necessary documents, personal data, mark sheet, qualification certificates, police verification etc. pertaining to personnel proposed to be deployed for the work for verification and produce the individuals for a formal interview/ selection by EIC or his authorized representative. Manpower so selected/ deployed shall be given initial training for related activities and shall not be changed by the contractor on his own/ without permission of EIC. However, any person deployed for the work and found erring misbehaving not skilled shall be replaced/ removed by contractor if so ordered by EIC.

h. Contractor shall keep all the personnel insured with a recognized insurance company. BGL will not be responsible for any liability arising in case of accident explosion, casualty, fire, injury or damage to anyone deployed under this contract.

i. After the operation of contract deployment of manpower at site, the wages of all manpower should be paid through bank only and mapping of account/ opening of account etc of all manpower has to be done by contractor within 01(One) month from the date of operation of contract. Also, during the period of contract, if any manpower left the site, the contractor has to provide the replacement as per contract and ensure proper mapping of account / opening of account etc of new manpower has to be done within 01 (One) month from the date of deployment and copy of bank statement should be submitted along with monthly bills.

j. In the event of delay in mobilizing the services/ manpower for the particular CNG compressor package a penalty at the rate of 0.5 % of the contract value per week or part thereof shall be recovered from the contractor subject to a maximum of 5% of the contract value.

k. In the event of delay in mobilization of resources to commence O&M of CNG compressor package, BGL shall have option to get the work done from any other agency at the risk and cost of the Contractor. The expenditure so incurred plus administrative charges @ 20% shall be recovered from Contractor's bill without any prior intimation.

l. Price Reduction Schedule (PRS) in case of delay of Supply Portion :- As per GPC applicable clause.

16.0 PRIOD OF CONTRACT:

The period of the contract shall be valid for **60 (Sixty) Months reckoned from the commissioning of motor driven Compressor package.** However, the period may be extended for another term of one year under the same terms and conditions with mutual consent subject to satisfactory performance and at sole discretion of BGL.

17.0 REPEAT ORDER

PURCHASER reserves the right, within 06 months of order (PO / Part Delivery Order / DO) to place repeat order up to 50% of the original ordered quantity (s) without any change in unit price or other terms and conditions.

18.0 REPATRIATION AND TERMINATION OF CONTRACT

The Owner/ Engineer-in-Charge reserve the right to terminate the contract on giving 30 Days/ 1 month notice without assigning any reason and upon expiry of such notice period the Contractor shall vacate the site/office occupied by him immediately

19.0 INDEMNITY AGREEMENT

The contractor shall exclusively be liable for non-compliance of the provision of any act, laws rules and regulations having over engagement of workers directly or indirectly for execution of work and the hereby undertake to indemnify the company against all actions, suits, proceedings, claims, damages, demands losses etc. which may arise under minimum wages act, payment of wages act, workmen compensation act, personnel injury (compensation insurance act ESI act, employees provident fund act, family pension and deposit linked insurance scheme or any other act or statutes for the persons engaged

under this contract.

20.0 PENALTY CLAUSE

A. PENALTY TOWARDS EXCESS GAS LOSS:

At the start of O&M period or even at any point of time during the O&M period, cost towards excess gas loss beyond the quoted figure shall be deducted from O&M bills.
Following calculations shall be used for deduction towards excess gas loss:
F = [G- {(Q/ 1164 (for 1600 SCMH)) * D}] * H
Where,
F = Penalty in Rupees to be deducted from O&M bill
G = Monthly Vent/Leakage loss observed during O&M period in KG

Q = Vent / Leakage loss quoted in Percentage
H = Cost of Natural Gas/Kg – Rs. 52/- per Kg
D = Production during the month (Discharge Meter) considering:
G above shall be taken as (Suction – Discharge) OR Reading from Vent Mass Flow Meter, whichever is higher.

Note: - Accuracy of Mass Flow Meter considers as per OEM Guideline and bidder may submit the same.

B. PENALTY TOWARDS EXCESS ENERGY CONSUMPTION:
At the start of O&M period or even at any point of time during the O&M period, cost towards excess power consumption beyond quoted figure shall be deducted from O&M bills.
Following calculations shall be used for deduction towards excess power consumption.
F = (G-Q) x H
Where,
F = Monthly Penalty in Rs.
G = Monthly Actual power consumption
Q = $\frac{\text{Guaranteed consumption rate quoted by supplier for every 1164 Kg of CNG}}{\text{1164 (for 1600 SCMH)}} \times \text{CNG produced during the month}$

H = Cost of power Rs. 10/Kwh

C. PENALTY TOWARDS PACKAGE EFFICIENCY LOSS

This penalty shall be imposed on compressor blocks not capable of delivering rated capacity of 1600 shall SCMH Following calculations be used for penalty towards package efficiency loss:
F = 2 x {(1600 x H x RD x AD) – M}
Where,
F = Penalty Amount in Rupees
H = Hours clocked in a month
RD = Average Relative Density for the month using GC Data
AD = Air Density = 1.22541
M = Discharge mass flow during the month in Kgs

Note:

1) Gauge Pressure at Station Inlet shall be used as benchmark for imposition of penalties and not suction pressure being displayed at the PLC.
2) Pressure regulator shall not be used to reduce the pressure at the compressor block inlet below 34 Kg/Cm^2.
3) In case pipeline pressure at the station itself is less than 34 Kg/Cm2, then the penalty shall be imposed if the package delivery falls below discharge values corresponding to the station pressure.

D. Penalty for Non-Performance during Period of Operation & Maintenance

Details of Penalty for non-performance of equipment's:

a. On normal day (i.e. the day other than the schedule maintenance day):
   i. The party has to ensure that the equipment is available for operation for minimum 20 hours per day and on an average the equipment availability has to be 98% in a month.
   ii. If the equipment is down for more than 4 hours on any day, Penalty would be applicable as follows:
      - 4 to 06 hours: Rs. 20,000/-
      - Beyond 06 hours: Rs. 40,000/- per day.

In case of daily availability is 22 hrs. but monthly average availability is below 98%. Then penalty @ of 10,000 per % or part thereof shall be applicable.

Note: If there is carry-over of breakdown from previous month to next month (for example if machine breaks down on last day of a month and is not operational till next month) then the penalty will be calculated on cumulative basis & the invoice for the final bill will be paid once the machine is operational.

b. On schedule maintenance day:
   i. The party would be required to carry out the recommended schedule/preventive maintenance of the equipment for which the party has to indicate the time required for each type of schedule maintenance.
   ii. If the equipment is down for more than 4 hours & up to 06 hours beyond the time indicated for the agreed schedule maintenance, the party would be penalized Rs. 20,000/- and for more than 06 hours Rs. 40,000/- per day.
   iii. In any case, the maximum penalty imposed in a month for non-performance of the equipment turns out be 50% or more of the amount of O&M charges to be paid to the party per month per compressor (a complete cost break up of O&M charges need to be furnished by the bidder during bid), OWNER will take necessary actions as per terms and conditions of the contract for such non-performance.

E. In any case/ any situation, total penalty will be limited to 50% of monthly invoice value of concerned package. Penalty shall not be carried forward to next month.

F. The calculations for levy of penalty as mentioned above shall be calculated on CNG Compressor wise basis for each locations of Bhagyanagar Gas Ltd.

G. Penalty shall be excluding preventive maintenance work and other work like power cut,

planned shutdown.

H. The wages of all manpower deployed at site should be paid through bank only and the copy of bank statement should be submitted along with monthly bills. If the contractor fails to pay the wages through bank will attract penalty Rs. 1000 per person per month and same will be deducted from contractor running bill.

I. After the operational of contract, Contractor has to provide the uniforms (as per clause no. 4 of scope of work) & safety shoes within 1 month, Incase not wearing/ providing of Uniform & Safety Shoes by any employee during their shift/duty, the penalty shall be imposed Rs. 500/- Per person deducted from contractor running bill per observed any time during the random/regular inspection by EIC or his authorized representative.

J. The contractor has to submit recent police verification for all the persons within a period of 90 days from the date of deployment under this contract for character verification as per TABLE – A of SOW, non-submission of character certificate will attract penalty Rs. 1000 per workmen& will deduct from running bill. Incase authority are unable to issue character certificate, letter to be submitted to BGL. Old police verification will not be considered. Date of police verification shall be after date of award of contract only.

K. Mass Flow Meters shall be calibrated through MFM OEM or BGL approved agency once in a year, if not done penalty shall be Rs. 25,000/- per mass flow meter.

L. Non calibration of instruments and PRVs as per SOW, penalty shall be Rs. 25,000/- for yearly instruments & Rs. 15,000/ for half yearly instruments.

M. For any IR (Industrial Relation) issue (like strike by operators for wages,union issues etc.) CNG station operation stopped, BIDDER will be penalized Rs. 25,000/- Incident. Max. Capping is up to Rs.1,00,000/- Month.

N. Non-availability of compressor due to malfunctioning or non-availability of any of its auxiliaries / part shall be considered as the non-availability of the compressor package and shall be liable for above penalty as per clause no 20.D of SCC.

O. Bidder has to submit the supply invoices timely for release of CAMC bills , any delay beyond 15 days will attract penalty of Rs.10,000.- per instance .

P. Non-Submission of RA/ CAMC bill by 15th of subsequent month will attract a penalty of Rs.10,000/- per instance and Rs. 100/- per day beyond 15 days of stipulated time for the applicable date of bill submission Same will be deducted from the running bills

Q. Failure to comply with HSE requirements shall attract penalty of Rs. 5000/- per each Noncompliance subjected to EIC's discretion.

21.0 RESPONSIBILITIES OF THE CONTRACTOR FOR COMPLINACE WITH LABOUR/INDUSTRIAL LAWS:

The Category of manpower is as under & accordingly wages to be paid as stated.

- Operator - X+1T1 with experience in compressor operation: Semiskilled rates of minimum wages.

A. The site is situated at Bhagyanagar gas limited & wages will be applicable time to time, rates of Hyderabad, shamirpet . The contractor has to pay following wage components to the persons engaged by him in BGL.

B.

Sr. No.	Particulars	Remarks
1	Labour License	The Contractor is required to obtain labour license under the provisions of The Contract Labour (Regulation & Abolition) Act, 1970 from the Office of Regional Labour Commissioner (Central), Telangana.
2.	Minimum Wage	The Minimum Wages shall be paid as notified by the Central Government or State Government, whichever is higher, as per the provisions of The Minimum Wages Act, 1948 / The Code on Wages, 2019, as applicable to Hyderabad (Category-A area / city) being notified by Dy. Chief Labour Commissioner (Central), Hyderabad from time to time. Wage Period and Monthly wages– Wage period shall be monthly and wages for a month will be calculated by multiplying daily rate of Minimum Wages by 26. The contractor shall be solely responsible for the payment of wages and other dues to the personnel, if any, deployed by him latest by 7thday of the subsequent month and submit the proof towards its remittance in the concerned bank account of each person engaged under this contract along with all necessary documents as specified in this contract which shall be duly certified by the Contractor and EIC.
3.	Provident Fund contribution including Employee Deposit Linked Insurance (EDLI) & Administrative charges	(a) The Contractor shall have his own PF Registration / Code No. with the Regional Provident Fund Commissioner (RPFC) as required under the provisions of The Employees' Provident Funds and Miscellaneous Provisions Act, 1952 and extend the benefits of Provident Fund, Employees Deposit Linked Insurance Scheme and Employee Pension Scheme, wherever applicable. (b) The Contractor has to ensure compliance (as per prevailing rates) and extend benefits under Employees' Provident Fund Scheme 1952, Employees' Pension Scheme 1995 & Employees' Deposit Linked Insurance Scheme 1976 to the resources deployed by him. Presently, the rate is 13.00% which includes PF @ 12%, Administrative charges @0.50% and EDLI @0.50%. (c) The Contractor should submit copies of separate e-Challans/ ECR/ proof of payment/receipt in respect of resources engaged through this contract only, on monthly basis. Common challans would not be acceptable in BGL. The Contractor should submit copies of previous months EPF e-Challans / ECR along with current month's bill.

4.	Employee State Insurance(ESI) contribution	(a) The Contractor shall have his own ESI Registration / Code no. allotted by Employee State Insurance Corporation (ESIC) as required under Employee State Insurance Act, 1948. (b) The Contractor is required to deposit ESI contributions through bank with Employee State Insurance Corporation on monthly basis and to arrange Smart Cards / any other prescribed documents to contract labours engaged by him. (c) The rates towards ESIC contribution shall be as prescribed by the authority from time to time. Presently, ESIC rates are 4.00% of minimum wages i.e. 3.25% Employer Contribution and 0.75% Employee Contribution. (d)The Contractor shall submit challan along with bank receipts/bank statement on monthly basis for the proof of depositing ESI contribution with ESIC.
5.	Employee's Compensation Act,1923	In case the work place is out of the notified coverage area under ESIC i.e. ESIC is not implemented in the area or in case of excluded employees under ESIC, the Contractor is required to take Employee Compensation / Workmen Compensation Policy from IRDA approved Insurance Company taking into consideration the maximum compensation liability as per provisions of Employee Compensation Act, 1923. The amount apportioned towards the Insurance Policy and the premium thereof shall release /reimburse, as per actual, only after submission of necessary proof.
6.	Bonus	The Contractor shall ensure the payment of bonus as per the provisions of The Payment of Bonus Act, 1965 / The Code on Wages, 2019 (if and when applicable). Present minimum rate of Bonus as per the Payment of Bonus Act, 1965 is 8.33% of minimum wages per month. The maximum bonus including productivity linked bonus to be paid in an accounting year shall not exceed 20% of the salary / wage of an employee.In case the wages are above the prescribed wage ceiling limits under the Payment of Bonus Act, 1965 / The Code on Wages, 2019, the ex-gratia may be paid at the rate of minimum Bonus i.e. currently @8.33% of minimum wages.The payment of Bonus / ex-gratia shall be made preferably before festival time. The amount apportioned towards the payment of bonus / ex-gratia shall be released / reimbursed, as per actual disbursement of Bonus / ex-gratia by the Contractor, only after submission of proof of payment.

7.	Death / Permanent Disability Gratuity	The payment of Gratuity in cases of death or permanent disablement during the currency of the contract shall be as per the provisions of The Payment of Gratuity Act, 1972. The amount towards payment of gratuity shall be reimbursed to the contractor on submission of proof of disbursement of gratuity to the nominee of the deceased/permanently disabled contract employee. Nomination form as prescribed under The Payment of Wages Act must be maintained by the Contractor.
8.	Leave wages as per Factories Act/ Rules or Shops & Establishment Act of respective State	The Contractor shall comply with all the applicable leave Rules including leave with wages in terms of applicable labour legislations i.e. Factories Act / Shops & Establishment Act/ Industrial Establishment (national & festival holidays, casual & sick leave) Act, 1965. The Contractor shall extend the leave with wages and maintain the Register of Leave pertaining to the resource deployed. The payment towards un-availed leave, as per Factories Act, 1948 / Shops & Establishment Act, shall be settled with the resource at the time of closure of the contract or separation of resource. i. As per Factories Act, 1948:-Annual Leave with Wages @ 01 day for every 20 days of work performed by him in the previous calendar year. ii. As per Shops & Establishment Act : Privilege Leave not less than 15 days and Sickness/Casual Leave not less than 12 days (this provision may vary from state to state) iii. As per Industrial Establishment (national & festival holidays, casual & sick leave) Act, 1965: (a) three national holidays of one whole day each on the 26th January, 15th August and 2nd October (b) five other holidays on any of the festivals specified in the Schedule appended to this Act. (c) Every worker shall in each calendar year, be allowed by the employer 07 casual leaves and 14 sick leaves in such manner and on such conditions as may be prescribed. (This provision may vary from state to state).
9.	Overtime for working extra work/ Compensatory off (provision for over time should be made in the contract value as per requirement)	Over time as applicable under Factories Act, 1948 or Shops & Establishment Act. Disbursement should be maintained in Overtime Register as prescribed in The Contract Labour (Regulation and Abolition) Act, 1970.

10.	Cost of safety kit & liveries in terms of safety provisions under Factories Act,1948 (for workers working in factories only)	Contractor has to distribute safety kit and liveries as per instructions of EIC. The cost will be reimbursed on submission of proof of purchase and distribution.
11.	Professional Tax	The Contractor should take Professional Tax Registration and also make timely payment in line with the existing laws.
12.	Other Acts	The contractor should also fully comply with all applicable laws and regulations including, but not limited to the following legislations: a) The Factories Act, 1948 or The Shops & Establishment Act, 1948 b) The Maternity Benefit Act, 1961 (wherever applicable) c) The Inter State Migrant Workmen (Regulation Of Employment And Conditions Of Service) Act 1979 (if applicable) d) The Building and Other Construction Workers (Regulation Of Employment And Conditions Of Service) Act, 1996 (wherever applicable) e) Labour Welfare Fund (if applicable) Any other Acts, rules & regulations and terms and conditions which may be applicable from time to time.

A. Other responsibilities of the Contractor under Labour Laws –

- All personnel deployed by the contractor should be on the rolls of the Contractor.
- No contract worker below the age of 18 years shall be deployed on the work.
- The Contractor shall ensure regular and effective supervision and control of the personnel, if any, deployed by him and give suitable direction for undertaking the contractual obligations.
- The personnel to be deputed by the contractor shall observe all security, fire and safety rules of BGL while at the site/work. His Work/Services will be supervised by the supervisors of contractor. Contractor has to strictly adhere to guidance, instruction whenever issued from time to time.
- Contractor shall provide proper identification cards to his employees to be deputed by him for Work/Services, duly signed by the contractor or authorized person on behalf of contractor.
- Contractor has to deploy the personnel with no past criminal records. Also, the contractor has to provide police verification for all the persons deployed by him.
- All existing and amended safety / fire rule of BGL are to be followed at the work site.
- The contractor shall not employ or permit to be employed any person suffering from any

contagious loathsome or infectious disease. The contractor shall get examined his employees / persons deployed from a civil govt. doctor.

- No employees or person of contractor (including contractor) be allowed to consume alcoholic drinks or any narcotics, while on duty. If found under the influence of above, the owner / BGL will terminate the contract immediately and may refer the case to police.
- It is the responsibility of the Contractor to adhere to the applicable laws from time to time and comply with all applicable amendments in labour laws.

Following documents shall be submitted by the Agency/Contractor to Engineer-In- Charge at various stages during the currency of the contract:

B. <u>Immediately after issuance / receiving of Letter of Intent (LOI)</u>

1. Application for issuance of Form-III for obtaining Labour license from Licensing Authority for engaging 20 or more contract workers or such other threshold limits as may be prescribed from time to time.
2. Copy of Labour License before commencement of work if 20 or more contract workers are engaged or such other threshold limits as may be prescribed from time to time.
3. List of persons along with Designation, Employee No., PF Account No., ESIC Account Number, Insurance Coverage Number etc.
4. Copies of Identity Card issued by the contractor of persons to be engaged in BGL.
5. Copy of Provident Fund Registration Certificate issued by concerned Regional Provident Fund Commissioner.
6. Copy of Employee State Insurance Registration Certificate issued by Concerned ESIC (wherever applicable)

C. <u>At the time of submission of Monthly Bills</u>

1. The payment to be made to the person deployed at site should not be less than the Minimum wages applicable for respective Area declared by Dy. CLC (Central), Hyderabad, from time to time, towards applicability of Central / State Govt. rates whichever is higher.

2. The Contractor is required to obtain labor license if applicable under the provisions of Contract Labour (R&A) Act, 1970 from the Office of RLC (Central), Hyderabad prior to mobilization of contract.

3. Unless otherwise specifically mentioned in the Special Conditions of Contract (SCC) and/or Scope of Work (SOW), the contractor shall bear any upward revision in the rate of Minimum Wages and other wage components, including but not limited to any kind of unprecedented or steep hike over and above the half yearly revisions of variable dearness allowance from time to time at its own cost during the contract period.

D. <u>Contractor is required to ensure the following documents to be submitted before settlement of monthly RA Bill:</u>

A. Payment of wages to the contract workers must be made **<u>through e-banking / digital mode through cashless transaction only</u>** and duly stamped e-banking wage sheet/bank statement of the bank must be duly certified and signed by both the contractor and EIC.

Further, a copy of certified and signed duly stamped e-banking monthly wage sheet/bank statement must be submitted to EIC along with subsequent monthly bill.

B. Monthly bill duly certified by the contractor or his authorized representative.
C. Copy of wage register duly certified by the contractor or his authorized representative and EIC of BGL.
D. Copy of e-banking wage sheet/bank statement duly stamped by designated bank and duly certified by the contractor or his authorized representative and BGL EIC.
E. Copy of e-banking wage sheet duly certified by authorized representative(s) of the contractor and BGL certifying as "Certified that the amount shown in the column No. ---- has been paid to the workman concerned through e-banking / digital mode".
F. Copy of Electronic Challan cum Return (ECR) and bank remittance slip for the proof of deposit of Provident Fund contribution with RPFC along with details of employees and Provident Fund A/C No duly certified by Contractor and EIC of BGL.
G. Copy of Electronic Challan cum Return (ECR) and bank remittance slip for the proof of deposit of ESI contribution with ESIC along with details of contributions of employees and employer etc. for the previous month duly certified by Contractor and EIC of BGL.
H. Copy of Professional Tax receipt for the concerned period.
I. Contractor shall submit bills in duplicate on monthly basis to the Company (not in piece meal). Contractor is required to submit the bills within 15 days of the following month, duly filled in all respect, to the Engineer-in-Charge or his authorized person. The bills complete in all respects will be processed and paid within 15 days from the date of receipt by the Finance & Accounts Department.

E. <u>Registers/documents to be maintained by the contractor:</u>

a. Contract Labour (Regulation & Abolition), Act, 1970 & Payment of wages Act, 1936: During the currency of the contract, the contractor has to maintain registers e.g. :
b. Muster Roll in prescribed format
c. Register of workmen in prescribed format
d. Wage Register in prescribed format
e. Register of Deductions in prescribed format
f. Register of Over time in prescribed format
g. Register of Fines in prescribed format
h. Register of Advances in prescribed format
i. Issuance and maintenance of Wage Slip in prescribed format
j. Issuance of valid Identity Card by the contractor in prescribed format
k. Such other Registers / documents as applicable and as may be prescribed from time to time.

F. <u>Employee State Insurance Act, 1948: : During the currency of the contract, the contractor has to maintain registers e.g.:</u>

a. Register of employees in prescribed format
b. Accident Book in prescribed format
c. Such other Registers / documents as applicable and as may be prescribed from time to time.

G. <u>Provident Fund & Misc. Provisions Act, 1952</u>

a. Monthly return in prescribed format for employees qualifying for membership of the PF fund.

b. Contribution card in prescribed format
c. Return of contribution card sent to the Commissioner on expiry of the Financial Year in prescribed format
d. Consolidated annual contribution statement in prescribed format. Copy of same should also be given to the individual contract worker and EIC every year.
e. PF Nomination Form. A copy should be provided to individual contract worker.
f. Such other Registers / documents as applicable and as may be prescribed from time to time

22.0 LIABILITY OF TAXES, DUTIES & STATUTORY LEVIES ETC:

The Contractor shall be exclusively liable to pay all taxes, duties, Octroi, royalties, fees, etc, including but not limited to Income Tax, Personal Tax, etc. that may be levied or leviable from time to time on Contractor, its Sub-Contractor and their personnel in respect of the work, services and materials and all contributions, and taxes for unemployment, compensation, insurance and old age pensions or annuities now or hereinafter imposed by any Central or State Government authorities BGL shall deduct at source any other taxes, levies or duties imposed by Central Govt./ State Govt./ Statutory Authority at the applicable rates - present or future from the sums payable to the Contractor. The rates quoted by the Contractor shall be deemed to be inclusive of all such taxes.

23.0 GOODS & SERVICE TAX:

Goods & Service Tax extra as applicable, the current rate of Service Tax is 18%. This rate may vary as per Government of India Guidelines published from time to time duration the tenure of contract.

24.0 RATES TO BE QUOTED

The rates quoted by the bidder shall be inclusive of services, taxes/ duties including service tax, work contract tax, all levies of State Govt. enforced from time to time; statutory requirements, compliance of labour laws, cost of personnel (including as per the minimum wages of the Central Govt. / State Govt. whichever is higher applicable, PF ESI, Accommodation, Transportation etc.) printed materials, office infrastructure, telecommunication expenses, insurances, administrative expenses, contingencies etc. and contractor's profit and any unforeseen expenditure which may be required for the successful completion of the work covered under the scope of work excluding services tax.

25.0 CONTRACT CUM PERFORMANCE BANK GUARANTEE

i. After finalization of the Contract, whenever work order is issued by the Owner, CONTRACTOR shall furnish to the Owner within 30 (Thirty) days from the date of issue of work order, an unconditional Contract Performance Bank Guarantee from a nationalized/ scheduled bank of India or any international bank of repute having a branch in India for due Performance of the Contract for a sum equivalent to
For Supply Portion: - CPBG @ 10% of supply value .
For AMC Portion :- CPBG @ 7.5% of the annualized Contract Value.

This Contract-cum-Performance Bank Guarantee shall be drawn in favour of the Owner and shall be initially valid for a period adequate to cover up to 90 days after end of defect liability period.

ii. In the event, completion of work is delayed/ extended beyond the scheduled completion date for any reason, whatsoever, the CONTRACTOR shall have the validity of the guarantee suitably extended to cover the period mentioned above.

iii. The Owner shall have an unqualified option under this guarantee to invoke the Banker's Guarantee and claim the amount there under in the event of the CONTRACTOR failing to honor any of the commitment s entered into under this Contract and or in respect of any amount due from the CONTRACTOR to the Owner. In case CONTRACTOR fails to furnish the requisite Bank Guarantee as stipulated above, then the Owner shall have the option to terminate the Notification of Award of Work and forfeit the Bid Security amount and no compensation for the works performed shall be payable upon such termination. Upon completion of the works as per completion schedule stipulated in the Contract, the above said guarantee shall be considered to constitute the Contractor's warranty/ guarantee for the work done by him or for the works supplied and their Performance as per the specifications and any other conditions against this Contract. The warranty/guarantee shall be in force from the date of issuance of certificate of Completion and Acceptance against this Contract as per GCC.

iv. The CONTRACTOR shall also arrange for the Contact Performance Bank Guarantee to remain valid until the expiration of the guarantee period for the entire work order period.

v. In the event of Completion of project being delayed beyond the Scheduled Completion Date, for any reason whatsoever, the Owner may without prejudice to any other right or remedy available to the Owner, operate the Bank Guarantee to recover the Compensation for delay leviable as per relevant clause of GCC. The Bank Guarantee amount shall thereupon be increased to the original amount, or the CONTRACTOR may alternatively submit a fresh Bank Guarantee for the equivalent amount of compensation for delay recovered.

26.0 DISCIPLINE

CONTRACTOR shall carry out operations hereunder with due diligence and in a safe and workman like manner according to good international practice. CONTRACTOR shall maintain strict discipline and good conduct among its employees and shall abide by and conform to all rules and regulations promulgated by the BGL governing the operations. Should BGL feel that the conduct of any of CONTRACTOR's employees is detrimental to BGL's interest, the Engineer – in – Charge shall have the unqualified right to ask for the removal of such employee either for incompetence, unreliability, misbehavior, security reasons etc. while on or off the job. The CONTRACTOR shall unconditionally comply with such instructions at his own expense. The contractor shall be responsible for the discipline and good behavior of all his personnel deployed in the Service 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.

27.0 DEFENSE OF WORK

If any action in court brought against owner or an officer or agent of the owner, for the failure, omission or neglect on the part of the CONTRACTOR to perform any acts, matters, covenant or things under the contract or injury caused by the alleged omission or negligence on the part of the CONTRACTOR, his

agent, representative of his sub CONTRACTOR or in connection with any claim based on lawful demand of sub CONTRACTOR'S workmen supplier or employee, the CONTRACTOR shall in such cases indemnify and keep the owner and /or their representatives harmless from all lesson, damages, expenses, decreases arising out of such action.

28.0 The contractor shall exclusively be liable for non-compliance of the provisions of any act, laws, rules and regulations including any amendments / modifications thereof from time to time, applicable to engagement of workers directly or indirectly for execution of work under this contract and hereby undertake to indemnify the company against all actions, suits, proceedings, claims, damages, demands, losses etc. which may arise under The Minimum Wages Act, 1948; The Code on Wages, 2019; The Payment of Wages Act, 1936; The Contract Labour (Regulation and Abolition) Act, 1970; The Payment of Gratuity Act, 1972; The Payment of Bonus Act, 1965; The Workmen's Compensation Act, 1923; The Employees' State Insurance Act, 1948; The Employees' Provident Funds and Miscellaneous Provisions Act, 1952; The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979; The Maternity Benefit Act, 1961; The Factories Act, 1948; The Shops & Establishment Acts; or any other applicable acts or statutes for the time being in force, as may be amended from time to time. The contractor shall indemnify BGL against all losses or damages, if any, caused to it on account of acts of the personnel, if any, deployed by him.

29.0 COMPLETION CERTIFICATE

Within 15 days of the completion of the work in all respect, the CONTRACTOR shall be furnished a certificate by the Engineer-in-Charge of such completion, but no certificate shall be given nor shall the work be deemed to have been executed fully until all, documents and reports at each and every stage of the work including but not limited to compliance with all applicable statutory labour laws, and the final completion report as mentioned in the Scope of work is submitted and accepted. Deliverables are included in the Scope of Work. The reports will be in computerized form on suitable package. Three hard copies of the reports, etc shall also be submitted along with soft copy. The quality of deliverables shall be accepted by the Engineer-in-Charge whose decision shall be binding and conclusive.

30.0 OWNER NOT BOUND BY PERSONAL REPRESENTATION

The CONTRACTOR shall not be entitled to increase on the scheduled rates or any other right or claim whatsoever by reason of any representations, explanations, statements or alleged representation, promise or guarantee given or called to have been given to him by any person.

31.0 DOCUMENTATION/ REPORT

The CONTRACTOR shall maintain all records and relevant documents as required. The CONTRACTOR shall submit detailed reports to BGL compiling the salient features and/or outcome of the work immediately after conducting the work. BGL shall review the reports submitted by the CONTRACTOR and offer its comments, which shall be incorporated in subsequent reports by the CONTRACTOR.

32.0 MANAGEMENT REVIEW

The CONTRACTOR shall attend Management Level Review Meeting once in a month or as and when required with agenda of progress achieved and major hold-ups at Owner's office. Monthly Review Meeting will be held at OWNER'S OR CONTRACTOR'S office with agenda of progress and holds in engineering, procurement and construction program for next month.

33.0 SITE CLEANING

a. The Contractor shall take care for cleaning the working site from time to time for access to work site and also from safety point of view. The Contractor at its own cost and risk shall carry out all such work.

b. Working site should be always kept cleaned up to the full satisfaction of the EIC, till handing over any work to BGL. The Contractor in addition to other formalities to be observed as detailed in the document shall clear the site to the full satisfaction of the EIC and the Authority having jurisdiction over it.

34.0 DISPOSAL OF UNSERVICEABLE MATERIALS, PACKINGS ETC.

i. Disposal of the damaged/ unserviceable materials, consumables, packing, etc shall be the responsibility of the Contractor.

ii. The Contractor shall dispose off the unserviceable materials, debris etc. to any area, as decided by the Engineer-In-Charge. Disposal area shall be arranged by the Contractor at his own risk and cost.

iii. The Contractor shall sort out, clear and stack the serviceable materials obtained during the maintenance/replacement at places as directed by the Engineer - In - Charge.

iv. No extra payment shall be made on this account. The quoted rates shall be inclusive of such disposals.

v. The Contractor shall be the custodian of the dismantled materials till the Engineering Charge takes charge thereof.

35.0 GUARANTEE/DEFECT LIABILITY PERIOD

i) The Contract Performance Bank Guarantee shall be released

For Supply Portion: - CPBG (shall be releases after warranty/Guarantee period plus 03 (Three) months (Claim Period).
For AMC Portion :- CPBG shall be released after completion of contract period plus 03 months.

ii) The guarantee will cover any repairs required or claims arising due to faulty or substandard workmanship. This will also include the repair and maintenance of any reinstatement undertaken by the CONTRACTOR. Such rectification of reinstatement may be carried out by BGL or a third party CONTRACTOR BGL's behalf and any such costs incurred by BGL will be recovered from the CONTRACTOR under the guarantee. Any acceptance or reinstatement by the concerned owner of property or BGL is conditional at the time of acceptance and does not absolve the

CONTRACTOR from the responsibility for further maintenance throughout the guarantee period.

iii) The guarantee may also be used for the recovery of any adverse variations in the material reconciliation at the end of the job, work order or project, and for any damage or loss to plant and equipment loaned to the CONTRACTOR by BGL.

36.0 OFF-LOADING

Further to the provisions as per relevant clause of GCC of Contract, in the event the Contractor is not performing to the satisfaction of Engineer-In-Charge, BGL is entitled to cancel the Contract for the uncompleted portion without being in anyway liable for any compensation payment to the Contractor on account of such cancellation and offload the uncompleted portion to another Agency/ Contractor in order to ensure satisfactory performance of the work at the risk and cost of the contractor.

37.0 SEVERABILITY

Should any provision of this agreement be found to be invalid, illegal or otherwise not enforceable by any court of law, such finding shall not affect the remaining provisions hereto and they shall remain binding on the parties hereto.

38.0 CONSEQUENTIAL DAMAGES:

Notwithstanding either party's fault, neither party shall be liable to the other party in Respect of any consequential damages whatsoever. The term "Consequential damages" as used herein shall include without limitations to the meaning, loss of profit, production, business opportunities or use of assets.

39.0 CHANGE IN LAW:

In the event of any change or amendment of any Act or law, Rules or Regulations of Govt, of India or Public Body or any change in the interpretation or enforcement of any said Act or law, rules or regulations by Indian Govt. or public body which becomes effective after the date as advised by the BGL for submission of final price bid for this CONTRACT and which results in increased cost of the works under the CONTRACT through increased liability of taxes, (other than personnel and Corporate taxes), duties, the CONTRACTOR shall be indemnified for any such increased cost by the BGL subject to the production of documentary proof to the satisfaction of the BGL to the extent which is attributable to such change or amendment as mentioned above.

Similarly, if any change or amendment of any Act or law, Rules or regulations of Govt. of India or public body or any change in the interpretation or enforcement of any said Act or Law, rules or regulations by Indian Govt. or public body becomes effective after the date as advised by the BGL for submission of final price bid of this CONTRACT and which results in any decrease in the cost of the project through reduced liability of taxes (other than personnel and Corporate taxes) duties, the CONTRACTOR shall pass on the benefits of such reduced cost, taxes or duties to the BGL.

Notwithstanding the above mentioned provisions, BGL shall not bear any liability in respect of (I) Personnel taxes on the employees of CONTRACTOR and the employees all it's SUB-Contractors etc. (II) Corporate taxes in respect of the CONTRACTOR and its SUB-Contractors etc.

Annexure 01
PARTICULARS OF PF CONTRIBUTION FOR THE MONTH OF ,20

(1) Name of the Firm/Agency/Contractor:

(2) Nature of Contract: Job/Service contract, AMC, O&M, Petty contract, Security, Seasonal

(3) Postal address of the Contractor:

(4) Phone No. of the Contractor:

(5) Fax No. of the Contractor:

(6) Address of PF office from where EPF Code No. has been allotted:

(7) EPF Code No. allotted by PF office

(8) Address of ESIC office from where ESI Code No. has been allotted

(9) ESI Code No. allotted by ESIC office

(10) Period of Contract: From_____to_____

(a) Extension Period of Contract, if any From_____to_____
(b) Place where contract workmen are working

(11) LabourLicence No._____Dtd._____

(12) Validity period of LabourLicenceFrom_____ to_____

(13) Details of Deposition of contribution towards EPF

(a) EPF Challan No._____ Amount_____Date_____

(14) Details of Deposition of contribution towards ESI

(a) ESI Challan No_____Amount_____ Date_____

(15) Detail of Contract labour engaged by the contractor

SECTION 11
SCHEDULE OF RATES

SCHEDULE OF RATE (SOR) FOR Procurement of 01 No. 1600 SCMH Motor Driven Compressor Package With 05 Year CAMC for upgradation of BGL CNG Mother Station, Shamir pet

PROJECT.: CITY GAS DISTRIBUTION PROJECT OF BHAGYANAGAR GAS LTD.

Bid Document No: BGL/633/2024-25

Name of Bidder:	

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

S.No.	Item Description	Qty	Units	1. Unit Price including packing & forwarding charges and freight 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.	GST in Percentage	Total GST Amount in INR (corresponding to total qty)	1. Total Price including packing & forwarding charges and freight 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 & frieght

				(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 & frieght**			
				Amount in INR / No.	**%**	**Amount in INR**	**Amount in INR**
A	B	C	D	E	F	G	H
	1600 SCMH Electric Motor Driven Online CNG Compressor Package						
Part-1	**HYDERABAD**						

1	Design, Engineering, Manufacturing, Supply including packaging and forwarding, insurance, custom clearance, handling, loading and unloading at site, delivery & unloading at Client's store /site of Skid mounted motor driven 1600 SCMH CNG Compressor Package with explosion proof electric & control panel having suction pressure of 35 kg/cm2(g), inlet line pressure range of 30 – 49 kg/cm2(g) with	**1**	**Nos.**			-	-

	discharge pressure 255 kg/cm2(g) with Priority panel .The package shall be inclusive of: a)String test of complete compressor package along with motor and accessories at packagers' factory including the TPIA charges. b)Special tools & tackles required for erection and commissioning (list of tools & tackles to be furnished by the bidder). c)Design, Engineering, Manufacturing, Supply including						

	packaging and forwarding, insurance, custom clearance, handling, loading and unloading of air compressor with flame proof motor of 7.5KW capacity (approx.) discharge pressure approx. 16 kg/cm2g, 1000 Water litre capacity air receiver for instrumentation air with PRV, air dryer along with all accessories and auxiliaries. d)Supply, Laying and commissioning of all required cables (i.e. main cable, instrument						

	cable, motor cable, UPS cable, etc..) with suitable glands.						
Part-2	**INSTALLATION, COMMISSIONING, TESTING**					-	-
1	Installation, commissioning & Field performance test of Compressor Package including all accessories/ equipment(s) i.e. air	**1**	**Nos.**			-	-

	compressor, CO2 flooding system etc. system at site.						
2	**Total amount for supply, installation, testing & commissioning (inclusive of taxes) based on quoted price**					-	
3	**SERVICES FOR COMPREHENSIVE OPERATIONS**					-	-
Part-3	**ITEMS FOR OPERATIONS**					-	-
1	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**			-	-
2	Operation charges for 2nd year i.e. after Warranty period per shift of	**1095**	**No of Shifts**			-	-

	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.						
3	Operation charges for 3rd year i.e. after 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**			-	-
4	Operation charges for 4th year i.e. after 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	**1095**	**No of Shifts**			-	-

	unit price (sl.no 1) quoted by the bidder.						
5	Operation charges for 5th year i.e. after 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**			-	-
6	**Total amount for OPERATIONS (inclusive of taxes) based on quoted price**					-	
7	**Total amount for OPERATIONS based on NPV**					-	
Part-4	**ITEMS FOR COMPREHENSIVE MAINTENANCE**					-	-

1	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 packages 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**			-	-
2	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 packages X 12 Months)						
3	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**			-	-
4	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**			-	-

5	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**			-	-
6	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**			-	-
7	**Total amount for COMPREHENSIVE MAINTENANCE (inclusive of taxes) based on quoted price**					-	
8	**Total amount for COMPREHENSIVE MAINTENANCE based on NPV**					-	
	Total amount for OPERATIONS (inclusive of taxes) based on NPV CALCULATION					-	

1	**A. Package Gas Loss:**					-	-
3	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. If package loss is quoted more than 1% of suction capacity gas consumption than bid shall be rejected. This quoted figure will be used for evaluation and total quoted price for all compressors towards supply, special tools and tackles,					-	-

	transportation, erection & commissioning, operations and comprehensive maintenance will be calculated as per following formulas: F = G * H * I * N * W Where, F = Loading Amount in Rs. G = Vent/Leakage rate quoted in percentage H = Cost of Natural Gas per Kg @ Rs. 52/- per kg I = Factor towards lifecycle in hours @7300 hours PER YEAR N = Number of machines W = 1164 kg for							

	1600 SCMH Under column 'E', bidder to quote 'G = Vent/Leakage rate in percentage' (without affixing % symbol)						
4	Package Gas Loss for 1st year Under column 'E', bidder to quote 'G = Vent/Leakage rate in percentage' (without affixing % symbol)	**1**	**No.**				
5	Package Gas Loss for 2nd year Under column 'E', bidder to quote 'G =	**1**	**No.**				

	Vent/Leakage rate in percentage' (without affixing % symbol)						
6	Package Gas Loss for 3rd year Under column 'E', bidder to quote 'G = Vent/Leakage rate in percentage' (without affixing % symbol)	**1**	**No.**				
7	Package Gas Loss for 4th year Under column 'E', bidder to quote 'G = Vent/Leakage rate in percentage' (without affixing % symbol)	**1**	**No.**				
8	Package Gas Loss for 5th year Under column 'E', bidder to quote 'G = Vent/Leakage rate in percentage' (without affixing % symbol)	**1**	**No.**				
9	**Total Value of Gas loss based on NPV CALCULATION**						
10	**B. Electric Power Consumption:**						

11	The compressor package shall be designed in such a way that Electric Power Consumption of Motor (KW/Hr) should be minimum for production of CNG. Bidder shall indicate actual electric power 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 will be calculated as per following						

	formulas: F = (G -140)x H x I x N Where, F = Amount in Rs. G = Bidder's Electric Power Consumption Rate quoted in KW/Hr for every 1600 SCMH (1164 Kg) of CNG produced H = Cost of Electric Power Consumption per KW/Hr @ Rs. 10/- per KW/Hr I = Factor towards lifecycle in hours @ 7300 hours PER ANNUM N = Number of machines Notes: 1.Bidder shall not be given any						

	advantage/credit for quoting power consumption below 140 KWH for 1600 SCMH. 2. The amount (F) as per the above calculations for 5 years shall be considered on NPV basis with discount factor @10% p.a. Under column 'E', bidder to quote "Bidder's Electric Power Consumption Rate in KW/Hr for every 1600 SCMH (1164 Kg) of CNG produced at rated suction pressure of 43 kg/cm2".						
12	Electric Power Consumption for 1st year	**1**	**No.**				

13	Electric Power Consumption for 2nd year	**1**	**No.**				
14	Electric Power Consumption for 3rd year	**1**	**No.**				
15	Electric Power Consumption for 4th year	**1**	**No.**				
16	Electric Power Consumption for 5th year	**1**	**No.**				
17	**Total IV. Value of Engine Gas consumption based on NPV CALCULATION**						

18	NOTE : 1. Inspection shall be carried out by Owner or its authorized consultant/ TPI at bidder's cost. 2. Inlet piping shall be of class 300# (filter, inlet valve and 3-way valve). 3. Delivery location of the Compressors may change as per requirement and the same shall be intimated to the supplier before dispatch. 4. Maximum limit to quote charges for Repair & Comprehensive Maintenance for 1 Machine Months shall be 1.5% of unit Ex- works price of Sr. No. 1, failing which will be liable for rejection of bid. 5. For SOR Sr. No. 8,						

	Bidder to ensure the minimum wages of Semi-skilled labour/ worker for construction industries per day (in Rupees) of respective state/ Central (whichever is higher). 6. Deployment of Bidder personal/Resources for Operation will be as per the direction of Engineer In Charge/BGL representative/GA in-charge with prior information of minimum one month. In case of installation of 2 nos compressors (for same supplier under difference work orders) at a particular CNG Station/Mother station i.e. in same premises, EIC may						

	ask the supplier/Bidder to deploy one personnel for operations of both compressors and payment will be done of higher SOR Rate of compressor package for one personnel/Resource only.						

19	Total amount for supply, installation, testing & commissioning, Operations & COMPREHENSIVE MAINTENANCE (inclusive of taxes) based on quoted price (without NPV calculation) **Note: The evaluated price as per tender condition i.e. , based on NPV calculations for cost heads (wherever applicable, as per tender) is given at row below (Sl. No. 20)**						
20	**Total in Figures**						