3.	External Instruments	Gauge shall be filled type level instrument with water for different levels and specific gravity correction shall be applied.
4.	Other type of tank level instruments	By lifting the float for 0%, 100% of range.
5.	Temperature loops with T/C.	Appropriate mV signals shall be fed from thermocouple head.
6.	Temperature loops with RTD	Appropriate resistance shall be fed from RTD head.
7.	Pressure switches	Alarm and shutdown simulation by disconnecting the wires at field instruments end.
8.	Owner's supplied items	As per Client / Consultant' representative instructions
9.	Special instruments & any other type of instruments.	As per Client / Consultant' representative instructions

B) Receiver alarm cards shall be checked for different settings on both increasing and decreasing signals. Shutdown schemes shall be checked for proper functioning, configuration and actuation. Performance of individual loops may be accepted for an overall accuracy of +/- 1.0% unless otherwise specified. Where deviation exists, recalibration of instruments, based on the scope of work, shall be carried out either by Field Contractor or Vendor.

C) Signal from controllers/shutdown schemes, control valves/shut-down valves shall be checked at the respective values. The strike checking including checking of time of operation of control valves/shutdown valves also forms a part of loop checking.

D) After loop checking is completed, vendor shall connect back any terminals and connections removed for loop checking.

II.4 Field Testing

All the equipment shall be checked thoroughly after its receipt at site. The tests, as a minimum, shall include:

a) Visual and mechanical testing
b) Complete system configuration loading
c) Demonstration of all system functions.
d) Checking of loop configuration
e) Checking of all TFT displays.
f) Checking of correct functioning of all key boards.
g) Demonstration of all system diagnostics
h) Checking of correct change-over of redundant devices
i) Checking of bus-degradation
j) Checking of proper functioning of all printers, sample printing of all types of log reports, shut-down reports and MIS reports.
k) Checking of all disc drives, historical trending points, alarm summary and alarm history.
l) Complete checking of shutdown system.
m) Complete checking of hard-wired instruments.
n) Demonstration of proper operation of system at specified power supply specifications.
o) Loading of user's program and check out of results.

III Testing/Calibration Equipments

Vendor shall make available all consumables, instruments, and equipment necessary for testing, calibration, maintenance etc. as required by the defined scope of works. All instruments and equipment used for the above purpose shall be of standard make with accuracy better than the accuracy expected from the calibrated/tested instruments, and certified by National Physical Laboratory or other equivalent agencies. These instruments/equipment are necessary only during testing/calibration/maintenance.

06.10.00 TRAINING

I. The vendor shall carry out training courses for the Owner's personnel. The courses shall be held at the vendor's premises before the plant is started up and the plant during the start-up of the plant itself. The vendor shall make available all the material needed for the courses at his own expense. The courses and the documentation used during the lessons shall be in English.

II. The vendor shall be responsible for furnishing details of course outlines, manuals of training, equipment necessary to conduct the training, exercises to evaluate trainees' progress. Vendor shall also be responsible for any other requirements necessary to train the engineers deputed by the purchaser within a time limit so that they acquire the necessary expertise to operate and maintain the programs and the equipment supplied. At least 30 man days shall be envisaged for training operation engineer, C & I maintenance engineer, supervisor and technicians.

III. Purchaser/Consultant shall select personnel for training on the basis of his requirements and shall review all materials furnished for adequacy of teaching aids and time tables.

IV. Training of Personnel

Each Instructor-designate shall have the following minimum qualifications for his area of instructions:

a) Complete and through technical knowledge of the equipment and system supplied under the contract an skilled experience in their programming, maintenance and operation.

b) Complete and through knowledge of the test and laboratory equipment and software, handbook and guides and their actual use as aids and tools in maintaining, diagnosing, programming, operating and trouble-shooting the hardware/software system.

V. Course Contents

The outline of each course shall give the subject matter, a short resume of the prerequisite subjects (if applicable), the position of the course in the training programme, the aim and yardsticks for evaluation and other topics, which shall add to the usefulness of the program. In order that the selected trainees shall have time to participate in the course, sufficient advance notice of minimum 8 weeks shall given by the vendor. The course outlines shall be submitted 10 weeks shall be given by the vendor. The course outlines shall be submitted 10 weeks ahead for review. The training exercise shall be designed to be objective in nature and shall include trouble-shooting exercises on similar equipment.

VI. Training Manuals

All training manuals shall be prepared by the Vendor and submitted for review 10 weeks ahead of the commencement of the course. After course completion, these manuals shall become the property of the owners. Any change in equipment, manuals and other material shall be informed to the owners. Any change in equipment, manuals and other material shall be informed to the Owner during the guarantee period. In addition to vendor documentation, the following minimum requirements shall be adhered to for the training manuals:

a) Functional flow charts, descriptive material source listings applicable to all operating and application software and diagnostics programs.
b) Schematic drawings of each assembly of the hardware for the course on maintenance.
c) All manuals pertaining to procedures, specifications and operation for each equipment.

VII PLC hardware and software maintenance training

VII.1 Vendor shall conduct a course in hardware (module level and optional component level) maintenance. Software maintenance and diagnostic of the system for Client at Vendor's facility. The course shall be conducted prior to the factory system performance tests so that trained personnel can participate effectively in the final testing if possible.

VII.2 The hardware maintenance training course shall cover every equipment item supplied as part of the PLC. This course shall include:

a) Actual operation, detection and correction of faults in equipment.
b) Familiarization with maintenance procedures for the system offered.

VII.3 Some of the topics covered in the course shall include:

a) Fundamentals of the system
b) Equipment logic diagrams
c) Diagnostic procedures
d) Peripherals maintenance

e) Preventive maintenance procedures

VII.4 Software maintenance training shall cover all software supplied with the system. The trained personnel shall be able to write and debug the application and system software.

06.11.00 WARRANTY & RESPONSIBILITY

I. The supplier shall guarantee that the supply complies with is indicated in the present specification, in the order and in the documents retrieved by the order itself. Vendor shall be fully responsible for the manufacturer in respect of proper design, quality workmanship and operation of all equipment, accessories etc. supplied by the vendor for the time period in the order.

II. The supplier shall be responsible for the realization of the system configuration, of the block logic, of the management of the commands relative to each single machine operating in a semi-automatic mode (command of the single machine) and automatic mode (automatic start-up and stop of a plant area).

III. If the supply dos not maintain the characteristics and performance levels indicated in the contract during the period of warranty, with the exception of wear within the normal limits, the Vendor shall be obliged to immediately make any modification needed to restore the above-mentioned characteristics and performance levels, at his own expense and care. As far as all these parts that have been replaced, repaired or in any case, directly or indirectly influenced by these operations, are concerned, the warranty period shall be extended by the same basic warranty period, starting from the date the repair, replacement or modification was finished.

IV. It shall be obligatory on the part of the supplier to modify and / or replace any hardware and modify the operating, application and diagnostic software free of costs, of any malfunction is revealed even during on-line operation after taking over with the warranty period.

V. Design, engineering, testing and commissioning shall be carried out by OEM only.

06.12.00 Installation, Calibration, Testing & Commissioning

I. Installation

a. Instrument piping / tubing installation

i. All primary piping / tubing shall be installed in the best workman like manner and shall follow installation standard in each case where there is no installation standard, the decision of the Engineer-in-charge shall be followed. Horizontal and vertical lines shall be installed using spirit levels and plumb and shall be supported to permanent structure at every 1.5 meter.

ii. Piping / compressor shall have a slope of 10% on horizontal runs. All the welding shall be carried out as per the relevant codes with electrodes approved by the Engineer-in-charge. Only qualified welders approved by the Engineer-in-charge shall carry out the welding IBR grade of welder shall be required wherever BIR grade welding is involved. After IBR welding, radiography as per the required standard to be done by qualified welder. Pipes shall be bent using pipe benders and any hot bending shall be totally rejected. Pipe shall be cut, using pipe-cutting devices. Hot cutting shall not be allowed. All threaded joints shall be jointed using Teflon tapes and no other pipe jointing compound shall be used except on higher temperature service where graphite sealing compounds shall be used. Brand of Teflon tape, insulation tape, and graphite compound is to be approved by the Engineer-in-charge.

iii. Tubing shall be bent with correct size tubing bender wherever possible to avoid the use of fitting. Tubing cutter shall always be used to cut tubing. The use of short length of tubing in long runs shall be avoided. Wherever required coils shall be provided. All tubing shall be run in such a manner as to give the maximum protection against mechanical damage. Tubing runs shall be grouped together where possible. Tubing shall be arranged so that couplings can be tightened without disturbing lines. Pipes or tubes installed but not connected, shall have the ends closed in an approved fashion to prevent the entry of foreign material. For a period up to one week, adhesive tape may be used. For longer periods caps or plugs shall be used. All reasonable precautions shall be taken to prevent foreign material entering pipelines before and during erection. All lines shall be blow through with filtered air before connection to instruments. No pipe or tube shall be left with mechanical strain on it. On tubing to pipe connections and in making up screwed pipe joints, Teflon tape shall be applied to make thread in a manner to insure tape is not over the end of the male fittings.

b. Instrument impulse pipe & fittings

The design and testing of instrument impulse pipes and fittings shall comply with all currently applicable status, regulations and safety codes. These pipes and fittings shall also confirm to the latest applicable standards. Impulse pipes and fittings shall be designed to meet the requirements of ASME code for pressure piping ASA – B 31.1. Impulse pipes shall be used from process tap points to instrument tea-off and impulse tubing shall be used from tee-off to the instruments.

c. Piping supports

i. Piping and compressor shall be adequate supported and fixed at distances not exceeding those in the following table.

Single Tubing / pipe	listance between suppo supports
3/8 inch OD and less	Continuous
½ inch to ¾ inch nominal site	2 meters (6 ft.)
¾ inch to 1 inch nominal size	3 meters (9 ft.)

All field mounted instrument air tubing shall be supported with steel angles / channels of a minimum 1/8 inch thickness fabricated to present a neat appearance. Multi core / multi pair cables shall always be installed on trays or ducts and properly clamped. At every vertical drop to / from junction boxes, they shall be clamped at frequent intervals as per instructions of Engineer-in-charge. They shall be connected inside the junction boxes strictly according to the numbering systems mentioned in the junction box schedule. All instrument signal / control / power cable shall be run only above the ground level in cable trays / ducts. At bends, minimum radius shall be maintained as per manufacturer's standard.

ii. Thermocouple compensating cables to be laid from instrument location to control room as per required standard. Identification tags shall be provided on either end of individual cores, multicore / pair / triad cables including unused cores as per wiring diagram / cable schedule / junction box schedules PVC ferrules shall be used for identification of cores. Aluminum tag plates shall be used for identification of cores. Aluminum tag plates shall be used for identification of cable / junction

boxes. All cables shall be cut, after the exact site measurements are taken between ends and the cable drums shall be so selected before cutting the lengths, as to avoid nay wastage. While terminating the leads at the field instruments, a 300 mm length loop shall be provided to facilitate easy removal of instruments. In the field, the cables shall be laid in the overhead ducts and trays as per layout drawings.

iii. While laying cables in cables / trenches or burying them, care shall be taken to ensure that two signal cables like alarm, analyser cables, special cables, compensating cables, etc are separate from other power supply cables. Separation of low signal cables and power supply cables in trays / ducts shall be done as shown in the tray / duct drawing. Jointing of cables are not permitted. At each road crossing and other places where cables enter pipe sleeves, adequate bed of sand shall be given so that the cables do not stack and get damaged by pipe ends after pack filling. After laying all the cables, the cable entry to control room shall be suitably filled and scaled so as to achieve a positive seal against the entry of gas / water etc. All cables shall be laid in accordance with the layout drawings and cable schedule and tubing schedule. Multicore / multipair cables shall be bent in a large redius as per manufacturer's standards.

iv. Cables shall be rigidly supported on structural steel and masonry individually or in groups as required using individual cast or malleable iron galvanised clips, multiple cable supports to cable trays. If drilling steel must be resorted to, approval must be secured and steel must be drilled where the weakening of the structure shall be minimum. Cable shall be supported at every 500 mm. In case, no such supports are available, the contractor shall provide suitable supports for the cable where required. No cable shall be terminated or left with mechanical strain on it in any conduit where cabling are run through conduit, the entry and exit shall be smooth and free from burners. The use of conduits shall be kept to a minimum, as far as possible. Cable must be pulled into ducts / conduit in a way that ensures there is no damage to the cable. All multi-cable laid in ducts shall be properly dressed and tied with nylon wire of 3 mm diameter. All cables finally entering JBs / cabinets shall run through flexible PVC conduits for approximately 500 mm.

d. Installation of Instruments

All electric instruments shall be generally installed on supports as per installation standards. Filter regulators shall be mounted on the

instrument supports below the instruments or at the nearby suitable structures as per instruction of the Engineer-in-charge. No instrument shall be installed in such a way that it depends for support on the impulse pipes, hand-rails, floor grills, process pipes or structures in the passage. Field mounted instruments shall be mounted on brackets, sub-panels, or placed on a suitable pedestal. They shall be easily accessible from grade, ladder or platform. All local indicators shall be readable from grade or operating level, and if used for manual control, shall be visible from the related valve. Where possible, local mounted instruments shall be mounted at approximately 1.35 meters (4ft 6 inch) above the platform or floor in an accessible position. Instruments shall be mounted as close to the sensing points as possible.

e. Process Connection and Installation

i. Installation of pressure instruments at locations subject to excessive vibration shall be avoided. All measurement tapping points for pressure above 30 bar application shall be provided with a double isolating valve at the pressure source and these valves shall not be smaller than 25 mm. This shall apply to all services where flange ratings are of or in excess of ANSI 600. An additional block valve and vent valve shall be required adjacent to the transmitter. Means shall be provided for venting pressure from the live and gauge so that gauges may be removed safely. Primary injection testing shall be incorporated together in a manifold. Approved ball valves shall be used where temperature conditions permit. The valves shall be rated for not less than the line pressure on the main pipeline.

ii. When an instrument is located at a distance of 2.5 meters or more from its pressure connection, an additional block valve and a vent valve shall be provided adjacent to the instrument vent valves shall be arranged, if necessary, with drain lines to ensure the operation of these valves does not create a hazard. If the pressure piping is of such length that the isolating valve is inaccessible from the instrument location, a suitable valve shall also be fitted at the instrument itself.

iii. All pressure instruments shall be installed vertically. These for steam must be tapped directly from above, for pressure transmitters and switches, there shall also be a condensing leg. The same applies to gas and vacuum measurements, but adequate provision should be made to ensure no condensation can take place along the line, i.e. the slope shall be adequate to drain any condensate back to the main lines (slopping upwards from the sensing point). Tapping points for liquids shall made

at an angle of 45^0 from the bottom of the main pipe and these are to be sloped downwards from the sensing point. An exception is made in the case of the tapping point for fuel oil or corrosive fluid in which the pressure instrument shall not have direct contact with the process fluid. Any suitable liquid shall be used as a medium to separate the fuel oil from the pressure instruments.

iv. Transmitters, controllers, pressure switches and the like shall be supported independent of the pressure connection. The type of support shall depend upon the make of instrument and location. When installing pressure instruments, care must be taken to avoid the possibility of imposing stresses from the pressure-piping, conduit etc. which may cause mal-function. When the pressure impulse line in liquid filled, the measuring unit shall be compensated for static head. The head correction shall be stated on the unit. All process connections, pressure impulse lines and instrument arrangements shall be fully detailed and to the approval of the Engineer-in-charge.

f. Instrument Erection Hardware

i. Main cable tray is of flat / angle construction with 3 mm thickness and fully galvanised. However, the various bends and tees have to be fabricated as per site conditions, if required. The quantum of trays shall be as per relevant drawings. The trays shall be properly supported at regular intervals. Wherever insert plates are not available, support on concrete structures of ceilings shall be fixed with a minimum of 10 mm expansion blots. Angle supports for trays shall be fabricated as required after retting approval from the Engineer-in-charge.

ii. All supports shall be cut with hacksaw only. Any work executed by gas cutting shall be totally rejected. Free ends of angle supports shall not sharp ends and shall be properly rounded off. All supports shall be painted with one coat of red oxide zinc chromate printer conforming to IS 2074 after cleaning to remove scales and then painted with 2 coats of final epoxy paint. Performed trays shall be used for branching cables and tubes from main trays. Junction boxes shall be erected by contractor.

II. Calibration & Testing

a. Calibration

i. All instruments shall be calibrated strictly as per the manufacturer's instructions prior to installation. The scope of calibration includes all

field instruments of all types namely electronic, electrical etc. Contraction shall use his own oil free instruments and air compressor for calibration purposes. Conversion from one unit to another for the purposes of calibration is not allowed.

ii. Procedure for calibration for different items are as outlived below. However, the detailed procedure shall be submitted to Engineer-in-charge for approval before proceeding with the calibration.

- All pressure and differential pressure transmitters shall be calibrated to the settings as per instrument data / specification sheet and instruction of Engineer-in-charge. Pressure instruments shall be calibrated by applying pressure to the instrument using dead weight tester and monometer (for low pressure).

- Receiver instrument shall be calibrated and aligned using test hookup as per instruction from the manufacture / Engineer-in-charge.

- Pressure transmitters shall be calibrated at 0%, 25%, 50%, 75% and 100% and vice-versa of range using dead weight tester.

- DP transmitters shall be calibrated at 0%, 25%, 50%, 75% and 100% and vice versa of range using dead weight tester.

- Control valves and positioners shall be checked for hysterisis and linearity and calibrated for rated strokes. Prior to calibration, valves shall be cleaned externally. The steam shall then be lubricated, if required and stroked few times to extreme positions of plug to ensure that movement is free from friction.

- The valve shall then be calibrated for rated stroke and linearity also. Subsequently, the valve shall be checked for hysterisis to the accuracy of 1% FS.

All calibration readings shall be recorded in the prescribed format and submitted to the Engineer-in-charge for approval. Where significant deviations from specifications are obtained, the matter shall be brought to the immediate notice of Engineer-in-charge for corrective actions. The contractor is responsible for calibration of all instruments / items covered under the scope of works. The test reports shall be submitted to

Owner on a daily basis. Calibration test facility shall be located near the work site.

b. Loop test

i. Loop test shall be performed after calibration of all instruments and leak test of signal lives loop test in conducted to check the functional performance of all elements comprising the loop thereby ensuing proper connections and operations. Before proceeding for loop test, the calibration results of individual elements shall be recorded on the prescribed proforma and shall get it approved by Engineer-in-charge for correctness of installation, measurement and calibration results. Loop testing for all control loops shall be generally by simulation of process conditions and shall fix points namely 0%, 25%, 50%, 75%, and 100% of full scale inputs. Detailed procedure shall be submitted to Engineer-in-charge for approval before proceeding with the loop testing.

ii. The field / receiver pressure switches are simulated for abnormality by disconnecting the wires of terminals and function of all associated system are checked. Performance of individual loops may be accepted for an overall accuracy of ±0.5%. where deviations exist, contractor shall recalibrate the instruments which forms part of the loop checking where required, at no extra cost. After the loop test is complete, the contractor shall connect back any terminations and connection removed for loop check. A loop shall be considered as completed, only after measurements in that particular loop are complete and certified by the Engineer-in-charge, in addition to loop sheets being duly filled in all respects and approved by the Engineer-in-charge and Owner. Final certified loop sheet shall be submitted in four copies and one transparency.

iii. Loop checking of following shall be carried out.

- All local loops
- All loops up to local panel
- All loops up to control room
- All loops to control room for non PLC / PLC instrument such as gas detectors, fire detectors and other special instruments.

c. Testing

i. Instrument impulse piping

- Flushing of impulse piping shall be carried out while the live is pressurised after the isolating valve of the instruments is closed. The connection near the instrument shall be opened so that no dirt enters the instrument. Testing of impulse piping /tubing shall be carried out after the installation of instrument with primary piping / tubing and flushing is complete in all respects and approved by the Engineer-in-charge. Primary piping / tubing shall be tested hydraulically to 1.5 times the maximum operating pressure.

  - After through flushing, lines shall be isolated from both instrument and vessel / piping ends. After pressurisation, the source shall be cut-off and the pressure shall not drop during 15 minutes testing period. The lines shall be blow with air, after hydraulic test. In case, no isolation valve is provided near the instrument, impulse piping / tubing shall be pressurised along with the instrument to the maximum pressure of the scale in case of pressure instrument and maximum operating pressure in case of differential pressure instruments with equalizing valve open. In special conditions, where hydro testing is not permissible due to service requirement, the testing shall be carried out by using air / nitrogen as per instructions by the Engineer-in-charge.

iii. Instrument air lines / signal tubing

- Flushing of instrument air lines shall be carried out while the line is pressurized to 7 Kg/cm^2 after disconnecting the copper tube at each air regulator upstream end. The line shall be blow for 15 minutes to remove trace of oil and dirt. The air regulator shall be taken in line, the copper tubing at the instrument end is disconnected and blown for 3 minutes to remove trace of dirt.
- Testing of instruments air lines shall be carried out with instrument air at 7 $Kg/cm\text{-}^2$ up to the upstream of filter regulators after through flushing. All lines shall be checked with soap solution and bubbler unit for possible leak at joint. All the signal tubing shall be tested with 1.5 Kg/cm^2 air after proper flushing.

- All air tubing shall be tested and inspected by one of the methods given in ISA RP7.1 “Pneumatic Control Circuit Pressure Test” Clean & oil free instrument air shall be used for the test instrument air tubing and piping shall not be isolated from the instrument and pressurized to 7 Kg/cm^2. Then they

shall be isolated from the pressure source and pressure reading on the gauge shall not fall by more than 1 PSI in ten minutes or as per the acceptance of the Engineer-in-charge.

iii. All cables (signal, control, T/C extension, special, power supply etc.) shall be laid as per the junction box / cables shall be tested for continuity and for the insulation resistance by a certified megger and checked for proper connections and results recorded and approved by the Engineer-in-charge. The testing shall be done after disconnecting the cable at both the ends.

Cable shall be identified with aluminum tags at both ends and termination ends by PVC ferrules. Wiring shall be checked to ensure that is correctly connected and properly grounded. Correct connections of all electric switches shall be checked. Alarm operation checks shall be made by the contractor to check functionally all alarms and trip system. Wherever possible, process conditions shall be simulated to check the operation. Faults in wiring or piping shall be corrected in the presence of Engineer-in-charge.

iv. Earthing of local panels / cabinets etc shall be done as per the documents and instructions of the Engineer-in-charge. Erection procedure shall be further detailed if necessary after award of contract and shall be subject to the approval by consultant / client.

III. Commissioning

The measuring and control instruments shall be commissioned in accordance with plant start-up schedule. The contractor shall take care to complete all pre-commissioning activities and simulation tests after erection to suit the over all commissioning of respective plant equipment.

The pre-commissioning activities of instruments shall be completed at least seven (7) days in advance as per the schedule of plant pre-commissioning schedule eg. Compressor rolling etc.

The controllers shall be tuned as per the process requirement. The list of set points, alarms interlocks, settings for the controllers shall be furnished in the standard format of controller manufacturer and handed over to client / consultant.

Control loop shall be put on auto mode as per the operation requirement of differential phases.

Before taking over of the plant by the client, all the instruments, system and auto control loops shall run satisfactorily for at least one (1) month at varying load without disturbing any adjustment. During this period, supervision and maintenance of total instrumentation equipment shall be the scope and responsibility of the Contractor.

The performance test shall be carried out for the system offered and certificates to these effects shall be approved by the client.

06.13.00 Drawing and Documents

Drawings and Documents for Instruments

Following drawings and documents shall be submitted for conventional instrumentation. All communications/descriptions in the drgs., documents, technical literatures and manuals shall be in English language :

Along with the offer

i) Process and instrumentation (P&I) diagrams for the unit and all auxiliary equipment indicating all mounted instruments and PLC displayed measurement using ISA symbols and using suitable tag numbers against each instrumentation equipment. Alarm and interlock functions shall also be indicated in the P & I diagrams.
ii) Approximate dimension of control rooms and analyser rooms.
iii) Quality and quantity of electric power requirement for instrumentation and also instrument air requirement.
iv) List of deviations/ exclusions if any w.r.t TS

Drawings/documents to be submitted by the successful Tenderer

A. **For approval**

i) Process and instrumentation (P&I) diagrams for each TB and its auxiliaries indicating all field and panel mounted instruments using ISA symbols and using suitable tag numbers against each instrumentation equipment. Alarm and interlock functions shall also be indicated in the P & I diagram.
ii) Specification of each instrumentation equipment indicating make, model no., application, scale range, quantity, tag no. (as per P&I

diagram), accuracy, power consumption etc. Data sheets for each instrument as per standard format shall be submitted with all the required details filled in along with detailed technical literature. Schedule of instruments / BOM shall be submitted by the Contractor.

iii) Analog control schemes for NGC and measurement diagram.

iv) Specification indicating make, model no., accuracy, quantity of laboratory equipment along with detail technical literature.

v) Instrument power supply diagram and instrument air supply diagram along with bill of quantities (BOQ).

vi) Instrument panel general arrangement drawings (both local and remote panels) along with BOQ for all units.

vii) Disposition of instrument panels, desks, cabinets, consoles etc. inside control room and computer room.

viii) Disposition of sampling instruments, cabinets, racks etc. inside analyser rooms (both dry and wet).

B. **For procedural Checking and Records.**

i) Instrument panel wiring diagrams.

ii) Hook – up diagrams.

iii) Data sheet for Control Valves

iv) Erection / installation diagrams for all primary sensors and field mounted equipment.

v) Alarm annunciation scheme.

vi) Flow sensor & control valve sizing calculation sheets.

vii) Instrumentation layout drawing showing location of sensors, control valves, transmitters etc. and route of cables from these up to the instrument panel in the control room.

viii) Cable and pipe schedules with specification.

ix) Manufacture's test, calibration and guarantee certificates for all the instruments.

x) Operation and maintenance manual for each instrument.

xi) Quality assurance plan for each instrument.

[C] **Drawings and Documents for PLC**

Following drawings and documents shall be submitted for PLC System. All communications in the drgs., documentations, technical literatures and manuals shall be in English language

[D] **Along with the offer**

i) System configuration diagram along with write-up on the system
ii) Instrument power requirement
iii) Tentative integral layout sketch of cubicles, consoles, peripherals etc. inside control room including total area requirement.

Drgs/doc to be Submitted by the successful Tenderer

A. **For Approval**

i) System configuration diagram along with write-up on the system.
ii) Bill of Material for PLC
iii) I/O listing
iv) Nest loading details.
v) Overall G.A. and general arrangement of various cabinets, panels, consoles etc. showing internal disposition of all components / units etc. with dimensional details.
vi) Single line power supply diagram.
vii) Graphic display sheets, plant mimic sheets.
viii) Quality assurance plan.
ix) System grounding scheme with bill of materials.

B. **For Reference /Information category drawings**

i) Wiring and termination diagrams for marshalling racks, cabinets and consoles
ii) Cable schedule, cable routing,
iii) Data sheet of cables
iv) Formats and work sheets for generation and display of overview, groups, loops, graphics, alarms, operator's guide messages, real time and historical trends, log and shift formats.
v) Application software formats and details in documentation and floppy disks.
vi) Hookup drawings
vii) Foundation plan drawings for various cubicles and consoles with dimensions along with opening on floor for cable entry
viii) Bus loading calculations
ix) Factory testing and acceptance procedure
x) Initialization/booting procedure and associated system software in documentation (all in English language) as well as floppies

xi) Test, calibration and guarantee certificate
xii) Operation and maintenance manual (in English language)
xiii) Warranty / guarantee certificate
xiv) Final 'As Built Drawings' and electronic media.

The quantity 6nos of final drawings and documents to be submitted to client / consultant shall be as per contract with **good spiral binding/Binding** no loose documents/drgs shall be accepted.

The quantity of drawings and documents to be submitted to Owner / Consultant shall be as per contract.

06.14.00 LIST OF MANDATORY SPARES

Clause No.	List of Mandatory Spares
1	LOCAL INDICATORS 1 NO EACH TYPE
2	1NO each . DPT,LT,PT,
3	PLC – CPU-1no. Communication card-1no. Power Supply-1 no. DI card-2nos DO card-2nos AI card-1 no. AO Card-1 Interposing relay-50nos FTU- DI-2nos., AI-1nos, DO-1nos SIL3- TMR -1 module
4	SOV -25nos

Clause No.	List of Mandatory Spares
5	Rota meter – 2nos
6	**CONTROL VALVES ACTUATORS AND ACCESSORIES**
	2 nos. complete set of critical application control valve

06.15.00 List of Laboratory Instruments

i. HAND HELD HART CALIBRATOR/Configurator-1no.

Type		Universal type, SMART, HART compatible shall be able to calibrate / configure different makes of Smart transmitters
Operating Temp. Range		upto 60 deg C min.
Display		Wide Screen LCD
Key Pad for navigation		Necessary keys shall be available for navigation, Configuration, operation, etc.
Electrical Connection		i. 2 standard banana jacks, suitable for 1.5m (5 ft) lead set with insulated mini grabbers and alligator clips to be provided for Transmitter Connection.
		ii. Min. 1.5 mtr. USB cable for connection to PC.
		iii. Suitable cable for connecting to Battery charger / Power Socket.
Accessories		a. Leather case
		b. Battery assemblies(rechargeable disposable

		versions)
		c. Power adaptor/battery recharger with universal plug
		d. Elastic handle strap & rubber shell
		e. USB cable & leadset to the transmitter with minigrabbers
		f. Soft carry bag with adjustable shoulder strap
		g. DVD with PC tool software and HART library

ii. **Handheld mA Calibrator -1no.**

This instrument shall provide an accurate and reliable measure of milliamp signals for use in calibrating receiver type instrumentation. The instrument shall be power by a self-contained rechargeable battery pack and shall include a battery charging circuit which operates automatically when the instrument is connected to a 240V AC supply. The instrument shall be designed to operate from a 240V AC, 50 Hz supply with the battery pack removed. The instrument shall meet or exceed the following requirements

Input range – selectable	:	0 – 10 mA
	:	0 – 100 mA
Output Range – selectable	:	0 – 10 mA
	:	0 – 100 mA
Protection	:	100 % range
Accuracy	:	+/- 0.02% of selected span
Ambient temperature	:	0 – 50°C
Ambient temp. error	:	0.05% of span

iv. Handheld Thermocouple Calibrator -1no.

Thermocouple calibrator shall be capable to accept all types of thermocouples (type J, K, T, E, R & S). Calibrator shall be digital LCD display and shall operate from built in rechargeable battery source. This shall be capable of both measurement and calibration mode of operation. Cold junction compensation shall be built in

Accuracy	:	Measure : 0.5deg C for K Type T/C between (-)150 to 750 deg C;
	:	1.0deg C for R/S Type T/C between 400 to 1750 deg C;
	:	0.4deg C for T Type T/C between 0 to 400 deg C;
Simulation	:	0.4deg C for K Type T/C between 190 to 1250 deg C;
	:	0.4deg C for R/S Type T/C between (-)50 to 800 deg C
	:	0.5deg C for T Type T/C between 150 to 400 deg C;
Ambient temperature	:	50°C (max.)
Temperature effect	:	0.01% per degree C or better
Power supply	:	240V AC UPS Power Supply for Table Mounted and in Rechargeable battery for field operation
Voltage protection	:	Equipment shall be protected against external voltage upto + 110V DC
Accessories	:	i. Carrying case
		ii. Connector leads
		iii. Extension cable
		iv. calibration certificate
		v. Battery with charger
		vi. Instruction manual

iv. **Handheld RTD Calibrator -1no.**

RTD calibrator shall be capable to accept 2, 3 & 4 wire platinum resistance thermometers of 100 ohms and copper resistance thermometer of 53 ohms. Calibrator shall be digital LCD display and shall operate from built in battery source. This shall be capable of both measurement and calibration mode of operation.

Accuracy		+/- 0.25% of full scale
		+/- 0.05°C or better
Ambient temperature		50°C (max.)
Temperature effect		0.01% per degree C or better
Power supply		240V AC UPS Power Supply for Table Mounted and in Rechargeable battery

		for field operation
Voltage protection		Equipment shall be protected against External voltage upto + 110V DC
Accessories		i. Carrying case
		ii. Connector leads
		iii. Extension cable
		iv. Calibration certificate
		v. Battery
		vi. Instruction manual

v. **Handheld Multi Function Calibrator-1no.**

The portable unit is intent to measure electronic transmitters, RTD's, Thermocouples and act as a source for calibration of secondary instruments and system inputs. The instrument shall be digital LCD display and shall display simultaneously both input measured value and output signal.

Data entry shall be through numeric entry function keys. Instrument shall have built in diagnostic and auto calibration facilities & shall also be capable of measuring voltage, current, thermocouples, RTD's & frequency and stimulation of corresponding primaries including two wire transmitters.

Accuracy		+ /-0.025% typical
Thermocouple		Type J,K,T,E,R&S
RTD		Pt-100 Ohms
Volts		0-10V, Resolution 0.2 mV
Millivolts		-10-120 mV, Resolution 2 Microvolts
Current		-5-60m Amp Resolution 1 micro amp
Ohms		0-4000 Ohms
Frequency		120-50 KHZ
Power supply		240V, AC 50 Hz
Common Mode rejection		80 db at 60 Hz or better
Normal mode rejection		40 db at 60 Hz or better
Linearity		+/-0.005 percent of span
Repeatability		+/-0.005 percent of span
Ambient temp.effect		+/-0.005 percent/deg.C
Long term stability		+/-0.00025 percent/100 hr non-cumulative
Ambient temperature		50 deg.C
Input protection		Upto 140V DC

Input/output isolation		300V DC, 50 M Ohm

Calibrator shall be furnished with RTD simulation facility, external charged battery pack, test leads, set of fuses, instruction manual. In addition one set of spare battery pack as well as charger for spare battery pack shall be supplied with each instrument.

vi **Handheld Pressure Calibrator -1no.**

Type		Precision Electronic with digital display
Range		i. 0-500 mmwcl
		ii. 0-2500 mmwcl
		iii. 0-1.6 kg/cm2 g
		iv. 1.6-10 kg/cm2 g
		v. 0-16 kg/cm2 to 0 – 250 kg/cm2
Accuracy		+ /-0.002 + (+/- 0.05 % of Reading)
Resolution		1 mm
Over range protection		20 percent of span
Pressure sensing element		Capacitive transducer
Display		
- Type		LCD
- Digit		4.5
Function		Display for actual value and Percentage error.
Other functions		24V DC supply for two wire transmitter Contact monitoring for switch devices
Power supply		240V AC UPS Power Supply for Table Mounted and in Rechargeable battery for field operation
Operating temp		60 deg.C
Pressure connection		1/8 and 1/4 inch BSP and NPT
Accessories		1. Calibration pressure pump
		2. Current output modules
		3. Instruction Manuals
		4. Carrying case
		5. Battery Charger

Application		Calibration of pressure / diff.pr. transmitters, pressure switches and converters etc.

vii. **Handheld Digital Multimeter-1no.**

Portable digital multimeters, with high voltage grade leads/probes and suitable casing including carrying strap are envisaged. Digital multimeter shall have 4 1/2 digits read out indicator with automatic decimal point and polarity indicator. Indication shall be in seven segment LCD display. Meters shall be complete with accessories for high voltage, DC current, temperature, Capacitance and frequency measurements.

Instruments offered, shall have built in overload protection feature. These shall have high resolution and low response time. For AC signals (True RMS) digital multimeter shall have good fidelity over a large range of frequencies. Signals and ranges required to be measured by the motor are furnished in a tabular form below :-

Sl.No.	Signal type	Range	Accuracy
1.	DC voltage	100 mV	+/- 0.02% +1 digit or better
		1 V	-do-
		10 V	-do-
		100 V	-do-
		500 V	-do-
		1000V	-do-
2.	AC voltage	Same as DC voltage	+/-0.5% of reading + 2 Digits or better
3.	Direct Current	200 micro amp.	+/-0.75 % of reading + 2 Digits or better
		1 mA	-do-
		10 mA	-do-
		100 mA	-do-
		1 A	-do-
		10A	-do-
4.	Alternating Current	Same as Direct Current	+/-1.0% of reading or better
5.	Resistance	0.1 K ohm	+/- 0.5% of reading + 2 digit
		1 K ohm	-do-
		10 K ohm	-do-
		100 K ohm	-do-
		1 M ohm	-do-
		10 M ohm	-do-

Sl.No.	Signal type	Range	Accuracy
6	Input resistance	10 Meg ohms	
7	Ambient temp.	0-50 deg.C	
8	Ambient Temp.	0.1% of reading error from 0-50 deg.C	
9.	Indication Lamp	One red indication lamp shall indicate the overload.	
10.	Quantity	4	
11	Accessories	Test leads, One set of spare Alkaline battery, Software & hardware for interfacing, etc	

viii. Electronic Test Bench – 1 No.

Self contained test bench made of anodized aluminium for testing and repair of electronic instruments and gadgets shall be furnished. It shall be modular in design enabling easy change of arrangement. The test bench shall have approximate dimension (LxWxH) 1500x750x650 (mm) with thick laminated top. The front panel shall be made from 3 mm thick anodised aluminium plate and individually engraved in mimic style. Sufficient drawers shall be provided.

The test bench shall include the following module:

(1) Main Power supply module: It includes main switch for whole workstation 3 ground socket for other instrument, 240V 4A AC low-voltage output, earth leakage circuit breaker etc.

(2) Isolated supply module: It shall include main switch, circuit breaker, 240V AC ±0.5%, 1 phase, 50 Hz, 3 kVA supply socket, no. of socket – six, 110V AC, 10 Amp, 50 Hz supply socket, no. of socket – one

(3) Variable AC power supply: It shall include 0-260V AC*, 1 phase, 50 Hz, 10 Amp, socket and terminal, 0-50V AC/2A, terminals. Digital meter for current (resolution 0.01A) and voltage (resolution 0.1V) no. of socket - one

(4) Variable DC Supply: Module shall include 0-60V DC* 3A stabilised output voltage supply No load/full load regulation shall be ± 0.02% or better, Digital display for voltage and current no of socket - one

(5) Constant DC Voltage supply: ± 48V DC*, 3A, no. of Socket - Two, ± 24V DC, 6A, no. of Socket – Two, ± 12V DC*, 10A, no. of Socket – Two. Each unit shall include Digital meter for Volts and Ampere.

(6) Digital multimeter: One four and half digit digital multimeter for display of voltage, current, resistance and having 24 measuring ranges, accuracy ± 0.1%

The following facilities shall also be provided:

(1) One DC voltage stabilizer: Regulation ± 0.02% for (0 to 60V, 1A), 0-100% load variation
(2) One AC voltage stabilizer: Regulation ± 0.5% for (240V AC nominal), 0-100% load variation

*(Voltage level is tentative and shall be matched to supply requirements of Tenderer's range of products)
The test bench shall include socket holders, where the electronic gadgets under test may be plugged. The front equipment shall include multi point connectors and test jacks for inter-connection. There shall be connection between the connector and holder in which device under test shall be plugged in.
The standard high accuracy resistors shall be included to load and measure the current output of devices. Necessary control devices for voltage and current adjustment/control, switches for power supply to feeders, isolation etc., shall be included. All electric circuits shall be protected against overload by MCBs, whose holders are located on front of the panel. All electrical circuits and metal structure shall be properly grounded.

ix. Pneumatic Test Bench – 1 No.

The pneumatic test bench made of anodized aluminium and modular in design enabling easy change of layout/arrangement as and when required shall be provided. The test bench shall be complete with shut-off valves, air filter-cum-pressure regulators and pressure gauges for testing pneumatic transmitters, controllers, power cylinders, control valves etc. The dimension for the test bench shall be approximately 1500x750x600 mm (LxWxH).

The test bench shall be furnished as per the following general specification:

(a) Complete with regulated air supply outlet of 0-20 psi and 0-30 psi, display plate with two four and half digit digital pressure indicator of range vacuum to 20,000 mm WG and 0-30 psi, accuracy ± 0.05% of full scale.
(b) Complete with Built-in selector for read out in five engg. units i.e. kg/sq.cm., psi, mm Wcl, bar, mm Hg.
(c) Complete with overload protection valve
(d) Complete with control plate with mimic panel incorporating three precision pressure regulators, filter reducing unit for the air supply, three 150 mm

dial pressure gauges having ranges 0-2, 0-4 & 0-6 Kg/cm² respectively and accuracy ± 0.25% full scale.

(e) Complete with two 0-30V 0.5A max. Stabilized DC power supply sources
(f) Complete with current source of 0 to 55 mA, and mV source of 0-100 mV.
(g) Complete with set of supports for the instrument under test, desk with drawers and all other necessary accessories.

The Tenderer shall be responsible for connection of instrument air line from his tapping point and also keep provision of giving supply from Air-Sets also. Tenderer must ensure that the consumption of air in the test bench is within the design capacity of the above tapping/piping or source.

x **Dead Weight Tester – 1 No.**

Dual range dead weight pressure gauge tester with combined high range and low range position unit, allowing an automatic change of scale of 10:1 ratio, with dual area screw press with ball thrust and axially located hand wheel shall be furnished. Piston cylinder assembly unit shall be made of special grade die steel or any other suitable material. The tester shall be provided with pressure instrument, levelling screws and relief valves to prevent damage. The measuring range shall be 1-600 Kg/sq.cm with accuracy better than ± 0.015% of the pressure being measured. It shall be suitable for gauges having 1/8", 1/4", 1/2" NPT connection.

Dead weight tester to be provided with following weights: 4 weights corresponding to 10 or 100 kg/sq.cm, 1 weight corresponding to 9 or 90 kg/sq.cm.,1 weight corresponding to 5 or 50 kg/sq.cm., 2 weights corresponding to 2 or 20 kg/sq.cm., 1 weight corresponding to 1 or 10 kg/sq.cm., 1 weight corresponding to 0.5 or 5 kg/sq.cm., 2 weights corresponding to 0.2 or 2 kg/sq.cm., 1 weight corresponding to 0.1 or 1 kg/sq.cm., 1 weight corresponding to 0.05 or 0.5 kg/sq.cm., 2 weights corresponding to 0.02 or 0.2 kg/sq.cm., 1 weight corresponding to 0.01 or 0.1 kg/sq.cm.,

Accessories to include spirit level, 8 bonded seals, pointer remover and punch, 2 spanners, one tool roll containing adapters for 1/4" & 1/2" NPT sizes, bottle of technical grade oil, dust cover, wooden carrying case etc.

Test certificate for accuracy and perfect cylindrical shape of the piston shall be furnished.

Software shall be provided to correct for effects of environmental factors such

as gravity and temperature to determine the pressure generated by dead weight testers.

7.0 PA Communication System (PACS)

7.1. PA communication system shall be provided as per the specifications provided. The bidder shall take responsibility for the completeness of the system and furnish the details of the units during detail engineering. All the Switching/ Control units of this system are proposed to be located in the Control room. PA system shall be connected to IP EPABX system and VHF based radio system.

7.2. IP based PACS exchange shall be provided with redundant processor, tone generator, fully wired rack, redundant power supply, Telephone Interface, Fire alarm Interface, Access panel, PACS exchange, Radio Interface, N+1 Amplifier, speaker loop termination, Beacon loop termination, line blancing assembly, Zone controller card, multimedia interface, access panel interface, 10 x Field Station Interface, Modbus RS-485, TCP/IP communication provision for interfacing with PLC, SCADA, EPABX, VHF, FAP, etc for monitoring and transfer of all the parameters, alarms, data, etc., Ethernet Switch, input and output control module, surge protection modules, configuration, hardware (rack mount) and software complete with all accessories. All critical resources like controller, tone generator etc. shall be redundant. Minimum 8 Nos. of speaker loops shall be provided with speaker loop monitoring.

7.3. PA & Plant communication system consisting of Central switching unit , Multi function digital controller, Master Control Station with goose neck microphone, units for interfacing with IP EPABX , Station PLC, Fire Alarm Panel, VHF system, Group msg amplifier, CD player, USB player, fire fighting system, complete in all respect for broadcast routine, pre-programmed announcement/ speech & messages, emergency speech & alarms, shall be provided. Necessary interface units for interfacing PAGA with other sub-system shall be provided.

7.4. Fully wired free standing Panel as per the specifications shall be provided for PA system.

7.5. Surge protection device for the power and communication shall be considered both internal and external type confirming to IEC or UL standards. Surge Protection devices shall be provided as per following philosophy-

- For all incomer power supply (UPS as well as Non-UPS)
- For each IP based phone station
- Earthing Circuit for lightning protection
- SPD for each Explosion proof camera supplied by bidder

7.6. All work required for integration in the existing EPABX system, including supply of all hardware, software, license etc. for complete integration purpose is included in the scope of the bidder without any cost implication to IGGL/ MECON.

7.7. A modern universal and high efficient communication / public address system utilizing IP technology, is required. The system will be used for the transmission of voice & alarms in industrial surroundings. The system shall be applicable for the applications such as

- Public Address
- Warning & Alarming
- Control and Monitoring

7.8. To meet the current and the future communication demands, the system shall be designed as an open, modular system, which facilitates system integration and future expansions. The main purpose of the system is to realise communication, public address and/ or warning functions. However, in addition the system shall be able to realise interfaces to other communication systems.

- Telephone systems for initiation of paging calls
- Control systems via potential free contacts
- Network management systems / SNMP
- Fire & Gas alarm systems via potential free contacts

7.9. The system shall offer, as a minimum, the following main features:

- Possibility to address the industrial plant publicly via the loudspeaker groups with amplifiers installed in the central exchange unit.
- Various voice messages and tone signals (freely programmable signal and tone sequences) can be released.
- Freely programmable communication and public address and general alarm system
- Unblocked communication
- Permanent self-monitoring of the system for immediate recognition of failures
- Control of all functions, software driven
- Numerous standard interfaces to external systems
- Centralized power supply of all connected components (no local power required)

To meet the latest safety standards, the offered system shall realise the following monitoring functions:

- Permanent monitoring
- Identification of failures and
- Independent generating of failure messages

The monitoring functions shall be there for the following components:

• Components of the central exchange unit (central control board, amplifiers etc.)
• Loudspeaker line monitoring

The system should guarantee communication in normal workflow and/ or in emergency cases. Information, working instructions and alarm messages are transmitted to personnel via access panels, telephones etc.

7.10. IGGL shall confirm areas of manned stations to be covered during detail engineering; however, the speakers shall cover the following areas as minimum –

• Control Building
• Substation
• Pigging Area
• Metering Area
• Complete Compressor Area
• Fire Water Area including pump area
• Security Gate Entry to terminal
• Warehouse
• Admin Building

7.11. The system shall comprise of central exchange(s) consisting of system control hardware, master control station located as mentioned elsewhere in bid document, and paging loud speakers complete with all interconnections. All interconnection cabling shall be of copper conductor, shielded and colour coded. Power supply to be drawn from the plant UPS supply at one point of the exchange. Configuration software with laptop shall be provided for the configuration of supplied PAGA System.

7.12. Central Exchange

The central exchange shall be a pre-programmed exchange with amplifier circuitry mounted in a central cabinet with individual rack mounted amplifiers. The cabinet shall be naturally ventilated, dust and vermin proof with IP – 41 enclosures as a minimum. It shall be possible to locate faults by monitoring from the central cabinet.

The central exchange shall have a processor module for the control of the central exchange. The exchange shall have a completely non-blocking type switching system and associated circuitry for call recognition and acknowledgement. Distinct push buttons shall be provided for various tones and their re-setting.

7.13. Alarm / Interface

• Alarm tones and priorities shall be configured according to the requirement so that alarm tones are generated under different conditions. Higher priority alarms shall be configured to override those of a lower priority.

• The paging system should have different tones for ESD and FSD siren and the system shall be hooked up with the fire and gas detection system.
• It shall also be possible to operate an alarm call from master control station(s) over all the loudspeakers during an emergency.
• A tone / speech generator shall provide a minimum of three (3) tones in priority sequence. These tones are user selectable, distinct signals that are factory programmed.
• Any other equipment / module required for the safe and satisfactory operation, control, protection, monitoring and testing of the system shall be included in the supply, even if not specifically mentioned herein.

7.14. Flashing Beacon

In areas with an expected noise level of 85 dbA or greater, a Xenon flashing beacon (15 Joules, yellow color lens) shall be installed in a prominent position. Noise level shall be assessed based on the acoustic study. The flashing beacon shall be minimum IP-65 and weatherproof or explosion proof (Ex'd, Zone-1, IIA/IIB, T3) depending upon the area of installation. It shall work on 230V AC. Vendor to note that junction box for beacon installed in hazardous area shall be Zone-1, IIA/IIB, T3 and Ex"d" certified. The cost of the flashing beacon shall be included in the quoted price of PAC system.

7.15. This system shall have PA/ Paging / Loudspeaker stations and connected paging speakers placed in the safe and hazardous areas. The output of the paging speakers shall be sufficient to announce the messages in the operating areas. Safe areas shall have normal speakers and hazardous areas shall be provided with FLP speakers. The exchange shall be suitable to accept min 10 Nos. potential free contacts from owner's fire alarm panel. The contacts shall be used to generate public address alarms through the loudspeakers connected to MCS.

7.16. The system shall allow making announcements / paging to selectively/ Group from any telephone extension provided in safe & hazardous area and also from a mobile VHF handset.

7.17. 2 Nos. Dedicated managed industrial Layer-2 Ethernet Switch for PAC system shall be considered.

7.18. The configuration of paging system shall be as under:

- Paging amplifiers shall be installed in the safe area, which shall be connected with number of 15/30 Watt FLP paging speakers to be placed at hazardous area.
- Paging amplifiers shall be installed in the safe area, which shall be connected with number of 15 Watt paging speakers to be placed at safe area.

7.19. One USB enabled CD player with integration with PA system shall be provided and installed in control room.

7.20. Separate and independent Desktop mounted Workstation with all required software shall be provided for PA system configuration.

7.21. Non FLP Type Desktop Master Control Station shall be provided in the control room for Announcement, Emergency Operation and to provide back-up services complete in all respect for broadcast emergency announcement/ speech & messages, emergency speech & alarms etc.

7.22. Supply of Intrinsically Non- Intrinsically Safe (Non FLP type) ; wall /column mounted with separate individual speaker unit, working on 230 V AC supply, weather proof canopy , locking arrangement and fitted with switch amplifier chord, rechargeable Ni-cad batteries, rotary switch handset with preset communication. The system shall be as per IS 5780 -1980. The peak output of the speaker shall not be less than 7 watts .

7.23. The Phones shall have the provision for receiving Outside Calls directly through the EPABX / Central control station.

7.24. Ceiling speaker / Horn type Intrinsically safe speaker / Horn type speaker / Box Type Speaker / Cone Type speaker with necessary mounting accessories, junction boxes, mounting brackets, clamps, nuts etc suitable for installation of Ceiling / false ceiling of inside / outside building (as required) complete in all respect. Speakers shall be provided in all the rooms (including cable cellar) of each building in plant. The quantity of speakers shall be provided such that sound level of 75dB is achieved at any place of each room of each building.

7.25. All phone stations (FLP as well as Non-FLP) shall be provided inside suitable enclosures and noise cancellation headphones shall be provided with each phone station for communication. The head phones shall be connected to the respective phone station.

7.26. Non FLP phone stations shall be provided tentatively at following locations–

- One Number shall be provided in guard room, One Number shall be provided in substation building, one no. In each building other than control room building.

7.27. FLP (Flame proof/ Intrinsically safe) phone stations shall be provided tentatively at following locations–

- One Number shall be provided in each compressor shed.

7.28. Horn Type IS/ exproof speakers shall be provided tentatively at following locations–

- In pump house, In Process Area ; the quantity shall be provided such as to cover the entire pump house and entire process area

7.29. Non IS Horn Type speakers shall be provided tentatively at following locations –

- near main gate, near fire water tank, near transformer area, Outside the control room

7.30. The location details provided are tentative and may be subject to change as per the requirement and as per the direction of EIC at site. The installation of PA system components shall be done as per the decision taken at site.

8.0 VHF communication with Walkie Talkie system for Compressor Station:

8.1. VHF communication system is required for Voice communications at Compressor station with Intrinsically Safe Type **Walkie Talkie sets (12 nos**) & antenna as required **shall be considered.** New VHF tower shall be provided, if required for VHF coverage of the entire compressor station. New bandwidth, necessary licence, obtaining frequency allocation, providing necessary software for programming of Hand-held and base stations & SCAFA clearance from respective statutory organisations is in bidder scope. All works related to liasioning and obtaining license in name of IGGL is included in scope of the bidder.

8.2. The Very High Frequency (VHF) Radio system shall provide coverage within the vicinity of Plant facility for personnel communications within the coverage zones. The radio shall be designed to provide full coverage within 1 km at compressor station. Vendor to ensure radio coverage in the 1 km radius, all required hardware and antennas as required shall be offered by bidder. Bidder shall provide 1 nos. of Fixed Radio with fist microphone and 12 nos. of Explosion Proof Handhelds. Repeaters as applicable shall be provided to meet the required coverage shall be provided by bidder without any additional cost implication to IGGL. The offered Radio system shall support a minimum 10 nos. of channels

8.3. The system shall have an Integrated Wireless Network System that shall integrate the IP Exchange (EPABX) with the wireless communication system. The system shall consist with base stations, interface unit, power supply unit, antenna, cables, etc. located in the safe area and numbers of handsets.

8.4. The handsets shall be provided with DTMF keypads, logic cards, Maintenance Free batteries & battery charging unit and must be PESO approved.

8.5. Handheld sets shall be intrinsically safe suitable for Hazardous area application (Zone 1, Group IIA/IIB, T3). Hand held equipment shall be provided with good quality carrying case & water resistance covers and associated accessories. A handset/ telephone shall be connected at each of the base stations. Handheld mobile shall have rechargeable batteries.

8.6. It shall be possible to have two-way semi-duplex communication between handset with handset, handset with any of the extensions of the intercom system and vice versa. The wireless communication system shall also announce paging messages through the paging speakers.

8.7. It shall be possible to have communication from the VHF sets & base stations to outside P & T lines.

8.8. The VHF system shall be provided for area coverage of 1 KM from base station to Handsets and 1 Km from handset to handset. Any number of repeater station required to meet the area coverage is included in scope of the bidder and shall be provided without any cost implication to IGGL/ MECON.

8.9. Bidder has to submit VHF area coverage study along with VHF technical document.

8.10. Intrinsically safe type Walkie Talkie sets with dialling facilities (with batteries & charger unit) - Supply of Intrinsically Safe (I S) VHF hand held sets with DTMF key pad suitable for integration with the Plant PA system & outside Telephone (BSNL/ Mobile) network through Central Exchange with all the user friendly features.

8.11. Spare Batteries for above handsets - Supply of spare battery with charger unit for the VHF hand held sets supplied for above batteries.

8.12. All necessary arrangement & formalities, (including all communication with the service provider, etc) to provide the end solution shall be Bidders responsibility. Owner's responsibility shall be limited to issue of necessary request letters seeking permission, as required.

9.0 Explosion Proof PTZ Camera with in-built IR–

9.1. Explosion proof PTZ camera is required at the compressor station for monitoring. The Explosion proof PTZ camera with in-built IR as per the specification shall be provided along with all accessories, licenses etc as required. The camera shall be provided by the bidder and shall be handed over to other contractor for installation and integration. However, bidder shall provide all the support required for

installation and integration of the supplied explosion proof cameras along with necessary licenses in the camera as required for integration.

9.2. The quantity of the camera shall be provided inside each compressor shed so as cover the entire area inside the compressor shed of each compressor. The coverage study along with drawing shall be provided by the bidder for approval.

10.0 Specification of PA Communication System (PACS), VHF based Walkie-talkie system , Explosion Proof PTZ camera

10.1. ENVIRONMENTAL SPECIFICATIONS

All equipment shall be capable of maintaining the guaranteed performance with operational lifetime of 10 years minimum when operating continuously under the following environmental conditions:

1.	Temperature	Operate: (Except EPABX, Test Instruments Ethernet Tester, IT hardware) : 0^0C to + 40^0 C (guaranteed) & up to + 55^0 C (degraded)
2.	Humidity	At any relative humidity up to 95% within the temperature range of 0 ^{0}C to 40^0 C
3.	Altitude	At any altitude up to 2000m above sea level.
4.	Sand and Dust	The housing to be supplied along with the equipment should be in such a way that entry for dust, insect / rodent is totally prohibited.
5.	Tropicalisation	Shall be fully tropicalised with all cards & conformal coated with lacquer.
6.	Shock and vibration	Shall withstand transportation and handling by air, sea and road under packed conditions.

7.	Salt, fog and mould	Shall withstand continuous usages in Marine growth environment.
8.	Electromagnetic	Shall meet the requirements as per IEC Compatibility-801.

10.2. General Design Criteria:

i. Generally, all hardware, software and firmware upgrades required within the designated periods shall be supported without the requirement for a complete
ii. overhaul or upgrade for any of the telecommunications equipment. The design of the systems and subcomponents shall facilitate upgrades to the hardware and software to ensure that the systems continue to be operational throughout their planned service life.

iii. All equipment shall be considered against any End of Life (EoL) notices issued by the Vendor / Manufacturer. All associated end of service, end of support and end of spares notices shall also be considered when determining the maximum design life of the equipment. Industry standard practice shall be followed as far as is practicable. This shall apply to equipment sizes, mounting methods, electrical and optical interfaces, terminations, cable entries and all other relevant criteria.
iv. All equipment shall be new and selected from its manufacturer's standard product line. Specially modified or adapted equipment and/or modules shall not be used. Similarly, bespoke equipment and software shall be avoided unless specifically requested by Owner.

10.3. Material Selection:

All materials shall be as detailed in this specification and other reference documents and standards mentioned in this document. All materials shall be new and free of defects and identifiable against their certification. All outdoor equipment shall be of industrial grade suitable to work minimum up to 55 Deg.

10.4. DESIGN GUIDELINES FOR TELECOMUNICATION EQUIPMENTS:

1. The system design shall be flexible enough to meet future expansion program up to the maximum capacity of each system and sub-system without deteriorating the performance of the system.

2. In general, specifications provided throughout this document shall apply. In case of conflict more stringent specifications shall override specifications given elsewhere and decision of the Owner/Engineer in all such cases shall be final.

3. Equipments shall conform to the similar housing standards and shall preferably be integrated in one 42U or slim rack or ETSI rack for at stations.

4. The optical and multiplexing equipment should be able to work continuously in non air-conditioned environment (guaranteed performance) under prevailing environmental conditions of the sites.

5. All venting, cooling shall be natural. However, in case of equipment internal forced cooling with suitable dust filters may be used, if required.

6. All equipments shall have sufficient number of alarms and supervisory indications and shall be provided with self-diagnostic facilities. All alarms and monitoring & diagnostic facilities shall be built-in & shall be displayed on the front panel of the equipments for ease of maintenance. It shall be displayed on the front panel of the equipments for ease of maintenance. It shall be possible to transmit these indicators, parameters to the control stations/NMS.

   a. The point shall be available on the front panel for system monitoring and easy fault- location.
   b. The healthy condition of the units shall be displayed by green LED's, unhealthy condition by red LEDs.
   c. All-important switches shall be provided with controls on the front panel with suitable safeguard to avoid accidental operation. Manual changeover should be performed by more than one Sequential operating procedure to avoid accidental operation.

7. The equipments shall be fully based on solid-state technology. The system hardware shall be modular to have flexibility to meet any demand for expansion or modification with minimum changes.

8. All equipments shall be immune to EMI, RFI interferences generated by any nearby source & shall meet the latest international standards in this regard.

9. The equipments shall be capable of functioning with minimum maintenance and shall be preferred to have no requirement of any preventive maintenance.

10. All PCBs used shall be glass epoxy type and shall not chip owing to repeated soldering/de-soldering. The PCBs shall not warp on any account.

11. All wiring-including field interconnection wiring shall be cabled and clamped to the chassis. The wiring shall follow standard color-code. All patch cords shall be provided with connectors matching to the cable used and shall have identification markings.

12. All sub-assemblies or modules, switches and controls and the circuit components shall be so mounted as to permit their replacement without appreciable disturbance to other components.

13. Vendor to specify the power requirement of the offered Telecom system at each telecom station.

14. If the vendor is not using distributed power supply system on individual module basis then the Power Supply cards shall be duplicated (1+1). However, one standalone power supply card shall be able to run the system for its entire lifetime & there shall be sharing of load between the two power supply cards under normal conditions.

15. The vendor shall carryout site survey / inspection as required for design, engineering, installation, integration & commissioning of equipment at site by deploying its competent technical manpower and test/measuring equipment / instruments, tools & tackles. The mentioned site survey & inspection, measurements need to be undertaken following standard test / measurement procedures using calibrated test/measuring equipment / instrument by the vendor

16. The vendor shall be fully responsible for detailed engineering and design of the proposed system. The vendor shall design the network in a scalable fashion so as to support the future bandwidth and service needs.

17. Racks for all the equipment of individual system, sub-system shall be provided from the reputed manufacturers only and they shall adhere to all the quality norms.

18. The equipment construction should be such that it does not allow ingress or entry of rodents, insects, and dust. For this, equipment should be suitably sealed from all sides, top and bottom.

19. All the special tools and tackles, etc. shall be procured and supplied as a package with its carrying cases, accessories (interconnecting cables, connectors, lamps, batteries, fuses etc.) for their respective manufacturer.

20. Termination for all used interfaces shall be provided with 100% spares capacity.

21. All equipment racks, housings shall be provided with antistatic wristbands.

22. Vendor shall be totally responsible for the completion of the project. Owner/Engineer reserves the right to modify, revise and alter the specifications of equipments and systems prior to acceptance of any offer. System requirements may be modified after selection of successful vendor to meet operational requirements not envisaged at the time of selection of Vendor.

23. Owner/Engineer reserves the right to modify the system requirements till such time the system is ready for final acceptance. Vendor shall undertake to meet the revised requirements without any financial implication to the Owner provided to additional equipments of selection as required.

24. In case at the time of implementation there is any change in the network design & configuration to meet the owner's operational requirements, the vendor shall undertake all the activities such as design, manufacturer, supply, Installation, etc. of additional equipment hardware and software for which additional financial implication, if any, shall be approved by the owner on the basis of sufficient details and justifications being provided by the vendor.

25. If during the course of execution of the work any discrepancy or inconsistency, error or omission in any of the provisions of the contract is discovered, the same shall be referred to the Owner/Engineer who shall give his decision in the matter and issue instruction directing the manner in which the work is to be carried out. The decision of the Owner/Engineer shall be final and conclusive and the Vendor shall carry out the work in accordance thereof at no additional cost to HPCL/ MECON.

26. The Vendor to give full documentary proof of satisfactory worked of the system.

27. Equipment Panels shall be free standing and conform to minimum IP 42 requirement. The panels shall have lockable front and rear doors and bottom cable entry and provided with gasket and fitting to keep out moisture, salt, dust, greases and corrosives. The panel shall be naturally cooled also fans shall be provided for ventilation. Panel shall be provided

with anti vibration pad. Necessary positive electrical isolation for earthing shall be considered as per the requirement of Telecom equipments.

28. All doors, drawers, trays and other weight supporting parts shall be fabricated of metal and adequately reinforced to limit vibrations. All components and devices inside the panel shall be well highly and the panel shall have a tidy look.
29. The equipment cabinet (Rittal Make) to be supplied shall be constructed to allow free airflow to dissipate heat generated. Construction shall be such that ventilation grills will not be obstructed when equipment is mounted in its installed position. In order to effectively remove dissipated heat from the cabinets, Min 4 Nos. fans along with vent louvers backed by wire fly screen shall be provided. Vendor shall calculate the heat dissipation and where the calculations prove the necessity, then air flow ventilation shall be assisted by integral low power silent running air extraction fans and same shall be included in vendor's scope. Inlet ventilation grills shall be filled with dust filters.
30. The Vendor shall guarantee satisfactory functioning of the system hardware mounted in the panels even in the event of failure of air-conditioning unit.
31. Hardware mounted and wired panels of all systems included in the scope of the Vendor shall be subjected to burn-in operation for minimum 15 days before dispatch to site.
32. The cabinet shall be made of CRCA sheet enclosures frame minimum thickness shall be 1.5 mm and the cabinet size 2000 mm height x 800 mm width and 800 mm depth and 100 mm base frame. Anti vibration pad & positive isolation for earthing shall be considered. Gland plate thickness shall be 3.0 mm. 20 % minimum two spare hole with locking plug shall be considered.
33. Power supply separate feeder for Cooling fans, panel door switches, space heater, maintenance socket and Tube lights front & rear end shall be provided.

Finish

i. All frame and steel work of the cabinets shall be degreased, then phosphate treated or coated with primer, followed by at least two undercoats
ii. All the cabinets shall have 'Nameplates' and 'Tag Plates' correlating with the type and location of the cabinet at both side front & back. Name Plate shall incorporate the Project Details (Client, PMC, Contractor, Project name etc.) and Tag plate shall incorporate type of panel and station type.
iii. The color shall be RAL 7035 Gray for external and for internal RAL 9001 Pale cream inside the cabinet. (It will be finalized in detailed engineering)

10.5. ENGINEERING REQUIREMENTS

i. The equipment shall be fully solid state and adopt state of the art technology. The equipment shall be compact and in composite construction and light weight. The manufacturer shall furnish the actual dimensions and weight of the equipment.

ii. All connectors shall be reliable and of standard type of ensure failure free operation over long periods and under specified environmental conditions. All connectors and the cable used shall be of low lost type and suitably shielded.

iii. The equipment shall be housed in standard 19" rack, or ETSI rack and with front access. The equipment shall have natural cooling and Fan based cooling arrangement.

- MTBF for fan shall be better than 60,000 hours.

iv. The plug-in units shall be suitable type to allow their removal/insertion while the equipment is in energized condition. The mechanical design and construction of each card/unit shall be inherently robust and rigid under all conditions of operation, adjustment, replacement and storage.

v. Each sub-assembly shall be clearly marked with schematic reference to show its function, so that it is identifiable from the layout diagram in the handbook. Each terminal block and individual tags shall be numbered suitably with clear identification code and shall correspond to the associated wiring drawings.

vi. All controls, switched, indicators, etc. shall be clearly marked to show their circuit diagrams and functions.

10.6. MAINTENANCE REQUIREMENTS

i. Maintenance philosophy is to replace faulty units/subsystems after quick online analysis through monitoring sockets and alarm indications. The actual repair will be undertaken at centralized repair centres. The corrective measures at site shall involve replacement of fault units/subsystems.

ii. The equipment shall have easy access for servicing and maintenance. Extension of degraded paths to test access point for diagnostic work after traffic is switched over to the healthy path should be provided.

iii. Suitable alarms shall be provided for identification of faults in the system and faulty units. Suitable potential free contacts should be provided for extension of summary alarms.

iv. As and when bugs found/determined in the software, the manufacturer will provide patches/firmware replacement if involved free of cost for three years. Modified documentation (hard copies and soft copies) wherever applicable shall also be supplied free of cost. Ratings and types of fuses used are to be indicated by the supplier.

10.7. POWER SUPPLY

i. Any AC to DC or DC to DC or DC to AC converter as required will be in Vendor's scope. Power supply / Converters cards shall be of N+1 configuration.

ii. Nominal power supply is with a variation over the range of 20 %, the equipment shall operate over this range without any degradation in performance. Power shall be provided at one point, further cabling and distribution is in the Vendor's scope.

iii. The power consumption shall be minimal. The actual power consumption has to be furnished by the manufacturer during detailed engineering.

iv. The derived DC voltages in the equipment shall have protection against over voltage, short circuit and overload.

10.8. EQUIPMENT SAFETY AND PROTECTION REQUIREMENTS

i. The equipment shall have a terminal for grounding the rack. Protection against short circuit/open circuit in the accessible points shall be provided.

ii. All switched/controls on front panel shall have suitable safeguards against accidental operations. The equipment shall be adequately safeguarded to prevent entry of dust, insects and lizards.

- OPTICAL SAFETY REQUIREMENTS

iii. All optical interfaces should comply to optical safety standards as mentioned elsewhere in the technical specification.

- OPERATING PERSONNEL SAFETY REQUIREMENTS

iv. The operating personnel should be protected against shock hazards as per IS-8437 (1993) "Guide on the effects of current passing through the human body" (equivalent to IEC publication 479-1-1984).

10.9. ELECTROMAGNETIC COMPATIBILITY (EMC)

i. The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein:

ii. Conducted and Radiated Emissions – To comply with class A [for low capacity (below 34 Mbps data rate)] of C ISPR 22 (1993). "Limits and methods of measurement of radio disturbance characteristics of information Technology Equipment".

iii. All equipment shall be designed to prevent the emission of and susceptibility to Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI). Equipment shall not be unduly affected by emissions from nearby equipment, nor shall the equipment itself produce emissions which would affect other equipment nearby. Emissions shall not initiate unpredictable or undesirable actions or responses, measurement errors, communication faults etc. All equipment shall comply with all local regulations and codes in connection with Electromagnetic Compatibility. All equipment shall conform to the recommendations of IEC 61000.

Electrostatic Discharge

To comply with IEC 1000-4-2 "Testing and measurement techniques of Electrostatic discharge immunity test" under following test levels

- Contact discharge level 2 (+ 4 KV)
- Air Discharge level 3 (+ 8 KV)

Fast transient common mode burst

To comply with IEC 100-4-4 "Testing and measurement techniques of electrical fast transient/burst immunity test" under level 2 (1 KV for DC power lines: 1 KV for signal control lines)

Immunity

IEC 1000-4-3 "Radiated RF electromagnetic field immunity test" Under Test level 2(Test field strength of 3 V/m)

Surges Common and differential mode

To comply with IEC-4-6 "Immunity to conducted disturbances" indicated by radio frequency field."

10.10. EARTHING SYSTEM

i. Earthpit shall be constructed for telecom system by bidder as per requirement and is included in the scope.

ii. The Bidder shall ensure that all requirements for system earth and earth bonding are considered and included in the system cabinets. Bidder's earthing arrangement in cabinets should be in accordance with electrical standards. Each cabinet shall be provided with earth bus bars with their frames. All lugs/strips shall be properly secured to the electrical earthing bus with an earthing wire of suitable size. All system grounds of various cards and equipment's, shields of instrument cables shall be connected to system ground bus which is electrically isolated from the AC mains earthing bus.

iii. All doors, swing frame and removable cabinets shall be provided with earth studs, which shall be strapped to the main frame using flexible braided copper wire. Screens for cables from other control cabinets shall be connected in the system. Screens for inter system cables shall be connected at one end only. Each cabinet, marshalling unit, local panel or junction box shall have a separate earth bar or 10mm earthing stud. Instrument/Clean Earth-Cable screens shall be run continuously from each instrument through the junction box to the telecom earth bus bar in the centrally mounted telecom equipment room. The screen shall be earthed at the equipment room only and tied back and insulated at the instrument device. Each telecom earth bar must be insulated from steel or any other earth system. All field instruments / junction boxes shall be bonded to earth using 2.5mm² minimum conductor size earth cables. The cable shall be terminated to an external earth stud on the field device and terminated to the nearest structural steel member with a suitable nut and bolt arrangement. Earth cable insulation shall be coloured green / yellow.

iv. Shielded copper wires shall be provided for earthing system.

v. Bidder shall provide 48V DC and 240V AC earthing in separate bus bars in cabinet for cabinet requiring both 48V DC and 240V AC. AC and DC earthing isolation shall be done in such cabinets.

- Standard: IS 3043-1966 or equivalent BIS & IEC standard
- The earthing material to be used shall be Electrolytic Copper having the material specifications confirming to the IS standards.
- The dimension of the Earthing strip, which shall be connected between Earth pit & the equipment or the earthing distributor, shall not be less than 25 mm X 5 mm
- The earthing pit should have water-pouring facility.
- Earthing resistance should be less than 2 ohms or should be suitable for the equipment to which the earthing is extended.

Approval shall be taken for all drawings and the distributions up to equipment as per the directions of Engineers In charge.

10.11. PUBLIC ADDRESS / LOUD SPEAKER COMMUNICATION SYSTEM (PACS system)

I. GENERAL

The description given below is for the main system units/ components and may not cover all. The tenderer shall take responsibility for the completeness of the system and furnish the details of the units not covered here, along with the offer. All the Switching/ Control units of this system are proposed to be located in the Control Panel room of the Security Gate Complex or main control room (Terminal area)

II. CENTRAL SWITCHING UNIT AND CONTROLLER

This is the most important and critical unit for the system. The unit shall consist of two sub-units namely the Switching unit and Multifunction digital controller.

III. SWITCHING UNIT

This shall employ a microprocessor based digital PCM-TDM, Fully non-blocking switching to provide a physical path between the caller and called party under the instructions from the various calling party. The switch shall provide at least 48 ports to meet the present requirement. It shall also contain its own power supply unit working from normal single-phase mains.

IV. MULTIFUNCTION DIGITAL CONTROLLER:

This is a multi-function controller and shall facilitate various functions and cater to the specific requirements like interfacing with client's IP EPABX, Zone formation, Tone generation, Paging message routing, Barge-in facility etc. Signals for the performance of the various functions are generated and routed in accordance with the requirements.

The following facilities shall be provided in this unit:

i. COMMUNICATION FACILITIES:	
Number of External or trunk lines	Min. 4 Nos
Number of ports for Subscribers/ Field stations	Minimum 48.
Communication feasibility between field stations	100%
ii. SIGNALS/ TONES GENERATED	
Signals/ Tones Generated	Siren Signal, Chime or Alert Tone, Busy tone, Dial tone, Error tone etc. It shall be able to announce pre recorded messages also, the messages will be made available during commissioning stage. There shall be no limit in voice messages.
iii. CONTROLS	
Controls	Mains ON/OFF switch with Fuse Protection
iv. INDICATIONS (LED):	
LED Indications	Power ON status, Trunk line ON status
v. OTHER FEATURES:	
a. Zone formation facility (User programmable).	
b. Paging Message routing for Individual zone, Multiple zones or All zones	
c. Interrupt or Barge-in facility	
d. Interfacing the music source for paging the same into selected/ all zones	

The housing for the unit shall be 19 inch Rack mountable and constructed of Powder Coated Anodised Aluminium of 1.6 mm minimum thickness. The unit shall operate from 240V +/- 10%, 50 +/- 5%Hz, Single phase AC.

V. MASTER CONTROL STATION

The master control station shall be designed to facilitate both private and public communication i.e. telephonic conversation and paging announcements, from a centralized location, in the Plant. The station, supplemented by the multifunction

digital controller shall carry out the various functions, with the operation of specific function keys.

Various components of the unit are –

i. Handset with 2 meter coiled chord.
ii. Key Pad with 12 push button keys (0 thru 9, # & * keys), Display with 2 rows of 16 character LCD for Caller /called party identification, Zone indication and Function display.
iii. Dynamic Gooseneck microphone for Paging in hands-free mode.
iv. 2 watt built-in speaker for hands-free mode.
v. Line/ Page amplifier
vi. 1 watt (minimum) loud speaker
vii. The master control station shall have an Ethernet communication interface with the central exchange.
viii. The PAGA system shall have modbus facility for interfacing with PLC system, RTU, FAP, etc over modbus and ethernet simultaneously for read and write. Redundancy shall be available on different communication cards. Ethernet connections shall be available for communication both read and write to third party devices and for configuration.
ix. Selector switch for hands-free mode of operation.
x. Function switches/ KEYS for special functions like Memory Dialing (MEM), Call Acknowledge (ACK), Redial (RDL), Calls hold, Release (REL), Call Transfer (TRF), Answer (ANS), Interrupt/Barge-in
xi. Indications (LED) for System Status ON/OFF, Zone busy/ free, Trunk Line Status etc.
xii. For Page functions, a common Page switch with various other combination switches shall be provided. The page switch in combination with one more function switch corresponding to different functions shall activate various functions like Initiate siren, Terminate Siren, Zone Selection, All Zone selection etc. The Page switch and all other related switches should be placed in a group.
xiii. All Functions Keys shall be Illuminated keys.
xiv. All Terminations shall be through Connectors mounted at rear side.
xv. The unit shall be desk-top type, surface mountable, made of min. 1.6 mm thick powder coated Anodised Aluminium, working on 240 V, Single phase AC.
xvi. The microphone assembly shall comprise of microphone, suitable gooseneck desk stand with press - to – talk switch with minimum 10-meter long flexible cable and connectors. The microphone shall be of robust construction, unidirectional type, matching with the amplifier, immune to stray magnetic fields and with noise cancelling characteristics. It shall have a frequency response covering frequency range of amplifier and noise free true reproduction of human speech shall be possible with the microphones.

VI. FIELD STATION

The field station (also called handset station) is intended for use in the plant at various locations, both indoor and outdoor, covered under the Plant communication system.

These stations have limited features.

a) The field stations shall be designed to suit Wall/column mounting or Desk/Table mounting as per requirement.
b) The Desk/Table top type model is to be designed for mounting inside rooms /buildings either partially or fully protected from an environment of heat, humidity and ingress of water & dust.
c) The wall/Column mounted model is to be suitable for mounting both inside and outside buildings with exposure to harsh environmental conditions prevailing in a Plant of this nature and therefore shall be suitably designed. Wherever a field station is to receive the page calls only and not required to talk back, the station shall be provided with only a loudspeaker and the amplifying unit.

The minimum facilities to be provided in a Field station shall be:

i. COMMUNICATION FACILITY:	
Hand set	With noise cancelling microphone (Or Built-in Mic and Speaker in case of Pilfer-proof station)
Key Pad	With 4x3 Matrix numerals, 0 thru 9
Display	LCD display for alphanumeric user-friendly message during call initiation, call recognition etc
ii. INDICATIONS LED:	
Station Status	Busy
Ringer Status	Ringer ON
iii. OTHER FEATURES:	
Pre and Line Amplifier	Built-in
Power Amplifier	Built-in, 20W
iv. CONSTRUCTION FEATURES:	
Type	Box
Material	LM-6, Minimum 3mm thick
Finish	MATT.
Paint Colour	Shade 692, as per IS-5 with epoxy coating

Protection class	IP-65 for Wall Mounting station. IP-54 for Desk Mounting station
Power supplies requirements	240V, single-phase 50Hz. AC supply

FLAME PROOF FIELD STATION:

The flameproof station is to be designed for use in hazardous locations inside plant. They shall be suitable for Wall/column mounting and designed for both indoor and outdoor applications. All outdoor field call stations shall be provided with canopy.

In addition to the features for normal FCS as described above the station shall be suitable for the following -

Area Classification - Div./Zone- 1, GAS GROUPS IIa and IIb Indoor/ Outdoor
Class of Protection - IP 65 min.

VII. AMPLIFIER SPECIFICATION: (FOR MASTER AND FIELD STATIONS)

I. LINE AMPLIFIER:

Input sensitivity	5mV rms. At 1 kHz
Output sensitivity	4V rms. At 600Ohms line transmission
Mode of operation	Balanced At 600Ohms line transmission
Signal to noise ratio	60dB
Frequency response	200Hz –10000Hz (+/-3dB)
Total harmonic distortion	Less than 1% at full load
No signal current drawn in	Approx. 30mA
Maximum current drawn at full	210mA.

Digital power amplifiers shall be provided for driving the speakers in the field and indoor locations. Each amplifier shall not be loaded with more than 80% of its rated power. The amplifiers shall be protected in N+1 configuration.

The zone selection module shall be provided to distribute the amplifier power to different selectively addressable zones / loudspeaker groups.
The exchange shall also house all-call module, alarm tone generator module, line interface cards and amplifiers etc.

The offered system shall be flexible and modular in construction with the possibility of expanding to a bigger system in the future. The construction of the panel shall be designed to allow for at least 25% expansion for future additions without involving any major modifications in the system.

The central exchange shall have built-in fault diagnostic unit using test and monitoring modules. It shall be possible to locate faults by visual signalling and monitoring by means of test plugs from the central cabinet.

All hardware necessary for fault isolation and troubleshooting shall be supplied as a part of the exchange.

POWER AMPLIFIER:

Input sensitivity	1V rms. At 1 kHz
Operating Voltage	240 V AC, matching transformer for 70V , 110V
Input Impedance	10K Ohms balanced
Output power	250/500 Watt continuous power per output
Signal to noise ratio	> 80dB
Frequency response	200Hz –10000Hz (+/-3dB)
Total harmonic distortion	Less than 1% at full load
Controls	Tone and Volume
No signal current drawn in	Approx. 25mA
Maximum current drawn at full	Approx. 850mA

B. HANDSET SPECIFICATION:

TRANSMITTER:	
Type	Dynamic with noise canceling.
Impedance at 1k Hz	300 Ohms
Sensitivity at 1k Hz	56dB
Frequency Response	200Hz-7000Hz(+/-3dB)
RECEIVER:	
Type	Dynamic with noise cancelling
Impedance at 1kHz	300 Ohms
Sound level at 1 kHz	24+/-4dB
Length of coil cord	2 meter- coiled (ABS plastic)

VIII. LOUD SPEAKERS:

The loud speakers shall be designed to cater to the needs of audibility of announcement in a plant. Depending on the ambient noise and sound output

requirement the speakers shall be either cone type or horn type. The Cone type speaker shall cater to enclosed space like control rooms, office rooms etc, while the Horn type speakers caters to open space like Plant buildings/ locations. The horn type speakers shall provide output, which is 6dB above the surrounding industrial noise of approximately 80 dB. Control rooms with false ceiling shall be provided with 'Ceiling mounted speakers', which shall be flushed with the ceiling. The speakers shall be complete with mounting brackets and accessories.

Explosion/ Flameproof Loudspeakers shall be provided in specified locations and wherever explosion proof FCS have been provided.

The applicable details of each type are given below:

Construction Material for Cone speaker	Aesthetically designed wooden cabinet
Construction Material for Horn speaker	LM-6, min.3 mm thick
Construction Material for Flame proof speaker, Driver unit housing	LM-6, min 3 mm thick
Finish	MATT.
Mounting	Wall/Column

IX. OTHER SPEAKERS -

A. CONE TYPE SPEAKER:

These shall be permanent magnet, cone type speaker with 6 watts power, line matching transformer housed in sturdy wooden enclosure suitable for wall mounting and generally shall be used indoor premises like Control rooms, Electrical rooms etc. The speaker shall be provided with volume level adjustment with a selector switch. The cabinet shall have grilled metal faceplate to diffuse high frequencies and prevent damage to the speaker. Housing shall be treated with acoustic under-coats to prevent resonance.

Technical parameters for these units shall be as follows:

Output power	RMS-6W
Voice coil impedance	1kHz, 8 ohms
Frequency response	200Hz – 10000Hz, +/-3dB
Volume control	To be provided
Protection-class	IP-54

B. CEILING MOUNT SPEAKER:

Power Min Max	 3 W 6 W
Frequency Response	100 Hz to 8000 Hz
	Loop In/Loop Out Terminals
Type	Indoor
Mounting	Ceiling
Impedance	8 Ohms
SPL at 1 kHz	93 dB
Weight	150 g.
LMT	Optional
Size	260 mm. Dia (typical)
Material	FRP

Indoor Ceiling Loudspeaker
It shall be false ceiling mount models complete with white grilles, fire dome type, selectable tapping and equipped with a line transformer.

Ceiling speakers shall be provided with necessary support for installing in false ceiling. Bidder shall select ceiling speaker to ensure that the weight and mounting arrangements of offered ceiling speaker shall be within the weight bearing properties of false ceiling material.

Indoor Wall Mount Loudspeaker
Power: 10W
It shall be wall mount models complete with selectable tapping and equipped with a line transformer. Indoor wall mount loudspeakers shall have loop in / loop out terminals. Junction box shall be provided by the bidder if the same is required at field.
• SPL 1W/1m: 87 dB
• SPL rated power: 95 dB
• Tapping: 10W/5W/2.5W

C. HORN-TYPE SPEAKER:

They shall be of power rating 20 Watts complete with driver units, impedance matching transformers, weather canopies, mounting brackets suitable for wall /column mounting and other accessories, suitable for outdoor use normally in Factory shop floors, Gantries, Open areas etc. These shall be designed to have uniform sensitivity, high efficiency and shall provide crisp clear speech reproduction. The mounting bracket shall be with adjustable base, suitable for vertical and horizontal mounting. Firm fixing arrangement with spring/ washers

shall be provided. These speakers shall be weatherproof conforming to IP 65-protection class. **Explosion proof/ Intrinsically safe units shall also be provided wherever specified.**

Technical parameters for these speakers shall be as follows:

Output power	RMS 20W
Voice coil impedance	1kHz, 8 ohms
Frequency response	200Hz – 10000Hz, +/-3dB
Protection-class	IP-65
	• GRP Material • SPL 1W/1m: 106 dB. • SPL rated power: 119 dB +/- 3 dB. • Power tapping's, via integral transformer Vendor to note that loudspeakers and junction box installed in hazardous area shall be Zone-1, IIA/IIB, T3 and Ex"d" certified

X. STATION JUNCTION BOX

Power Supply	
Input	240V +/-10% AC 50Hz Single Phase
Output	To house conversion equipment for AC, DC as per requirement
Protection	MCB in incoming side and Fuses in outgoing side
Controls	ON/OFF Toggle switch
Arrangement for earthing	To be provided
Terminations	For AC/ DC Power supply, GND, PAGE, PVT, Call MCS etc.
Construction Material	LM-6, 4mm Thickness
Finish	MATT
Colour	Shade –692 as per IS-5
Mounting	Wall/Column
Cable entry	Provision for entry from top and bottom
	junction box installed in hazardous area shall be Zone-1, IIA/IIB, T6 and Ex"d" certified

XI. LOUDSPEAKER JUNCTION BOX

Connector	Screw type
Cable Entry	From bottom to top through glands
Construction Material	LM-6, 4mm thick
Colour	Shade 692 as per IS-5
Protection	IP-65
	junction box installed in hazardous area shall be Zone-1, IIA/IIB, T6 and Ex"d" certified

XII. PROGRAMMING UNIT:

A PC based programming unit shall be provided along with all necessary hardware and software to facilitate programming of all user functions including the communication chart at site. One set of original software in CDs /DVDs/removable media shall be also provided by the vendor which shall be handed over to Client after commissioning of plant communication system.
The specifications of the PC shall be as follows-

Sr. No	Parameter	Minimum Requirement	Compliance /details	Remarks/ Comments
1	**Make**			
2	**Model**			
3	**Processor**	Intel latest Core-i9 processor , cores >=4, 64 bit, clock>=2.3 GHz, Turbo-boost, memory controller supporting DDR-4 2400 MHz or higher, minimum 2 memory channels, built-in graphics capable of supporting minimum resolution of 1920x1080p, 32bit colour resolution		
4	**Motherboard**	OEM Motherboard		
5	**Memory**	8 GB DDR4-2400 RAM expandable upto 16 GB		
6	**Hard Disk Drive & controller**	1 TB SATA. Support for RAID 0 & 1		
7	**Optical Drive**	Super Multi DVD writer, Min 16x		
8	**Graphics**	Integrated Intel Graphics		
9	**Audio**	Integrated Realtek HD ALC221		
10	**Ethernet**	Intel X540-T2 1 GbE Dual Port Adapter		
11	**Slots**	Total : 4 (1) low profile PCI slot, (1) low profile PCI Express x1 slot, (2) low profile PCI Express x16		

		slots		
12	**Ports and Connectors**	**Front I/O:** (4) USB 3.0, headphone and microphone **Rear I/O:** (4) USB 3.0 (2) USB 2.0, (2) PS/2, (2) RJ-45, (1) VGA port,(1) DVI Port, (1) Display Port, (1) audio in, (1) audio out, (1) HDMI		
13	**Form Factor**	Tower		
14	**Monitor**	32 " Color with minimum FHD (1920 x 1080 @ 60 Hz) resolution. Input connector (1 VGA & 1 DVI)		
15	**Keyboard**	Wireless keyboard		
16	**Mouse**	Wireless 2 Button Scroll Mouse		
17	**Software**	Latest Windows Operating System , Latest Microsoft office Suite , Anti Virus, Latest Adobe Acrobat Pro, PA system software		
18	**Operating System**	Latest Windows operating system compatible with NMS software		
19	**Recovery Tool**	Restore CD		
20	**Drivers for different Operating systems**	Drivers should be freely available on OEM's web site		

XIII. SYSTEM FEATURES AND MODE OF OPERATION FOR PLANT COMMUNICATION:

i. The purpose of this system is to provide quick and efficient communication through paging/ private mode and emergency communication to the operating personnel at various locations.

ii. The system shall be designed to provide two-way page/ private communication and based on “distributed amplifier “ principle with signal amplification at each subscriber location so that the communication process is not affected with shut down of any particular station. The announcement shall be carried out in two modes namely ‘Page’ and ‘Private’. In page mode the announcement is

made into loudspeakers of all zones or selected zone(s) for broadcasting an important/ emergency message. This mode is also used for inviting attention of any particular field station in a zone and requesting him to call back/ respond. The called party then comes to his FCS and converts the conversation into private mode by activating page/ private mode switch and continues the conversation using his handset just like a telephone. Once the private mode operation starts all the speakers of the zone(s) are free to receive the next page call. The total area of operation shall be divided into smaller zones by grouping the subscribers as per the functional requirement.

iii. It shall have the following paging and communication facilities-

a) Call back from any of the field call stations to the master control station(s).
b) Muting facility for silencing the loudspeaker connected to the booster amplifier.
c) Conference call between multiple field call stations at the discretion of the master call station.
d) Initiation of call from any of the field calls stations to master control station.
e) Monitoring the health of the system.
f) Operating an alarm call from master control station(s) over all the loudspeakers during an emergency (An alarm).
g) Speakers may be muted during general pages, but not muted when alarms are initiated, allowing alarm broadcasts to be heard throughout the system.
• Where more than one master control station has been specified, priority communication between the master control stations shall be possible.
• The paging shall be hooked up with the fire and gas detection system
The system shall provide the facility for monitoring speakers and speaker loop status.

Following types of communication shall be possible in the system by selection and suitable programming –

a) Master control station (MCS) to any Field control station (FCS) in any zone and vice-versa.
b) MCS to any one zone, multiple zones or all zones in page mode
c) Paging shall be done from Master Control Station located in the control room.
d) FCS to FCS in same zone
e) FCS to FCS in different zone through MCS
f) Selected FCS(s) to any or all zones in page mode
g) Selected FCS(s) to any FCS without routing through MCS
h) The communication chart shall be prepared after consultation with client and completely user programmable at site. All necessary hardware, software and programming instructions shall be included in supply, so as to facilitate any

change of the communication chart by the client in future without help of the equipment supplier.

i) All page announcements shall be preceded by an alert tone of Apprx. 20-second duration for call attention of the working personnel in the area.

j) The system shall also have additional facility to interface auto announcement module during emergencies like fire, explosion etc. This module shall have top most priority for relaying pre-recorded messages to all the speakers. Facility for making such announcements shall be given only at the MCS and a few no. of FCS through programming.

XIV. FAULT INDICATION AND DIAGONOSIS:

Any failure of any of the main system units like Switching unit, MFDC, MCS shall be annunciated through Audio-Visual means at the location of the Main panel/ Programming console.

XV. PRE TIMED AND RECORDED TONES AND MESSAGES:

The system shall be programmed to announce messages at a pre-determined time or for sirens or 'end of shift' signals to be triggered at fixed times as per site requirement.

The Integral Microprocessor controller shall automatically balance call requirement by employing a call priority algorithm, which shall have a signal hierarchy, this means that signals (calls, messages or alarms) with a higher priority can interrupt and override those of less priority/ importance and lower priority signals can not interrupt or override those of higher priority.

XVI. LOCAL LS MUTE:

While making a page announcement, the loud speaker of the announcing station shall automatically get muted to eliminate the acoustic feedback.

Other facilities of the system shall be –

- It shall have provision to take analog inputs from the telephone network so as to be able to page into the specified areas from designated telephones, anywhere in the telephone network.
- The system shall be 100% expandable with addition of FCS only.
- The system shall directly take an input from the Fire alarm system and shall be able to trigger the appropriate pre recorded voice emergency message to the required areas.

XVII. INTERFACE BETWEEN PLANT COMMN. SYSTEM AND THE EPABX:

The central page controller shall have an interface with the local EPBX using a number of extension / junction lines. Specified telephones through programming of COS in the EPBX shall have access to dial on to the page controller and make announcement in the required zone(s).

Field Station Interface
PAGA System shall be equipped with interface for min 10 nos. of field intercom station.

Interfacing with Other Systems
PAGA System shall have interface with the following systems:
• Fire & Gas detection System - Hardwired (Potential free Contact)
• EPABX System- SIP protocol
• VHF Radio
• Station PLC Hardwired (Potential free Contact)

XVIII. POWER SUPPLY:

Provision is being made for one no. of feeder of 240 V, 50 Hz. Single ph. AC of suitable rating at a single location i.e. UPS DB at the Control Room in Admn Building. The same shall be used for both Telephone Exchange as well as Plant communication System. Requirement of power for all main and sub units shall be met from this location by use of proper distribution and cabling. For this purpose, all necessary distribution boards, sockets (including explosion proof sockets/ JBs wherever required) hardware, cabling, termination etc. beyond the outgoing terminals of the UPS DB, shall be considered by the tenderer in his scope.

10.12. VHF Based Walkie-Talkie COMMUNICATION SYSTEM:

I. For facilitating ease in operation and maintenance, hand-held VHF Sets (exp proof Walkie-Talkie) are envisaged in Terminal. The sets shall be complete with Rechargeable battery set, Battery charger with detachable Power chord, Set cover and other required accessories. Bidder's scope shall include the responsibilities for obtaining the allotment of three frequencies from the statutory allotment authorities. For this, all necessary liasoning work shall be in the bidder scope. All the cost

related to same is included in bidder's scope. The coverage area of the system shall be complete boundary limit of the terminal as covered in suggestive telecom drawing. The system design & approval as per the requirement of statutory requirements is in bidder's scope.

II. VHF Radio system shall be designed for frequency range of 136 – 174MHz. VHF Radio system Handsets with 1 channels configured based on frequencies allotted from relevant government authorities. The use of these channels shall be for Communications within Plant Area of compressor station.

III. Handheld radio sets used shall be Intrinsically Safe (IS) sets suitable for Area Classification Zone 1 IIA/IIB T3 and certified by PESO. Each VHF hand set shall be provided with dedicated single unit charger.VHF radio antennas shall be supplied and installed at suitable heights to obtain the required 2 Km operation range. The offered Radio equipment shall be based on recent ITU-R and technology standards

IV. **Fixed Radio**

i. Fixed radio shall be installed in the Control Room of Control Building The radios are provided with end-to-end encryption capabilities and operate 136-174 MHz VHF frequency band for voice. The radios shall be supplied with associated antenna and mounting pole, power supply, bracket for console mounting and external microphone and speaker. Fixed Radio shall operate on 240V AC, 50 Hz Power supply.

V. The handheld radio shall have a wide band operation capability to cover the entire frequency range from 136 MHz to 174 MHz. The hand-held VHF radios shall be rugged and approved for both the ATEX and IEC Ex standards, intrinsically safe for use in hazardous areas suitable for Area Classification Zone 1 IIA/IIB T3 and certified by ATEX.

VI. The VHF system shall be provided with portable radio (handheld) programmed with the frequencies allotted & allocated for VHF communications. All handheld shall be intrinsically safe as specified by IEC 60079-14 and shall be certified by CCoE / PESO (Mandatory).

VII. Handheld units shall be splash proof, having an enclosure protection IP 65 as minimum. 6-way multiple charging unit shall be provided at the location where handheld is kept, and the battery chargers should be capable of rapid charging. Accessories like leather case with belt, belt hooking clip, antenna, charger etc. shall be supplied along with each handheld radio set.

VIII. Handset shall have mini- mum 14-character alpha numeric LCD display & keypad. Handheld units shall have operating temperature 0 to 50 Degree.

IX. Handset shall have switch-able RF power level to optimize coverage to conserve battery consumption. Battery charger with proper adapter suitable for 240 V AC, 50 Hz shall be supplied with each hand- held radio. Intrinsically safe batteries shall be provided and shall have minimum 12 hrs backup.

X. The offered Radio equipment shall have the following features:

1. Display
2. Self-diagnostics
3. Group call
4. Selective programmable call
5. General call
6. Scanning

XI. VHF Radio Interface with other System

i. The VHF Radio System shall interface with the EPABX system, to facilitate communication between telephone users and radio users. Interface with the telephone system shall allow telephone users to dial specific talk groups within the radio system. The VHF Radio System shall also interface with the PAGA system, to allow a radio user to record a message on a voice recorder in PAGA system.

ii. This message will then be transmitted as a broadcast message over the PAGA system after the radio user stops speech recording.

TECHNICAL DETAILS OF VHF SETS:

A. GENERAL

- Frequency- 136- 174 MHz VHF band or UHF Band (Supplier free to suggest any other band considering the topology details)
- Channel capacity- 64 or better channels.
- power supply: To be provided through rechargeable NiMH batteries (Charger and batteries to be included in the offer)
- Protection class- Min. IP 54, Intrinsically safe.
- Resistance against Shock/Vibration- To confirm MIL std 810 C/D/E and TIA/EIA 603.
- Battery strength indication- Through Tri-colour LED.
- Power level adjustment- Switchable.
- Channel sparing- 12.5/25 KHz, switchable/programmable.
- Signalling- PTT-ID.

Other features-Channel scan, Time-out-Timer, Busy channel lockout.

B. TRANSMITTER

Operating temperature	Maximum 600C
Frequency stability	+/- 0.00025%.
Power	5 W.
FM Hum & Noise	-40dB
Conducted / Radiation emission	-36dBm
Audio response	300-3000Hz
Audio distortion	Less than 3%.

C. RECEIVER

Sensitivity	0.25 micro volt
Inter modulation	70 dB
Adjacent channel selectivity	60 dB @ 12.5 KHz / 70 dB @ 25 KHz
Spurious rejection	70 dB
Rated audio	500 mW
Audio distortion	< 3%.
Hum & Noise	-45dB @ 12.5 KHz, -50 dB @ 50 KHz.
Audio response	300-3000 Hz
Conducted spurious emission	-57 dBm

XII. Bidder shall be responsible for liasioning in arranging operating licenses, including radio frequency licenses, License –in-principle and operating license, for systems and equipment supplied. Bidder shall provide VHF license to add the VHF sets being supplied for new frequency, bidder shall be required to carry out all the works including preparation of application, getting the same approved by Owner, submission of the same to concerned authorities, assist in replying to queries, arrange for inspection/ survey of sites by authorities. Owner will provide administrative support where appropriate in the application by the Bidder for radio frequency licenses and equipment on behalf of Owner.

XIII. Only Annual Frequency charges shall be borne by Owner. All statutory regulations shall be fulfilled before start of installation of system. Licenses shall be in favor of Owner from statutory authority for all VHF units covered under the supply scope. The wireless systems shall be designed to cater for future additions of units and licensing from statutory authority for additional sets.

XIV. Liasioning services shall be provided for obtaining additional frequencies & operating license for additional channels in favor of Owner from statutory authority for VHF units. Bidder to indicate fee charges required for frequency allocation of

single channel & its license. Bidder shall also indicate their government liaison charges for above services. Bidder to consider all liasioning charges including application charges in their bid, no additional payment shall be provided for the same.

XV. Vendor should carry out necessary liasioning for obtaining the "Decision to grant of License & Operating License" from the Wireless Planning Coordination Committee (WPC), Ministry of Communications-New Delhi. Entire Scope of Job is divided into five (5) steps in sequence:

Step 1:
Successful bidder has to submit the application for new license for new VHF Handsets & Base Stations, Repeater station (if any). Acknowledgement of application has to be submitted to IGGL.
Step 2:
Vendor has to co-ordinate with WPC for processing the application and for generation of demand note (Letter of Intent-LOI) by WPC. Demand note to be submitted to IGGL.
Step 3:
After getting the demand draft for amount mentioned in demand note from IGGL, Vendor has to submit the demand draft to WPC. Necessary co-ordination to be made by vendor for timely getting the Letter of Agreement (LOA) to IGGL.
Step 4:
After getting the LOA vendor has to supply VHF Handsets & Base Stations to IGGL to carry out necessary programming of VHF handsets & Base Stations. Post supply of VHF handsets & Base Stations, Vendor has to submit Invoice, Dealer Possession License (DPL), Covering letter to WPC.
Step 5:
Vendor has to ensure the processing of above-mentioned documents (mentioned in step 4) and to carry out necessary co-ordination with WPC officials for getting the original license.

Note: Time period for Step 2 onwards will be started from the date WPC has started processing the applications. The date mentioned in WPC circular will be taken as staring date. Entire process from Step 2 to Step 5 has to be completed in Sixteen Weeks from the date mentioned in WPC circular.

Machine Monitoring System Overview

1.0 Primary protection devices shall be included within the condition monitoring system wherever possible, avoiding any duplication.

2.0 The compressor/ prime mover package shall be equipped with a condition monitoring system designed to assist the PURCHASER in assessing and improving the operation of the machinery assets. These condition monitoring requirements shall not compromise or interfere with the operation of the primary machine protection systems.

3.0 Specific Technical Requirements

i. The system shall be designed to ensure the reliability and integrity of the data. The failure of part of the system shall not jeopardize the function of any other components in the system.

4.0 All field sensor inputs shall be continuously monitored and connected to dedicated input processing hardware.

5.0 Continuous, local display of each incoming signal shall be available. The monitoring equipment shall comply with all aspects of API 670. Any field sensor inputs from hazardous areas shall be via IS Isolators such as MTL 4000 series or equivalent.

6.0 In order to optimize the system performance during heavily loaded periods, e.g. machine starts, it is preferred that the majority of data processing should be performed by local processors and data then made available to the Plant Control System.

7.0 All data shall be available to the Plant Control System or SCADA system via MODBUS TCP/IP communication interface.

8.0 Machine Monitor Requirements

A. The radial vibration, axial position, key phasor, accelerometer or velometer and temperature monitors should comply with the following:

i. Vibration instruments shall be interfaced with dedicated vibration monitoring system for each compressor
ii. Key phasor shall be interfaced with key phasor module of vibration monitoring system for each compressor.
iii. Bearing and winding temperature RTDs shall interfaced with compressor PLC.
iv. Panel mounted surge protection devices shall be supplied.
v. Monitor to be available to accept regulated mains or DC voltage as standard from the rack power supply.
vi. Monitor shall respond to power up inhibit signal.
vii. Monitor shall respond to a trip multiplier signal where appropriate.
viii. Monitors shall be configurable via the engineering station of compressor PLC or remotely via the communication interface;
ix. Provide 2 fully adjustable set points for 0-100% of full scale;
x. 4-20mA recorder outputs (preferred);
xi. Provide an alarm, danger and system OK relay for all channels;
xii. Visual display indicating system OK;
xiii. Visual display indicating signal alarm;
xiv. Visual display indicating an alarm, trip or unhealthy signal;

xv. Redundant power supply units (healthy status of PSUs shall be taken to compressor PLC).
xvi. Redundant communication bus to system monitor for information transfer to Plant Control System or SCADA via serial links.
xvii. Display of the variables being measured. In case of radial vibration and axial position monitors displays should indicate probe gap volts and vibration amplitude for each channel.
xviii. System diagnostics shall include power, monitor, program, probes etc.
xix. Power up inhibit to minimize false alarms due to transient power surge.
xx. Trip multiply function to elevate set points by a factor of two or three to allow for initial high vibration during start-ups.
xxi. Remote reset capability.
xxii. System health, transducer "OK" relay output.
xxiii. Volt free contacts outputs for both vibration and temperature inputs.
xxiv. Intermittent, fleeting or short duration transient spikes should not generate false alarms.
xxv. Phase monitoring must be achievable. These signals should also be made available for triggering purposes in the Vibration monitoring system.
xxvi. The system shall be capable of expansion to incorporate other monitoring features necessary for future pump set.

B. Common rack with dedicated I/O modules for each pump for vibration monitoring shall be considered and same shall be hot-swappable / pluggable type. Temperature monitoring shall be considered in compressor PLC & it shall be segregated compressor wise.

C. Vibration monitoring rack to be installed inside the compressor PLC and display unit shall be mounted on the front side of compressor PLC. Vibration modules shall have BNC connectors for tapping raw vibration data.

D. Compressor PLC (along with Vibration monitoring system) shall be interfaced with Station PLC/ SCADA over hardwired and serial communication link. All the data regarding monitoring/diagnostics shall be shared over redundant MODBUS TCP/IP communication link. All the similar kind of instruments shall be daisy looped.

E. VENDOR shall supply a separate industrial grade engineering work station (with CPU of latest configuration) in cabinet & shall be loaded with graphics package of unlimited tags & software (both works& run time) of compressor PLC. It shall be also loaded with vibration monitoring rack configuration software. Vibration monitoring system diagnostics shall also be taken to compressor PLC system.

F. Vibration Probes

i. Vibration Probe is required for sensing compressor vibration and in case compressor vibration exceeds pre-set level, it should give a signal for tripping of pumping unit. The VENDOR shall provide 2oo2 voting logic to avoid spurious trips.

ii. Vibration sensors (Probes) to be placed for Motor/ engine Drive End, Motor/ engine Non-Drive End, compressor Drive End and compressor Non-Drive End for each compressor.

iii. Key- phasor, Two (2) Number axial displacement probes with voting logic to be provided on the non-driveend side of each compressor. If vibration sensors are eddy current (displacement probes), then two probes (in X & Y directions) shall be provided near each bearing.

G. Temperature Sensors (RTD Type)

i. These sensors shall be installed per bearing, to continuously monitor and provide alarm on rise of each compressor bearing temperatures (both DE & NDE). The VENDOR shall provide 2oo2 voting logic to avoid spurious trips.

ii. RTDs shall be provided at the following places:

- compressor casing, Motor/ engine Drive end (MDE) bearing, Motor/ engine non Drive end (MNDE) bearing, compressor drive end bearing, compressor Non Drive end bearing , compressor Thrust bearing temperature, RTD's for the motor winding temperature (if applicable).

Specification For EXPLOSIVE PROOF PTZ CAMERA

		EXPLOSIVE PROOF PTZ 2 MP CAMERA
S.No.	**Parameter**	
1	Compression	A. The IP Camera shall process and compress video images into digital data files utilizing H.264 or better compression technology.
2	Integration	The camera shall integrate with VMS of the approved makes.
3	Lens	MFZ Lens min range (4.5 to 6.5mm) and maximum range (135 to 140 mm) Motorized Focus 10 X digital Zoom, 30 X optical zoom or better
4	Video Streams	Minimum 3 Compressed streams from the IP Camera; 1st stream- 2 MP at 25 fps 2nd stream- 1080p at 15 fps 3rd stream- vendor to specify
5	Power over Ethernet	Provision shall be there for both PoE as well as without PoE power supply
6	Resolution	2MP Full HD images up to 25 fps
7	Low Light Performance	Camera shall offer Infrared LED illuminators that function to a range of up to 200 meters which can be set to automatic, always on, or always off) ; Day – 0.3lux , Night – 0.01 lux.IR sensor inbuilt or external shall be acceptable to meet the performance
8	Camera Operating System	The IP camera shall utilize an embedded stable OS that resides on onboard non-volatile flash memory. It shall not reside on internal or external Hard Disk Drives. The camera shall not use a standard PC based OS and should not require constant virus or OS patch management for proper security protection
9	Storage and Network Optimisation	The camera shall provide a constant bit rate mode where the bit rate and the quality parameters can be set to perfectly match the storage and network requirements

10	Pickup Device	1/2.8" or better type CCD/CMOS/MOS Sensor
11	Authentication and protection	The camera shall use an Unalterable Image Format to maintain the security and integrity of the digital video files.
12	Communications	Ethernet Port along with programmable capability for static or dynamic (DHCP) IP addressing
13	Protocol Support	The camera shall support the following protocols: TCP/IP, HTTP, UDP, DNS, SMTP, RTP, RTSP, SNMP, IGMP,HTTPS protocols
14	Remote Programming Functions	a. Ability to change the network configuration of the camera, including IP address, gateway and port information, transmission protocols, security protocols and other values pertaining to standard network configuration
		b. Simple video stream viewing and PTZ control via the webclient
		c. Ability to adjust compression levels d. Ability to adjust the frame rate
		e. Ability to adjust traditional CCTV camera settings including:
		i. White balance iii. Contrast
		v. DC auto-iris control vi. Shutter speed
		vii. Exposure time
		f. Network Throttling
		g. Password Management h. Camera title
15	Environmental protection (Housing)	A. Operating Temperature: 0° to 60 ° C
		B. Humidity: 10 to 90% non-condensing.
		C. IP66 Compliance

		Enclosure: Stainless Steel – SS316 or better , Electro polished construction
16	Regulatory and Compliance	A. UL
		B. FCC
		C. CE
		D. PESO, Exd IIC T6 and IP66 or better
17	Effective Pixels	1920*1080(2MP)
18	Scanning System	Progressive Scan
19	Day & Night	TDN (Auto ICR / Color / B/W)
20	Image setting	Brightness,Contrast,Saturation,Sharpness,Anti-flicker,Exposure,White Balance, WDR, BLC,Mirror,Flip,3D NR
21	AGC	On / Off
22	Signal-to-Noise Ratio	More than 50dB
23	Wide Dynamic Range	(Min 120 DB) or better
24	Television System	PAL
25	ONVIF S & G profile compliance	Required
26	Bit Rate	32kbps - 8Mbps continuously adjustment CBR/VBR
27	On-board storage	supportable up to 64 GB SDXC/SD Memory recording
28	Video Compression	H.265
29	Ethernet	10Base-T / 100Base-TX, RJ-45 connector
30	Streaming	Simultaneously multi-profile streaming Controllable frame rate and bandwidth Constant and variable bit rate
31	Users	At least 5 users
32	View Material	Vandalproof (IK-10 or equivalent) with Poly Carbonate
33	Power supply	Vendor to specify.
34	Power Consumption	As per POE standard.
35	Mounting	Shall be pole with stand/wall mounted/ceiling mounted with suitable brackets

36	Surge/Lightening Protection	Required (Internal/External) in compliance with IEC 62305 requirements
37	Security	Authentication, IP Filter, User access log, Digest Authentication, IEEE802.1x
38	SD Card	Mandatory. The camera shall be able to record during an alarm/ event or in case of network failure. constant overwrite or to stop recording when the
		card is full and notify the administrator that the card is full
		It shall be provided with 64 GB SD Card
39	Backlight Compensation	ON/OFF
40	Color, Brightness,Contrast	Functionality Required
41	Electronic Shutter	1/25 to 1 / 10000 s or better
42	Digital Noise Reduction/ 3D noise reduction	ON/OFF
43	Automatic Lens Control	Automatic Iris
44	Focus	Automatic
45	Cooling Fan /Heater	Required
46	Upgrade	Through web browser, online, firmware upgrade
47	Controls	Camera shall be remotely controllable and configurable.
48	Pan/Til and Zoom and speed	Pan – complete 360 Degrees Continuous; Pan speed - minimum 0.1° to 20°/sec variable-speed operation . Tilt +/- 90 degrees with auto flip ;tilt speed- 0.1° to 20°/sec variable-speed operation
49	No of presets	Min. 100 nos. Minimum 2 Programmable tours
50	Hazard Classification	Hazard Classification:Class 1 Group A,B,C,D) Class2 (E,F,G) T6 . Class 1 , Zone 1 , A ,Ex d IIC , IP66 , CCOE

07.00 QUALITY SYSTEM, INSPECTION & TEST OF PLANT & EQUIPMENT AT MANUFACTURER'S PREMISES

07.01 General

Inspection & testing of plant & equipment shall be witnessed by MECON / CLIENT as per approved QAP at the works of successful tenderer during manufacturing and / or on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved drawings, manufacturing drawings and applicable national / international standards.

07.02 Quality System Requirements

The successful tenderer must recognise the importance of quality and follow defined quality programme in all stages of. manufacturing and quality control activities of the product. Contractor must define and implement the tasks and controls that will provide needed assurance, in case manufacturing of product is sub-contracted either partly or fully and/or for the procured components of the product. All bought-out equipment or component shall be procured from preferred vendor list of concerned project.

MECON / CLIENT reserve the right to verify the quality programme of tenderer & its vendors/sub- vendors to assure the effectiveness of the programme to meet the intended and specified quality of the product.

07.03 Quality Assurance Plan (QAP)

07.03.01 The successful tenderer shall furnish Quality Assurance Plan (QAP) for all equipment in respective packages after finalization of billing schedule / equipment identification number for MECON's approval at least one month prior to start of manufacturing in accordance with clause 3.2 and 3.3 of this chapter.

07.03.02 QAP shall be prepared & furnished separately by Contractor in Form Nos. 11.20(DQM)F-09,10,11 Ed.3 Rev 1 (specimen blank enclosed) for structural, mechanical, electrical, instrumentation and refractory items respectively , including major bought-out items. QAPs must be submitted in requisite sets as per contract for approval and shalll be duly stamped and signed by the successful tenderer. Also, column no. 4,5 & 7 of QAP formats are tentative and for reference purpose only. QAP submitted in any format other than those mentioned above will not be accepted.

07.03.03 The successful tenderer shall submit copies of P.O., Sub-P.O., T.S., approved GA drawings/ data sheets & detailed manufacturing drawings(if asked for) as backup reference materials for scrutiny & final approval of QAP by MECON. All billable items as per approved billing schedule of same category (i.e mechanical, electrical, structural, refractory etc) shall preferably be submitted in a single lot, serial wise, to avoid unnecessary delay in the process of QAP Approval.

07.03.04 Inspection and test requirements shall be decided with due consideration of factors like safety, duty cycle, operating conditions, equipment life, environmental conditions, place of installation and statutory regulations, as applicable, for a particular equipment. Any, additional type or special tests or routine tests if found necessary to establish the intended quality after detailed engineering, then same have to be incorporated in the QAP without any commercial implication.

07.03.05 QAPs shall be prepared by the successful tenderer in consultation with their Sub-contractors / Manufacturers to avoid any complicacy later .

07.03.06 Soft copies may be forwarded in advance for intimation. However, hard copies shall be submitted in requisite sets to enable Client/MECON to forward comments if any.

07.03.07 Approval of QAP does not give approval of make. Make shall be as per contract.

07.04 Calibration of Measuring Equipment

07.04.01 All the measuring equipment used for inspection & testing shall be of appropriate accuracy class and shall have valid calibration certificate with traceability to national standards of NPL / NABL accredited laboratories with unbroken chains of comparison. The calibration certificates shall be submitted to MECON/ CLIENT for review prior to inspection.

Calibration certificate shall also indicate reference no. of calibration standards calibrated by NPL / NABL accredited laboratories and copies of such calibration certificates of calibration standards shall be furnished in the compiled dossiers of inspection/test results if asked for.

07.04.02 In case valid calibration certificates are not available, inspection may not be carried out using uncalibrated instruments. Successful tenderer/contractor shall be responsible for any delay due to re-inspection / revisit.

07.05 Test Certificates and Documents

07.05.01 For each of the items/equipments offered for inspection, following test certificates and documents as per approved QAP in requisite copies, duly endorsed by the Manufacturer and successful tenderer/contactor with appropriate linkage to project, purchase order and acceptance criteria etc. shall be submitted to MECON/ CLIENT.

i) Raw materials identification & physical and chemical test certificates for all materials used in manufacture of the equipment.

ii) WPS, PQR & WPQ documents as per applicable code.

iii) Details of stage-wise inspection & rectification records for fabricated items, castings, forgings and machined articles if asked for by MECON/Client.

iv) Control dimension chart with records of alignment, squareness etc.

v) Manufacturer's material and performance/relevant test certificates for all bought-out items.

vi) Details of heat-treatment and stress relieving charts as per specification.

vii) Non-Destructive Test reports as per respective code carried out by NABL accredited laboratory.

viii) Static/dynamic balancing certificate for rotating components/machines.

ix) Hardness test certificate.

x) Pressure / Leakage Test Certificates.

xi) Performance Test Certificates for all characteristics.

xii) Routine / Type / Calibration /Acceptance / Special tests (Type Tests etc) certificates for electrical/ power electronics/ automation/ instrumentation items as identified in QAP. Furnishing valid type test certificate for similar design of above items is mandatory until unless exemption is granted specifically in technical specification for any item. In case, type test certificate of similar design is not available, successful tenderer shall organize to carry out such tests at his cost without affecting the project schedule.

xiii) Surface preparation and painting certificates.

xiv) Certificates from competent authority for the items coming under statutory regulations (IBR/ FM/ UL/ CMRI/ NEPA/ Weights & Measures etc.).

xv) Environmental test reports for electronics/ automation items.

07.05.02 Where physical and chemical test certificates of raw material are not available, the successful tenderer/Sub-contractor shall arrange to have specimens and test samples of the materials, tested in NABL accredited laboratory at his cost and submit the copies of test results in requisite numbers to MECON/CLIENT for review. Number of test samples against each heat/cast/lot or batch of materials, as applicable shall be as per relevant Indian or International Standards. This is admissible only if specific makes are not indicated in the contract.

07.06 Internal Inspection by Successful Tenderer/ Manufacturer

07.06.01 Inspection and tests shall be carried out by Contractor and Manufacturer in accordance with approved drawings/datasheet/material specification/T.S/P.O., relevant standards (BIS/ASME/IEC/DIN/API etc.) and approved QAP. Records shall be maintained for each inspection and test carried out and signed documents shall be submitted to CLIENT/MECON for verification.

07.06.02 The successful tenderer shall carry out their internal inspection and obtain clearance from statutory bodies e.g. IBR, CCE, TAC, Weights & Measures, safety (NEPA/ UL/ FM etc.), IE rules, CMRI etc. prior to offering any equipment for CLIENT/MECON's inspection in accordance with approved QAP.

07.06.03 The successful tenderer/ Manufacturer shall identify all the inspected equipment/component/raw materials & shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification/rework, rejected etc.

07.06.04 The successful tenderer shall establish and maintain procedures to ensure that the product that does not conform to specified requirements, is prevented from inadvertent use or supply/ installation. The description of non-conformity that has been accepted subsequently by MECON/ CLIENT by concession and/or of repairs, shall be recorded.

07.06.05 Where facilities for testing does not exist in the successful tenderer / Sub-contractor's laboratories or in case of any dispute, samples and test pieces shall be drawn by the successful tenderer/Sub-contractor in presence of MECON / CLIENT and sealed sample shall be sent to any NABL accredited laboratory for necessary tests at former's own cost.

07.06.06 The MECON / CLIENT shall have the right to be present and witness all tests being carried out by the successful tenderer / Sub- contractor at their own laboratory or approved laboratories. Also, the Inspection Agency shall reserve the right to call for confirmatory test on samples, at his discretion.

Repaired and reworked product shall be offered for re-inspection to MECON/ CLIENT along-with records of corrective action taken.

07.07 Manufacturing and Inspection Schedule

Successful tenderer shall submit the schedule for manufacturing and inspection indicating equipment / components, sub- assembly/ assembly, date of approval of drawings / data sheets, address of manufacturer with contact person and scheduled date of inspection. Such reports shall be submitted to respective MECON Inspecting Offices with a copy to Inspection Co- ordinating Office once in a month. These monthly reports shall state the planning for next three months. Submission of first reports must commence one month prior to commencement of manufacturing activities of the product.

07.08 Method of Undertaking Inspection & Testing By MECON/ Client

07.08.01 Inspection call shall be given only on readiness of the equipment/ assembly/ sub-assembly and after approval of all relevant drawings and QAP. Client/MECON shall be given 14 working days notice period to organize inspection for indigenous items and 30 working days notice period for imported items after receipt of hard copies of inspection call. In case, equipment/ assembly/ sub-assembly offered for inspection are found not ready on or after proposed date, Inspection Memo shall be issued then and there and the call shall be cancelled. All the cost of visit of Client/MECON's engineer shall have to be borne by the successful tenderer. Photographic evidence to support readiness of material may be required to be furnished along with fresh inspection call.

If the equipment/assembly / sub-assembly after inspection found not acceptable, requiring rework or involve MECON's re- inspection, Successful tenderer/contractor shall be responsible for any delay due to re-inspection / revisit.

07.08.02 Inspection call shall be raised to MECON through IMS (Inspection Management System). Soft copy of all documents like test Certificates, Internal Inspection Reports, P.O., Sub-P.O., T.S., Approved QAP, approved GA drawings/ data sheets/manufacturing drawings and all other relevant certificates as per approved QAP shall be attached with inspection call in IMS. All TC's shall be signed and endorsed by successful tenderer. Inspection calls without above documents shall be treated as invalid and be liable for rejection. Also, the hard copy comprising of all documents along with signed and stamped inspection call shall be submitted to Counsultant/ Client for further processing. Scrutinizing of call documents shall start after receipt of hard copies of inspection call and shall be processed within 14 working days.

IMS user manual and vendor registration process/forms are clearly demonstrated in attached ANNEXURE-1.

07.08.03 The successful tenderer shall offer substantial quantities of items for inspection considering economical aspect of inspection with respect to size of order.

07.08.04 On receipt of the Inspection call, pertaining to particular package / equipment / item, Inspection& QA group of MECON (Co-ordinating office for Inspection activities) shall organize inspection visit or will issue Inspection assignment to other MECON's office (based on location of vendor's manufacturing works / relevant job expertise) as per approved QAP.

07.08.05 For items where inspection has been waived as per approved QAP, calls shall be processed on the basis of document review within 14 days, upon receipt of complete hard copy documents.

07.08.06 Observation/ Comments if any, forwarded by client/MECON through IMS / mail to be complied within 1 month from the date of such comments. In case the compliance is not submitted within 1 month by successful tenderer, inspection call shall be liable to be cancelled. New inspection call shall be raised as per regular inspection calls in accordance with approved QAP.

07.08.07 In absence of complete documents viz. relevant Approved QAP, Approved Drawing / datasheet / Technical Specification, manufacturer's test reports, inspection call will be commented / sent for clarification through IMS. Compliance submitted shall be reviewed within 14 working days by MECON/ Client.

07.09 **Obligations of Successful Tendrer**

07.09.01 Inspecting Engineer of MECON/ Client shall be provided with all facilities and full & free access to manufacturer premises at any time, during contract period by successful tenderer / contractor, to facilitate inspector to carry out inspection & testing of the product during and/or after manufacturing of the same.

07.09.02 The successful tenderer shall nominate a Representative / Co-ordinator to liaison with MECON/ CLIENT on all inspection matters. Representative of successful tenderer shall be present during all inspection at Sub-Contractor's works.

07.09.03 The successful tenderer shall comply with instructions of MECON/ CLIENT fully with promptitude.

07.09.04 The successful tenderer shall provide all instruments, tools, necessary testing and other inspection facilities to MECON / CLIENT free of cost for carrying out inspection.

07.09.05 The cost of testing welds by ultrasonic, radiographic and dye penetration tests etc. in the fabrication workshop shall be borne by the successful tenderer .These tests need to be witnessed & approved by ASNT/ISNT Level-II qualified NDT personals

07.09.06 The successful tenderer shall ensure that the equipment / assembly / component of the plant and equipment required to be inspected, are not dismantled or dispatched before inspection.

07.09.07 The successful tenderer shall not offer equipment for inspection in painted condition unless otherwise agreed in writing by MECON/ CLIENT.

07.09.08 The successful tenderer shall ensure that equipment and materials once rejected by the MECON/CLIENT, are not re-used in the manufacture of the plant and equipment. Where parts rejected during inspection have been rectified as per agreed procedures laid down in advance, such parts shall be segregated for separate inspection and approval, before being used in the work.

07.10 **Stamping and Issue of Inspection Documents**

07.10.01 Inspection Memo(IM):- For items, which do not conform to Technical Specification in one or more quality characteristics requiring rectification / rework, Inspection Memo [Form No.- 11.20(DQM)F-18] shall be issued indicating therein the details of observation & remarks. All the non-conformities with respect to specification of the product shall be indicated in the Inspection Memo for further quality control by successful tenderer.

07.10.02 Inspection Certificate(IC):- On satisfactory completion of final inspection & testing, all accepted plant & equipment shall be stamped suitably and Inspection Certificate[Form No.11.20(DQM)F-19] shall be issued by the MECON for the accepted items.

07.10.03 Inspection Waiver Certificate(IWC):- MECON shall release Inspection Waiver Certificate [Form No. 11.20(DQM)F-20] for the items, which are identified under waiver category in the approved QAP, upon verification of all inspection & test reports as indicated in the QAP.

07.11 **General Clause**

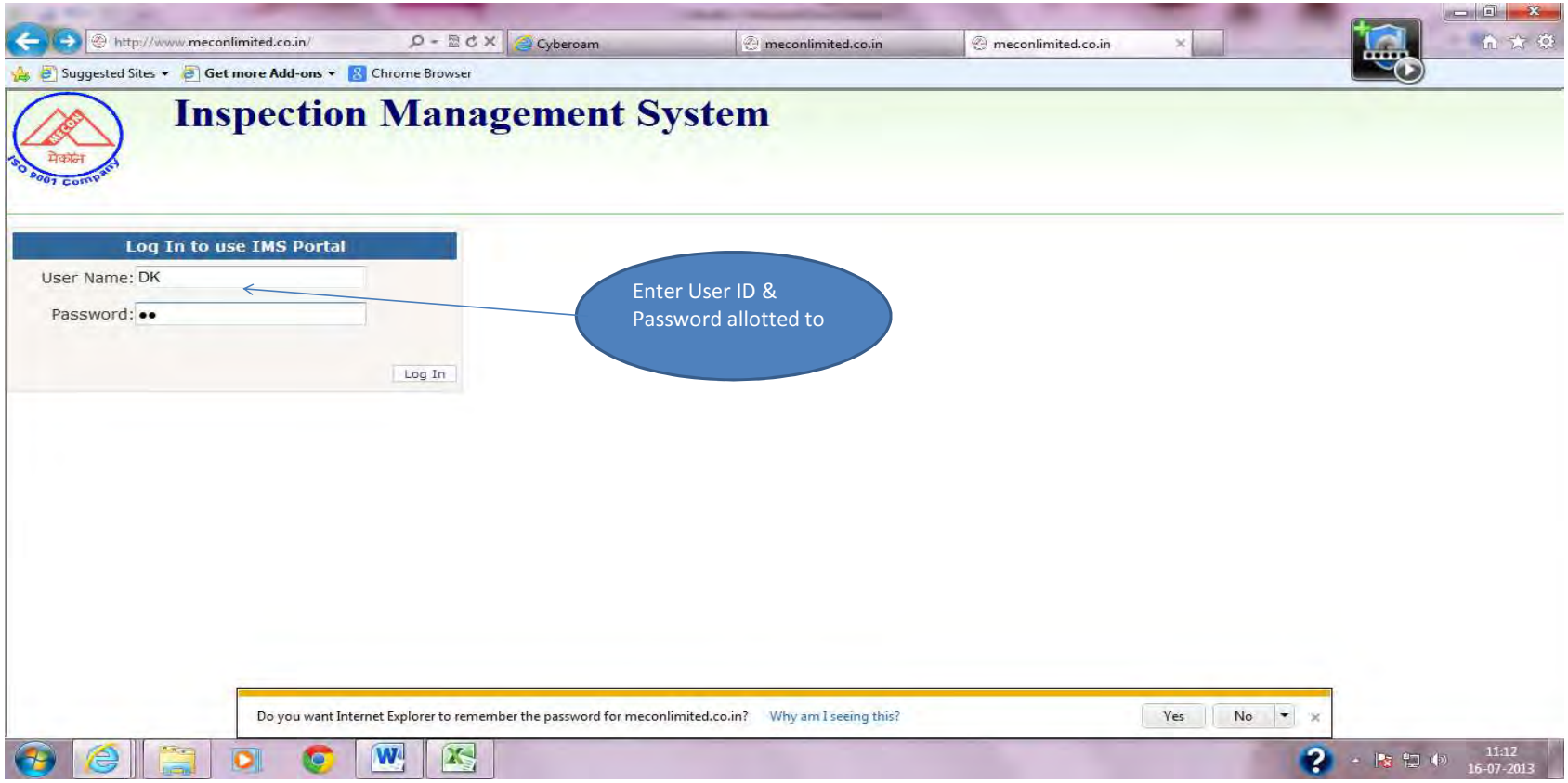
07.11.01 Inspection & tests carried out by MECON / CLIENT shall not absolve the responsibility of the successful tenderer/ Manufacturer to provide acceptable product as per the terms of contract nor shall it preclude subsequent rejection.

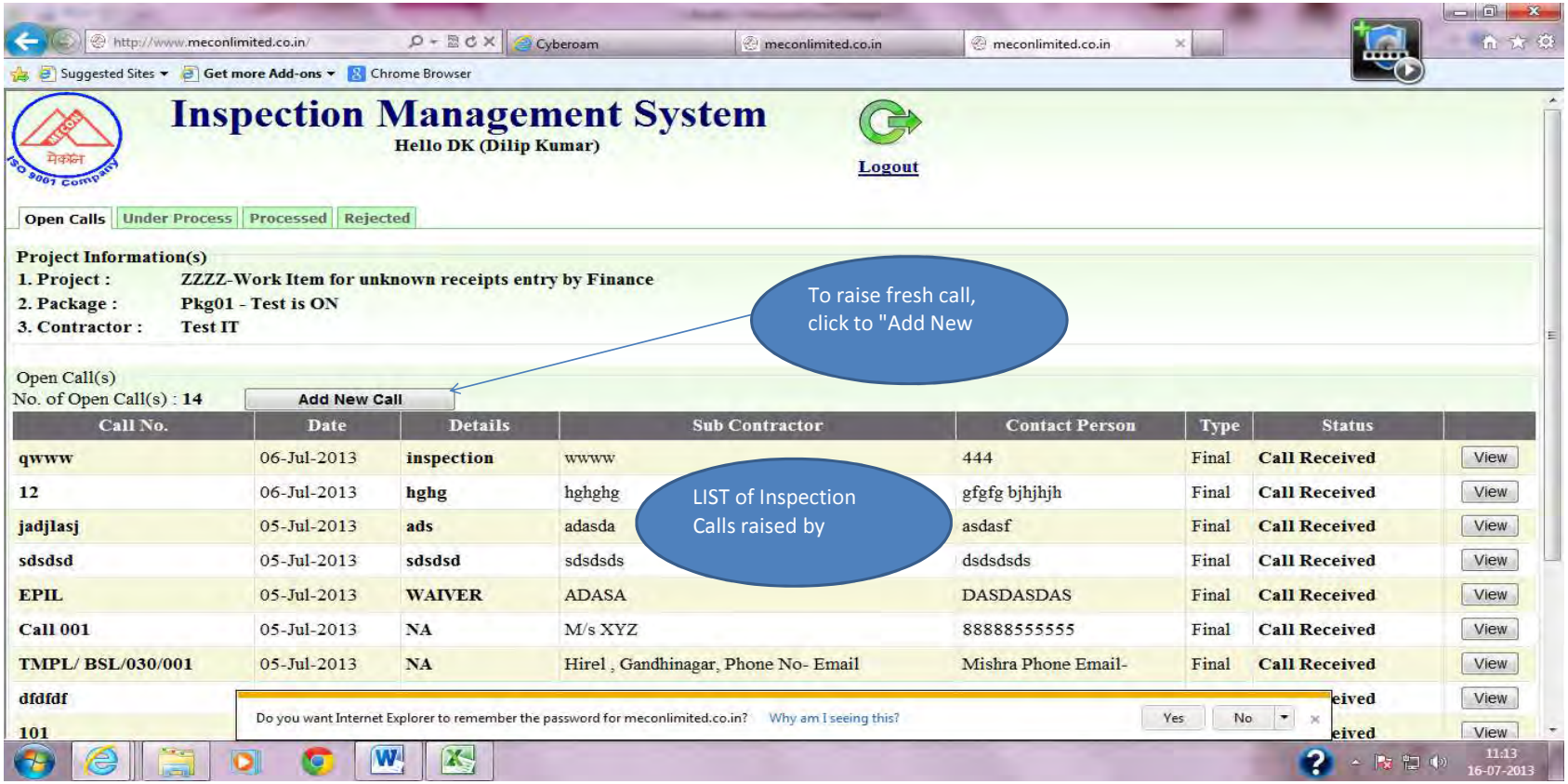
07.11.02 CLIENT/ MECON reserve the right to inspect any product at any stage of manufacturing beyond pre-identified stages and hold points of approved QAP.

Annexure – 1

User Manual for IMS


http://www.meconlimited
.co.in/
or
To Raise inspection
call click on "CALL
CALL FOR INSPECTION
Final results of Selection of Manage
About Us | Product & Services | Active Tenders | HR in MECON | Contact Us
MECON LIMITED
(A Government of India Enterprise)
50 Years of Nation Building
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
A House of Engineering Excellence
....Aiming beyond
>> Flash News <<
VENDOR REGISTRATION
RIGHT TO INFORMATION ACT 2005
TRANSPARENCY & INTEGRITY PACT


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Inspection Management System
Log In to use IMS Portal
User Name: DK
Password:
Log In
Enter User ID & Password allotted to
Do you want Internet Explorer to remember the password for meconlimited.co.in?
Why am I seeing this?
Yes
No
11:12
16-07-2013


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Inspection Management System
Hello DK (Dilip Kumar)
Logout
Open Calls
Under Process
Processed
Rejected
Project Information(s)
1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT
To raise fresh call, click to "Add New
Open Call(s)
No. of Open Call(s) : 14
Add New Call
LIST of Inspection Calls raised by
Call No. | Date | Details | Sub Contractor | Contact Person | Type | Status
qwww | 06-Jul-2013 | inspection | wwww | 444 | Final | Call Received | View
12 | 06-Jul-2013 | hghg | hghghg | gfgfg bjhjhjh | Final | Call Received | View
jadjlasj | 05-Jul-2013 | ads | adasda | asdasf | Final | Call Received | View
sdsdsd | 05-Jul-2013 | sdsdsd | sdsdsds | dsdsdsds | Final | Call Received | View
EPIL | 05-Jul-2013 | WAIVER | ADASA | DASDASDAS | Final | Call Received | View
Call 001 | 05-Jul-2013 | NA | M/s XYZ | 88888555555 | Final | Call Received | View
TMPL/ BSL/030/001 | 05-Jul-2013 | NA | Hirel , Gandhinagar, Phone No- Email | Mishra Phone Email- | Final | Call Received | View
dfdfdf
101
Do you want Internet Explorer to remember the password for meconlimited.co.in? Why am I seeing this? Yes No
11:13
16-07-2013

http://www.meconlimited.co.in/ | Cyberoam | meconlimited.co.in | meconlimited.co.in

Suggested Sites | Get more Add-ons | Chrome Browser

Open Calls | Back to Prev. Page

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

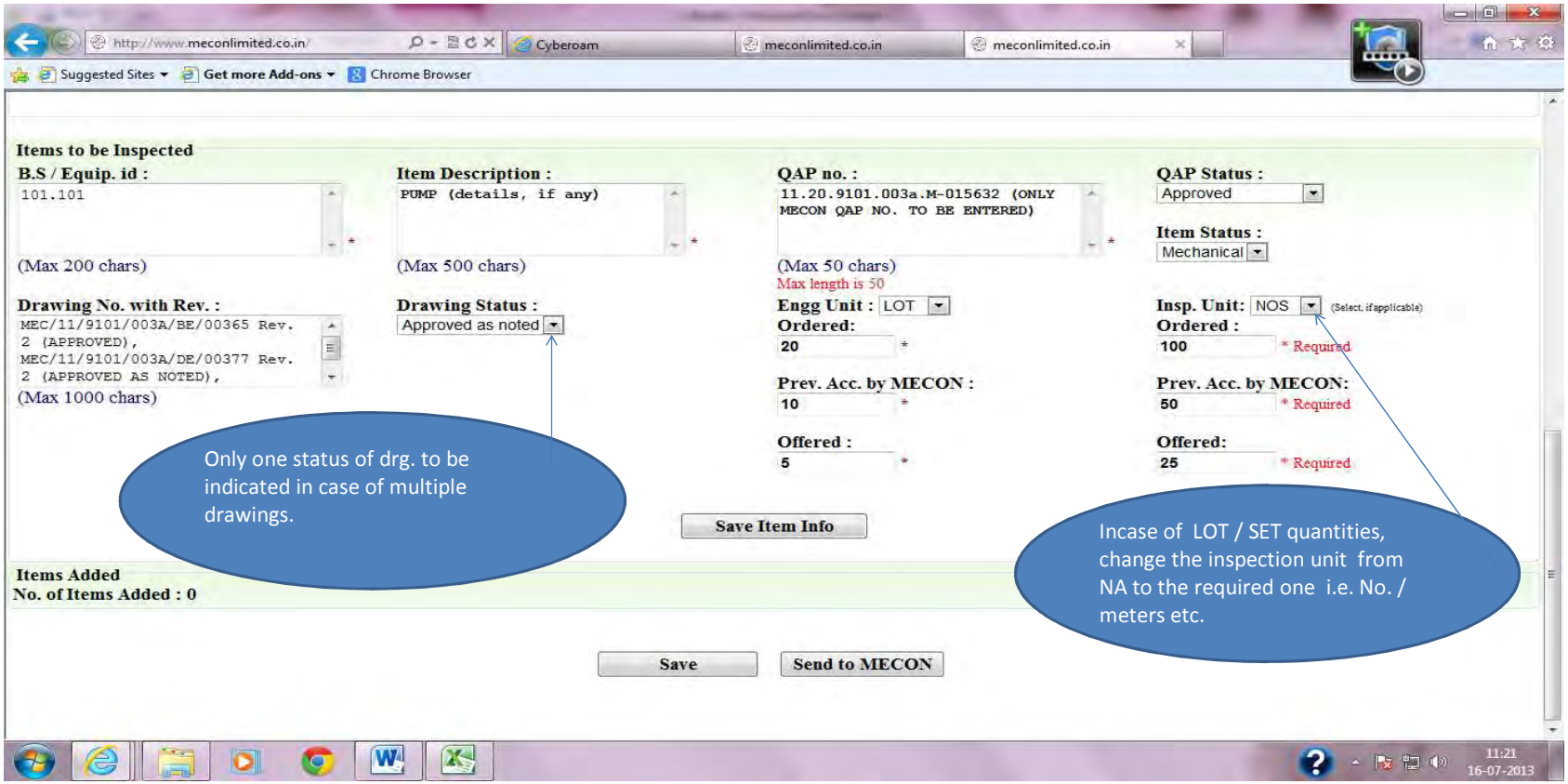
Call Informations

1. Call No. : 101 (Max 150 chars)
2. Call Date : 16 JUL 2013 *
3. Call Remarks : PUMP M&P KOLHAPUR (Max 500 chars)
4. Sub Contractor details : Mather & Platt (Max 1000 chars)
5. Sub contractor P.O No. : 1012124222352 dtd. 01.05.2012 (Max 100 chars)
6. Inspection place (address) : KOLHAPUR-6545655 MAHARASHTRA Ph. No.: 546556565 (Optional, Max 500 chars)
7. Contact Person with no. : Bhosle M: 9356845296632 sdhdsjdj : 2125453232 bhosle @ matherplatt.com (Max 500 chars)
8. Proposed Date : 20 JUL 2013 *
9. Inspection type : Stage Final *
10. List of Documents : 1. INDEX 2. QAP (APPROVED) 3. DRAWING / DATASHEET (APPROVED) 4. TECHNICAL SPECIFICATION & PO 5. INTERNAL INSPECTION REPORT (Max 100 chars)
11. Special Notes / Off day : Offday : SUNDAY AS per QAP, item under inspection caetgory of MECON. (Optional, Max 500 chars)

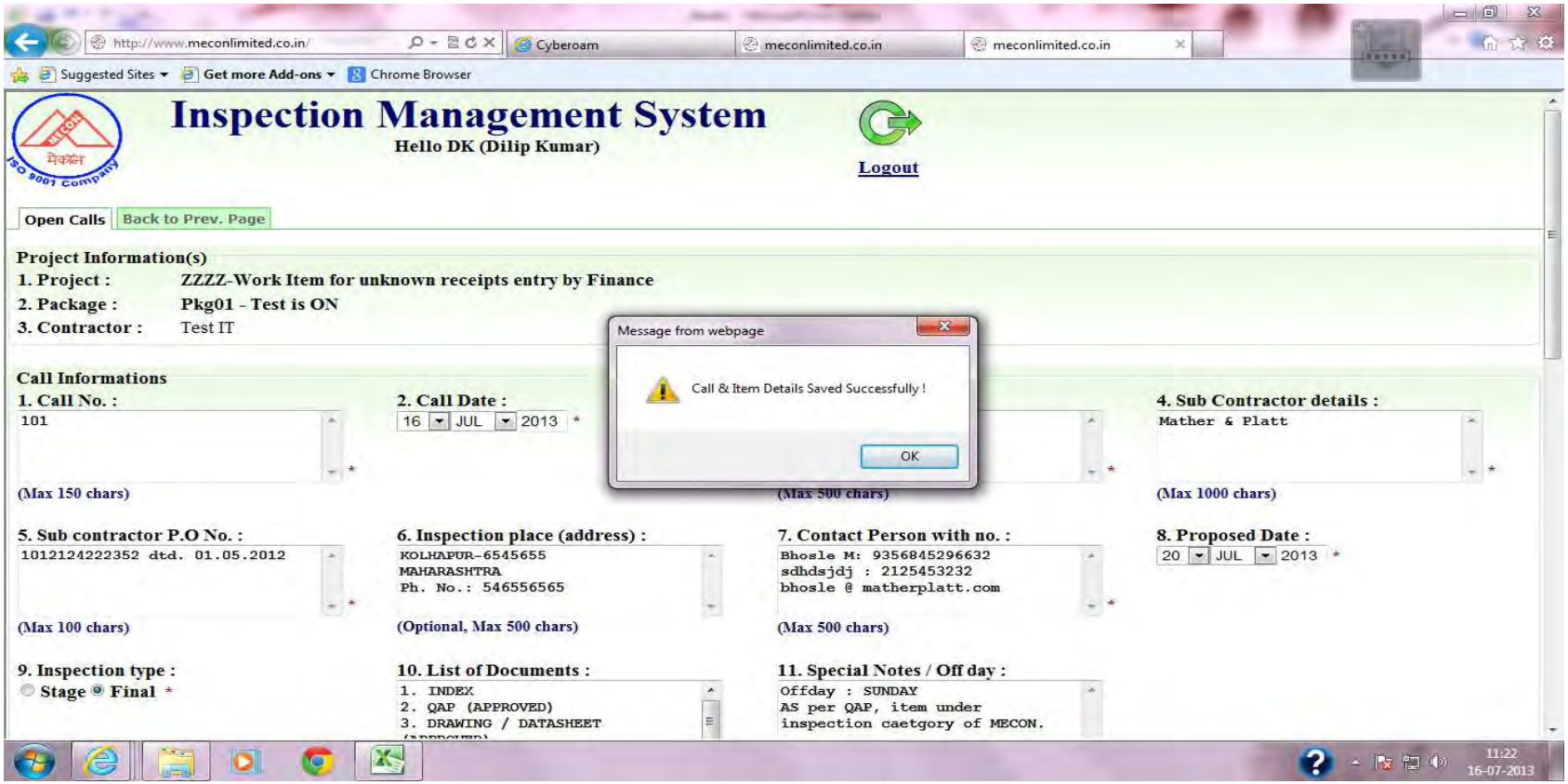
Enter all the details of the inspection call.

11:17 16-07-2013

NOTE : Proposed date of inspection can not be earlier than the inspection call date.



NOTE : For COMMENTED drawings, inspection call can not be raised.



NOTE : After entering all the mandatry fields, kindly "SAVE" the call.

http://meconinfo/insp/AddCall.aspx | Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo

Suggested Sites | Get more Add-ons | Chrome Browser

Save Item Info

Items Added

No. of Items Added : 1

B.S /Equip. id	Item Description	Item Type	Dwg. Status	QAP	QAP Status	Engg & Insp. Unit	Ordered	Accepted	Offered		
101.101	PUMP (details, if any)	Mechanical	AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015632	A	LOT, NOS	20 , 100	10 , 50	5 , 25	Edit	Remove

Attachment

Attachment (if any) : Browse... Add this file

File Name	
11.20.9101.02079.IC.01.pdf	Remove
amd.iwc.9101.01041.IW.01.docx	Remove
fixtures final.xlsx	Remove
IWC No..11.20.9101.01406.IW.01 Dtd.02.05.2013.pdf	Remove
scan.rar	Remove

1. Attach all the relevant documents as indicated in the call.
2. All test reports shall be duly endorsed by the principal contractor.

Save | Send to MECON

11:27 16-07-2013

NOTE: The saved item will be shown as above in the Items added portion.

Save Item Info

Call & Item Details Saved Successfully !

Items Added

No. of Items Added : 2

B.S /Equip. id	Item Description	Item Type	Dwg. Status	QAP	QAP Status	Engg & Insp. Unit	Ordered	Accepted	Offered		
101.101	PUMP (details, if any)	Mechanical	AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015632	A	LOT, NOS	20 , 100	10 , 50	5 , 25	Edit	Remove
101.102	pump 2	Mechanical	AAN / AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015631	A	Bags	10	0	5	Edit	Remove

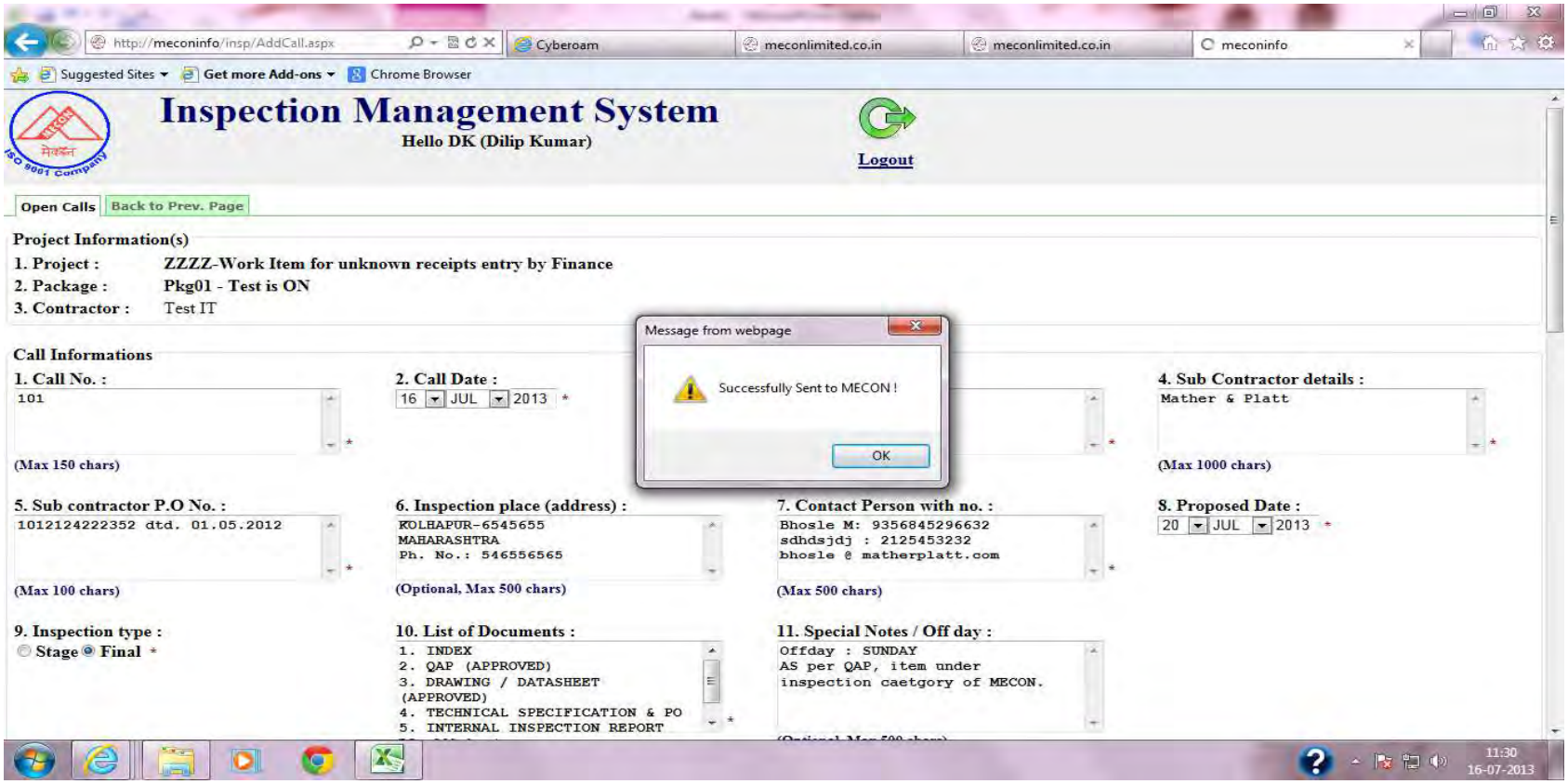
Attachment

Attachment (if any) : Browse... Add this file

File Name	
11.20.9101.02079.IC.01.pdf	Remove
amd.iwc.9101.01041.IW.01.docx	Remove
fixtures final.xlsx	Remove
IWC No..11.20.9101.01406.IW.01 Dtd.02.05.2013.pdf	Remove
scan.rar	Remove

Save Send to MECON

NOTE: Multiple items will be shown as above in the Items added portion.



NOTE: Upon entering and saving all details, kindly "SEND to MECON". Please check all the details before sending.

http://meconinfo/insp/AddCall.aspx

Items Added

No. of Items Added : 2

B.S /Equip. id	Item Description	Item Type	Dwg. Status	QAP	QAP Status	Engg & Insp. Unit	Ordered	Accepted	Offered		
101.101	PUMP (details, if any)	Mechanical	AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015632	A	LOT, NOS	20 , 100	10 , 50	5 , 25	Edit	Remove
101.102	pump 2	Mechanical	AAN / AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015631	A	Bags	10	0	5	Edit	Remove

Attachment

Attachment (if any) : Browse... Add this file

File Name	
11.20.9101.02079.IC.01.pdf	Remove
amd.iwc.9101.01041.IW.01.docx	Remove
fixtures final.xlsx	Remove
IWC No..11.20.9101.01406.IW.01 Dtd.02.05.2013.pdf	Remove
scan.rar	Remove

To Print inspection call, click Print Letter.

Save | Send to MECON | Print Letter

Successfully Sent to MECON !

NOTE: While printing ensure 'POP UPS'are enabled.

http://meconinfo/insp/AddCall.aspx

Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo

Suggested Sites | Get more Add-ons | Chrome Browser

Items Add
No. of Iter

B.S /Equ	Status	Engg & Insp. Unit	Ordered	Accepted	Offered		
101.101		LOT, NOS	20 , 100	10 , 50	5 , 25	Edit	Remove
101.102		Bags	10	0	5	Edit	Remove

Attachme
Attachmen

11.20.910
amd.iwc.9
fixtures fi
IWC No..
scan.rar

Letter

http://meconinfo/insp/DK-ACK432.pdf - Windows Internet Explorer

http://meconinfo/insp/DK-ACK432.pdf

Inspection Call Proforma

Form No. 11.20(DQM)F-05/2 Rev. 0
Page 1 of 2

Inspection Call no. : 101

Call Date : 16-Jul-2013
Submitted On : 16-Jul-2013

Project :	ZZZZ - Work Item for unknown receipts entry by Finance...	Package :	Pkg01 - Test is ON
Contractor :	Test IT	Proposed Date :	20-Jul-2013
Sub-Contractor :	Mather & Platt	Sub Cont. Order No. :	1012124222352 dtd. 01.05.2012
Place of Inspection :	KOLHAPUR-6545655 MAHARASHTRA Ph. No.: 546556565	Contact Person :	Bhosle M: 9356845296632 sdhdsjdj : 2125453232 bhosle @ matherplatt.com
Remarks :	PUMP M&P KOLHAPUR	Note/ Off day :	Offday : SUNDAY AS per QAP, item under inspection caetgory of MECON.

List of Items offered for Inspection to MECON :

A=Approved, AAN=Approved as Noted, INF=Information Category

Item identification no. /B.S no.	Description	Drawing No. with revision	Drawing approved status	QAP Status/ No.	Unit	Quantity		
						Ordered	Already Accepted	Offered
101.101	PUMP (details, if any)	MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED)	AAN	A /11.20.9101.003a.M-015632	LOT, NOS	20 100	10 50	5 25

11:33
16-07-2013

http://meconinfo/insp/AddCall.aspx | Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo

Suggested Sites | Get more Add-ons | Chrome Browser

Items Add
No. of Iter

B.S /Equ									Status	Engg & Insp. Unit	Ordered	Accepted	Offered		
101.101			3A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/00 3A/DE/00377 Rev. 2 (APPROVED AS NOTED),		3a.M-015631					LOT, NOS	20 , 100	10 , 50	5 , 25	Edit	Remove
101.102										Bags	10	0	5	Edit	Remove

Attachme
Attachmen

11.20.910
amd.iwc.9
fixtures fi
IWC No..
scan.rar

Letter

http://meconinfo/insp/DK-ACK432.pdf - Windows Internet Explorer

http://meconinfo/insp/DK-ACK432.pdf

List of Documents & Test Certificates enclosed in four (4) sets :

1. INDEX
2. QAP (APPROVED)
3. DRAWING / DATASHEET (APPROVED)
4. TECHNICAL SPECIFICATION & PO
5. INTERNAL INSPECTION REPORT
5.

Inspection Call Proforma

Form No. 11.20(DQM)F-05/2 Rev. 0
Page 2 of 2

Call Date : 16-Jul-2013

Inspection Call no.: 101

Submitted On : 16-Jul-2013

For Contractor/Sub-Contractor

Name & Designation with stamp

11:34
16-07-2013

http://meconinfo/insp/Default.aspx | Cyberoam | meconlimited.co.in | meconlimited.co.in | Inspection Management Sy...

Suggested Sites | Get more Add-ons | Chrome Browser

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Open Calls | Under Process | Processed | Rejected

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

Check the status of your call.

Open Call(s)

No. of Open Call(s) : 15 | Add New Call

Call No.	Date	Details	Sub Contractor	Contact Person	Type	Status	
qwww	06-Jul-2013	inspection	wwww	444	Final	Call Received	View
12	06-Jul-2013	hghg	hghghg	gfgfg bjhjhjh	Final	Call Received	View
jadjlasj	05-Jul-2013	ads	adasda	asdasf	Final	Call Received	View
sdsdsd	05-Jul-2013	sdsdsd	sdsdsds	dsdsdsds	Final	Call Received	View
EPIL	05-Jul-2013	WAIVER	ADASA	DASDASDAS	Final	Call Received	View
Call 001	05-Jul-2013	NA	M/s XYZ	888888555555	Final	Call Received	View
TMPL/ BSL/030/001	05-Jul-2013	NA	Hirel , Gandhinagar, Phone No- Email	Mishra Phone Email-	Final	Call Received	View
dfdfdf	04-Jul-2013	fdfdf	dfdfdf	dfdfdfdf	Final	Call Received	View
101	03-Jul-2013	TEST EDIT	asas	sassss	Final	Call Received	View
bbbb	01-Jul-2013	bcadghafdghf	sadasdggh	dbvdfg	Final	Call Received	View
6757576	10-Jun-2013	ghghgh	fdhdfhfdh	dfgdgg	Final	Call Received	View
sass	16-Jul-2013	sasas	sasasa	asasas	Final	Sent to MECON	View
101	16-Jul-2013	PUMP M&P KOLHAPUR	Mather & Platt	Bhosle M: 9356845296632 sdhdsjdj ; 2125453232 bhosle @ matherplatt.com	Final	Sent to MECON	View
2qeq	10-Jul-2013	etet	yryher	3424512	Final	Sent to MECON	View
2222	04-Jul-2013	tewgw	erqer	22	Final	Sent to MECON	View

11:36 16-07-2013

http://meconinfo/insp/ViewDetail.aspx | Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo

Suggested Sites | Get more Add-ons | Chrome Browser

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Call Details | Back to Prev. Page

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

Call Informations

1. Call No. :
101, dated 16-Jul-2013
Print Letter

2. Call Remarks :
PUMP M&P KOLHAPUR

3. Sub Contractor :
Mather & Platt

4. Order No. :
1012124222352 dtd. 01.05.2012

5. Inspection place :
KOLHAPUR-6545655 MAHARASHTRA Ph. No.: 546556565

6. Contact Person :
Bhosle M: 9356845296632 sdhdajdj : 2125453232 bhosle @ matherplatt.com

7. Proposed Time :
20-Jul-2013

8. Inspection type :
Final

9. List of Documents :
1. INDEX 2. QAP (APPROVED) 3. DRAWING / DATASHEET (APPROVED) 4. TECHNICAL SPECIFICATION & PO 5. INTERNAL INSPECTION REPORT 5.

10. Special Note (if any):
Offday : SUNDAY AS per QAP, item under inspection caetgory of MECON.

11. Call Status :
Sent to MECON

12. Status Date :
16-Jul-2013

13. Remarks from MECON

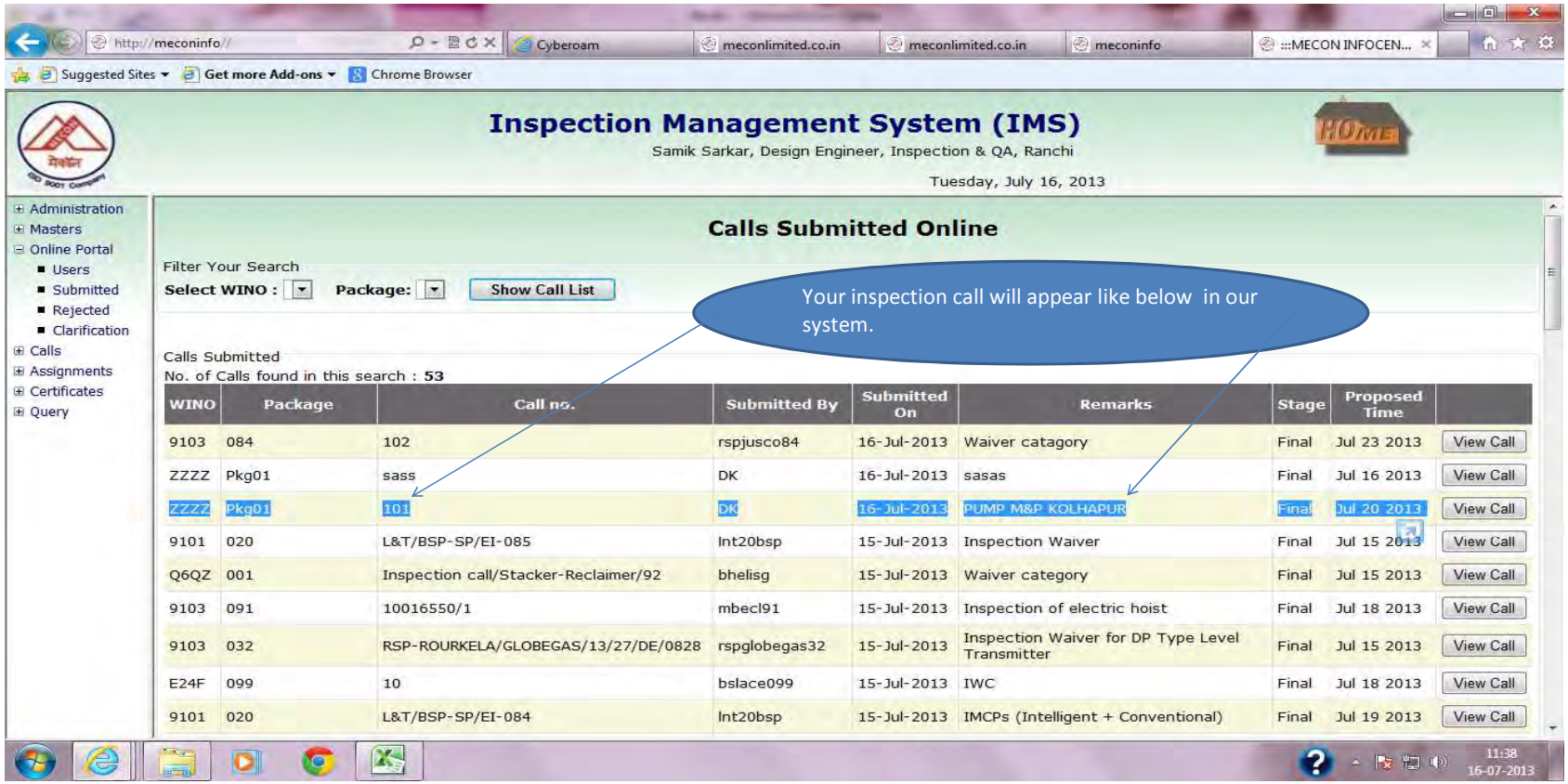
Attachment (if any)

File Name
11.20.9101.02079.IC.01.pdf
amd.iwc.9101.01041.IW.01.docx
fixtures final.xlsx
IWC No..11.20.9101.01406.IW.01 Dtd.02.05.2013.pdf
scan.rar

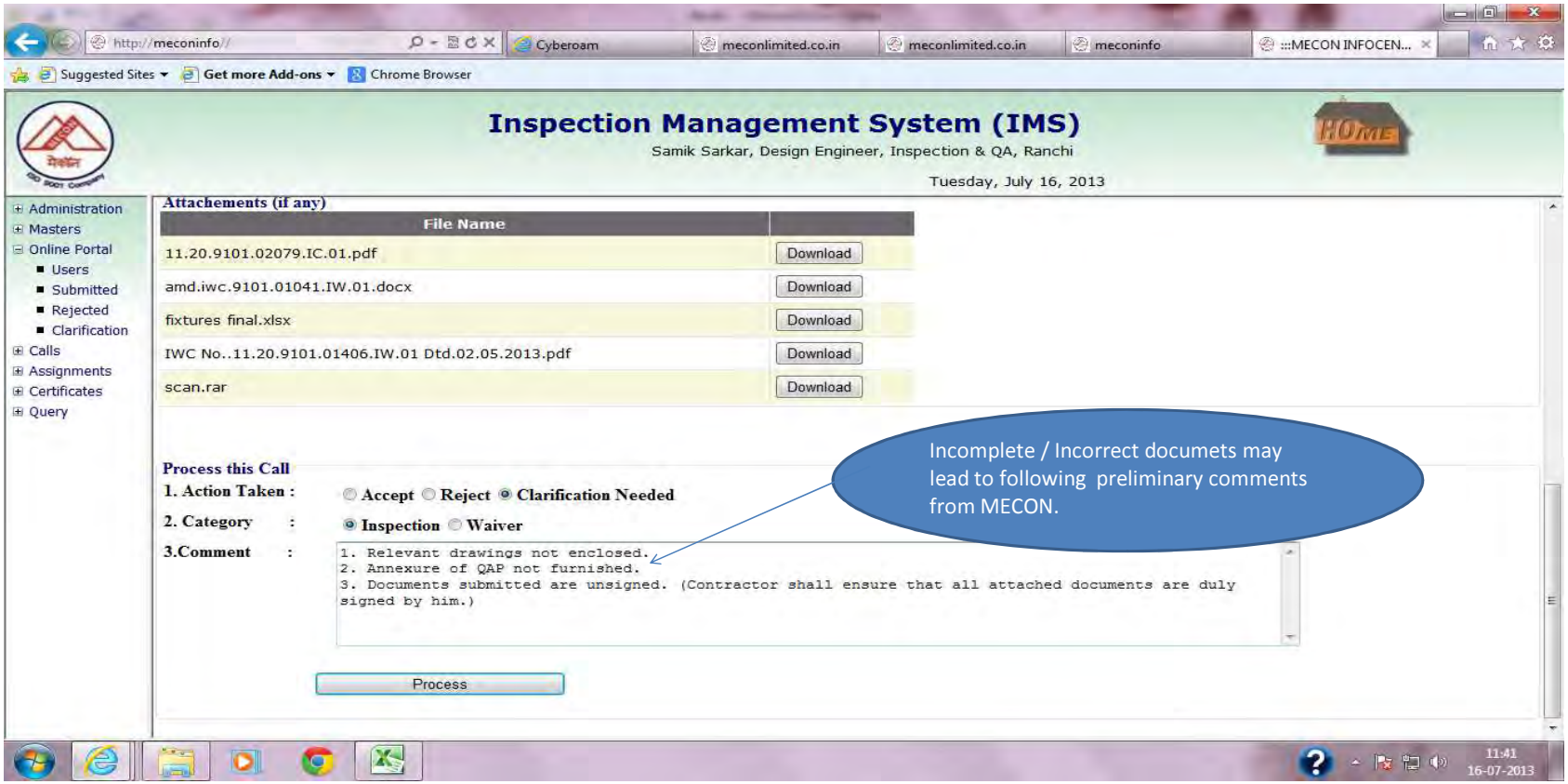
Items Added
No. of Items Added : 2
A: Approved, AAN: Approved as Noted, INF: Information Category

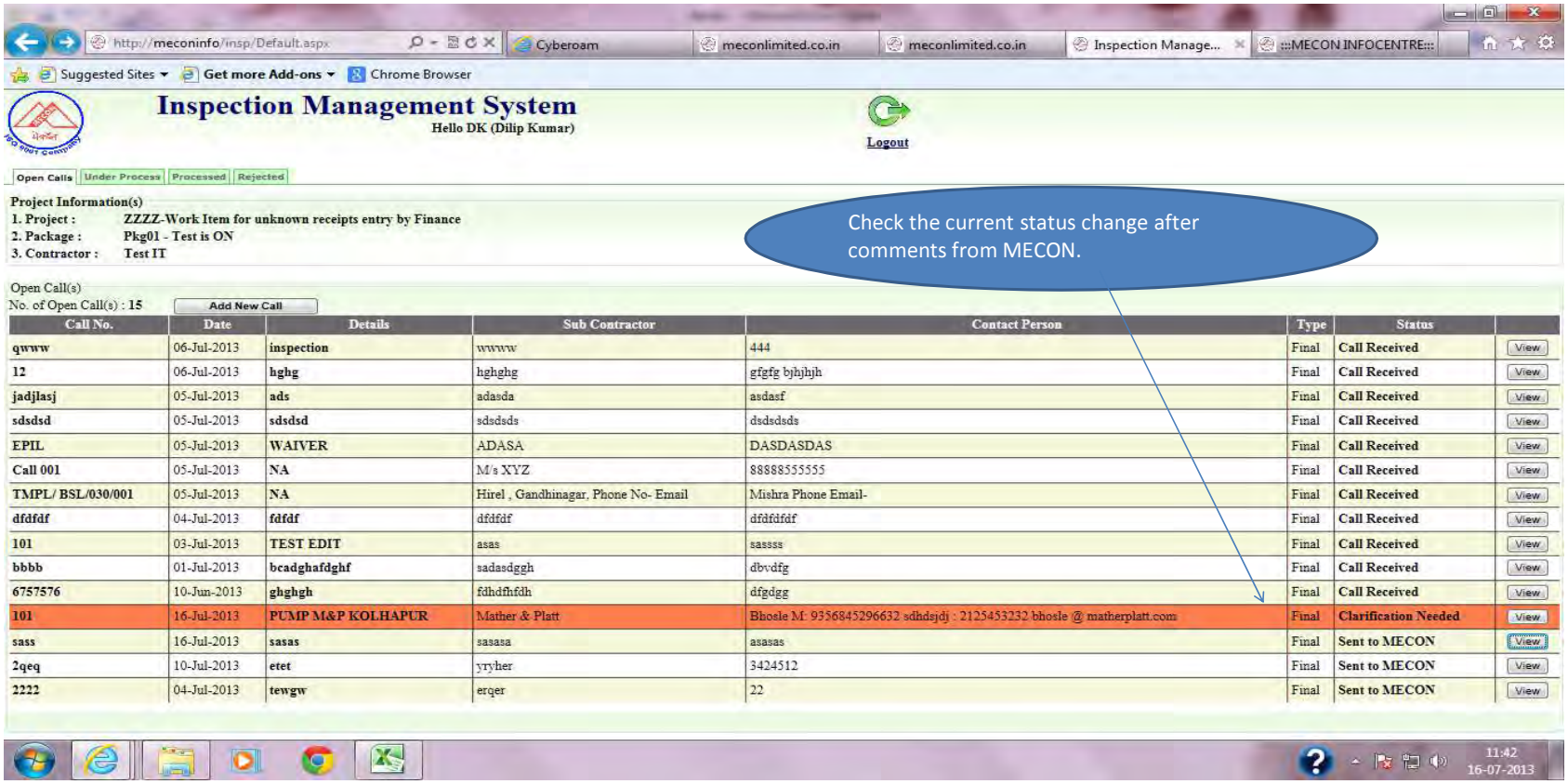
B.S /Equip. id	Item Description	Item Type	Dwg. Status	QAP	QAP Status	Engg & Insp. Unit	Ordered	Accepted	Offered
101.101	PUMP (details, if any)	Mechanical	AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015632	A	LOT, NOS	20 , 100	10 , 50	5 , 25
101.102	pump 2	Mechanical	AAN / AAN / MEC/11/9101/003A/BE/00365 Rev. 2 (APPROVED), MEC/11/9101/003A/DE/00377 Rev. 2 (APPROVED AS NOTED),	11.20.9101.003a.M-015631	A	Bags	10	0	5

11:36
16-07-2013



WINO	Package	Call no.	Submitted By	Submitted On	Remarks	Stage	Proposed Time	
9103	084	102	rspjusco84	16-Jul-2013	Waiver catagory	Final	Jul 23 2013	View Call
ZZZZ	Pkg01	sass	DK	16-Jul-2013	sasas	Final	Jul 16 2013	View Call
ZZZZ	Pkg01	101	DK	16-Jul-2013	PUMP M&P KOLHAPUR	Final	Jul 20 2013	View Call
9101	020	L&T/BSP-SP/EI-085	Int20bsp	15-Jul-2013	Inspection Waiver	Final	Jul 15 2013	View Call
Q6QZ	001	Inspection call/Stacker-Reclaimer/92	bhelisg	15-Jul-2013	Waiver category	Final	Jul 15 2013	View Call
9103	091	10016550/1	mbecl91	15-Jul-2013	Inspection of electric hoist	Final	Jul 18 2013	View Call
9103	032	RSP-ROURKELA/GLOBEGAS/13/27/DE/0828	rspglobegas32	15-Jul-2013	Inspection Waiver for DP Type Level Transmitter	Final	Jul 15 2013	View Call
E24F	099	10	bslace099	15-Jul-2013	IWC	Final	Jul 18 2013	View Call
9101	020	L&T/BSP-SP/EI-084	Int20bsp	15-Jul-2013	IMCPs (Intelligent + Conventional)	Final	Jul 19 2013	View Call


Inspection Management System (IMS)
Samik Sarkar, Design Engineer, Inspection & QA, Ranchi
Tuesday, July 16, 2013
Administration
Masters
Online Portal
Users
Submitted
Rejected
Clarification
Calls
Assignments
Certificates
Query
Attachements (if any)
File Name
11.20.9101.02079.IC.01.pdf
amd.iwc.9101.01041.IW.01.docx
fixtures final.xlsx
IWC No..11.20.9101.01406.IW.01 Dtd.02.05.2013.pdf
scan.rar
Download
Process this Call
1. Action Taken : Accept Reject Clarification Needed
2. Category : Inspection Waiver
3.Comment :
1. Relevant drawings not enclosed.
2. Annexure of QAP not furnished.
3. Documents submitted are unsigned. (Contractor shall ensure that all attached documents are duly signed by him.)
Process
Incomplete / Incorrect documets may lead to following preliminary comments from MECON.



Check the current status change after comments from MECON.

Call No.	Date	Details	Sub Contractor	Contact Person	Type	Status	
qwww	06-Jul-2013	inspection	wwww	444	Final	Call Received	View
12	06-Jul-2013	hghg	hghghg	gfgfg bjhjhjh	Final	Call Received	View
jadjlasj	05-Jul-2013	ads	adasda	asdasf	Final	Call Received	View
sdsdsd	05-Jul-2013	sdsdsd	sdsdsds	dsdsdsds	Final	Call Received	View
EPIL	05-Jul-2013	WAIVER	ADASA	DASDASDAS	Final	Call Received	View
Call 001	05-Jul-2013	NA	M/s XYZ	88888555555	Final	Call Received	View
TMPL/ BSL/030/001	05-Jul-2013	NA	Hirel , Gandhinagar, Phone No- Email	Mishra Phone Email-	Final	Call Received	View
dfdfdf	04-Jul-2013	fdfdf	dfdfdf	dfdfdfdf	Final	Call Received	View
101	03-Jul-2013	TEST EDIT	asas	sassss	Final	Call Received	View
bbbb	01-Jul-2013	bcadghafdghf	sadasdggh	dbvdfg	Final	Call Received	View
6757576	10-Jun-2013	ghghgh	fdhdfhfdh	dfgdgg	Final	Call Received	View
101	16-Jul-2013	PUMP M&P KOLHAPUR	Mather & Platt	Bhosle M: 9356845296632 sdhdsjdj : 2125453232 bhosle @ matherplatt.com	Final	Clarification Needed	View
sass	16-Jul-2013	sasas	sasasa	asasas	Final	Sent to MECON	View
2qeq	10-Jul-2013	etet	yryher	3424512	Final	Sent to MECON	View
2222	04-Jul-2013	tewgw	erqer	22	Final	Sent to MECON	View

http://meconinfo/insp/AddCall.aspx

Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo | :::MECON INFOCENTRE:::

Suggested Sites | Get more Add-ons | Chrome Browser

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Open Calls | Back to Prev. Page

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

Call Informations

1. Call No. : 101 (Max 150 chars)

4. Sub Contractor details : Mather & Platt (Max 1000 chars)

5. Sub contractor P.O No. : 1012124222352 dtd. 01.05.2012 (Max 100 chars)

8. Proposed Date : 20 JUL 2013

9. Inspection type : Stage Final *

10. List of Documents :
1. INDEX
2. QAP (APPROVED)
3. DRAWING / DATASHEET (APPROVED)
4. TECHNICAL SPECIFICATION & PO
5. INTERNAL INSPECTION REPORT
5.
(Max 100 chars)

11. Special Notes / Off day :
Offday : SUNDAY
AS per QAP, item under inspection caetgory of MECON.
ALL COMMENTS BY MECON INCORPORATED & RESENT.
(Optional, Max 500 chars)

12. Comment from MECON :
1. Relevant drawings not enclosed. 2. Annexure of QAP not furnished. 3. Documents submitted are unsigned. (Contractor shall ensure that all attached documents are duly signed by him.)

MECON's preliminary comments

Message from webpage

Kindly Verify these informations : B.S No. or Equipment Identification no., Item Description, QAP No., Drawing No. with Revision, Ordered Unit wrt. Engg. unit, Accepted Unit wrt. Engg. Unit, Offered Unit wrt. Engg. Unit,

OK

Items to be Inspected

B.S / Equip. id : (Max 200 chars)

Item Description : (Max 500 chars)

QAP no. : (Max 50 chars)

Approved

Item Status : Refractory

Drawing No. with Rev. :

Drawing Status :

Engg Unit : Recs

Insp. Unit : NA

11:44 16-07-2013

http://meconinfo/insp/AddCall.aspx

Cyberoam | meconlimited.co.in | meconlimited.co.in | meconinfo | :::MECON INFOCENTRE:::

Suggested Sites | Get more Add-ons | Chrome Browser

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Open Calls | Back to Prev. Page

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

Call Informations

1. Call No. : 101 (Max 150 chars)
2. Call Date : 16 JUL 2013
4. Sub Contractor details : Mather & Platt (Max 1000 chars)
5. Sub contractor P.O No. : 1012124222352 dtd. 01.05.2012 (Max 100 chars)
6. Inspection place (address) : KOLHAPUR-6545655 MAHARASHTRA Ph. No.: 546556565 (Optional, Max 500 chars)
8. Proposed Date : 20 JUL 2013
9. Inspection type : Stage / Final
10. List of Documents :
1. INDEX
2. QAP (APPROVED)
3. DRAWING / DATASHEET (APPROVED)
4. TECHNICAL SPECIFICATION & PO
5. INTERNAL INSPECTION REPORT
5.
(Max 100 chars)
11. Special Notes / Off day : Offday : SUNDAY AS per QAP, item under inspection caetgory of MECON. ALL COMMENTS BY MECON INCORPORATED & RESENT. (Optional, Max 500 chars)
12. Comment from MECON : 1. Relevant drawings not enclosed. 2. Annexure of QAP not furnished. 3. Documents submitted are unsigned. (Contractor shall ensure that all attached documents are duly signed by him.)

Message from webpage

Successfully Sent to MECON !

OK

Upon compliance of all preliminary comments, resend to MECON.

Items to be Inspected

B.S / Equip. id : (Max 200 chars)

Item Description : (Max 500 chars)

QAP no. : (Max 50 chars)

Item Status : Refractory

Drawing No. with Rev. :

Drawing Status :

Engg Unit : Recs

Insp. Unit : NA

11:45 16-07-2013

http://meconinfo/insp/Default.aspx | Cyberoam | meconlimited.co.in | meconlimited.co.in | Inspection Manage... | :::MECON INFOCENTRE:::

Suggested Sites | Get more Add-ons | Chrome Browser

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Open Calls | Under Process | Processed | Rejected

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

Open Call(s)

No. of Open Call(s) : 15 Add New Call

Call No.	Date	Details	Sub Contractor	Contact Person	Type	Status	
qwww	06-Jul-2013	inspection	wwww	444	Final	Call Received	View
12	06-Jul-2013	hghg	hghghg	gfgfg bjhjhjh	Final	Call Received	View
jadjlasj	05-Jul-2013	ads	adasda	asdasf	Final	Call Received	View
sdsdsd	05-Jul-2013	sdsdsd	sdsdsds	dsdsdsds	Final	Call Received	View
EPIL	05-Jul-2013	WAIVER	ADASA	DASDASDAS	Final	Call Received	View
Call 001	05-Jul-2013	NA	M/s XYZ	88888555555	Final	Call Received	View
TMPL/ BSL/030/001	05-Jul-2013	NA	Hirel , Gandhinagar, Phone No- Email	Mishra Phone Email-	Final	Call Received	View
dfdfdf	04-Jul-2013	fdfdf	dfdfdf	dfdfdfdf	Final	Call Received	View
101	03-Jul-2013	TEST EDIT	asas	sassss	Final	Call Received	View
bbbb	01-Jul-2013	bcadghafdghf	sadasdggh	dbvdfg	Final	Call Received	View
6757576	10-Jun-2013	ghghgh	fdhdfhfdh	dfgdgg	Final	Call Received	View
sass	16-Jul-2013	sasas	sasasa	asasas	Final	Sent to MECON	View
101	16-Jul-2013	PUMP M&P KOLHAPUR	Mather & Platt	Bhosle M: 9356845296632 adhdsjdj : 2125453232 bhosle @ matherplatt.com	Final	Sent to MECON	View
2qeq	10-Jul-2013	etet	yryher	3424512	Final	Sent to MECON	View
2222	04-Jul-2013	tewgw	erqer	22	Final	Sent to MECON	View

11:49 16-07-2013

http://meconinfo/insp/Default.aspx

Inspection Management System

Hello DK (Dilip Kumar)

Logout

Open Calls | Under Process | Processed | Rejected

Project Information(s)

1. Project : ZZZZ-Work Item for unknown receipts entry by Finance
2. Package : Pkg01 - Test is ON
3. Contractor : Test IT

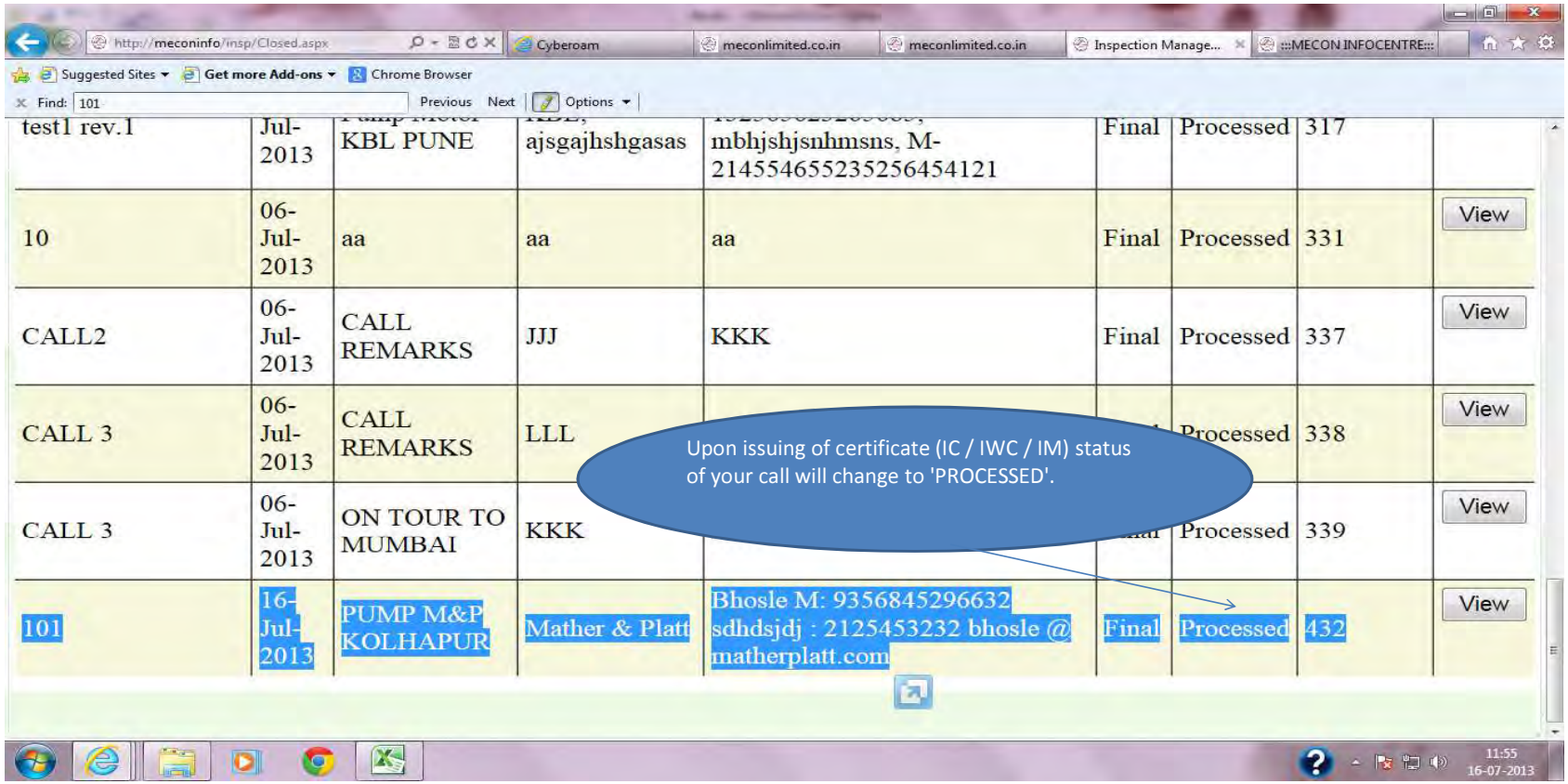
After primary scrutinizing of the documents, your call will be under 'Call recived' .

Open Call(s)

No. of Open Call(s) : 15 Add New Call

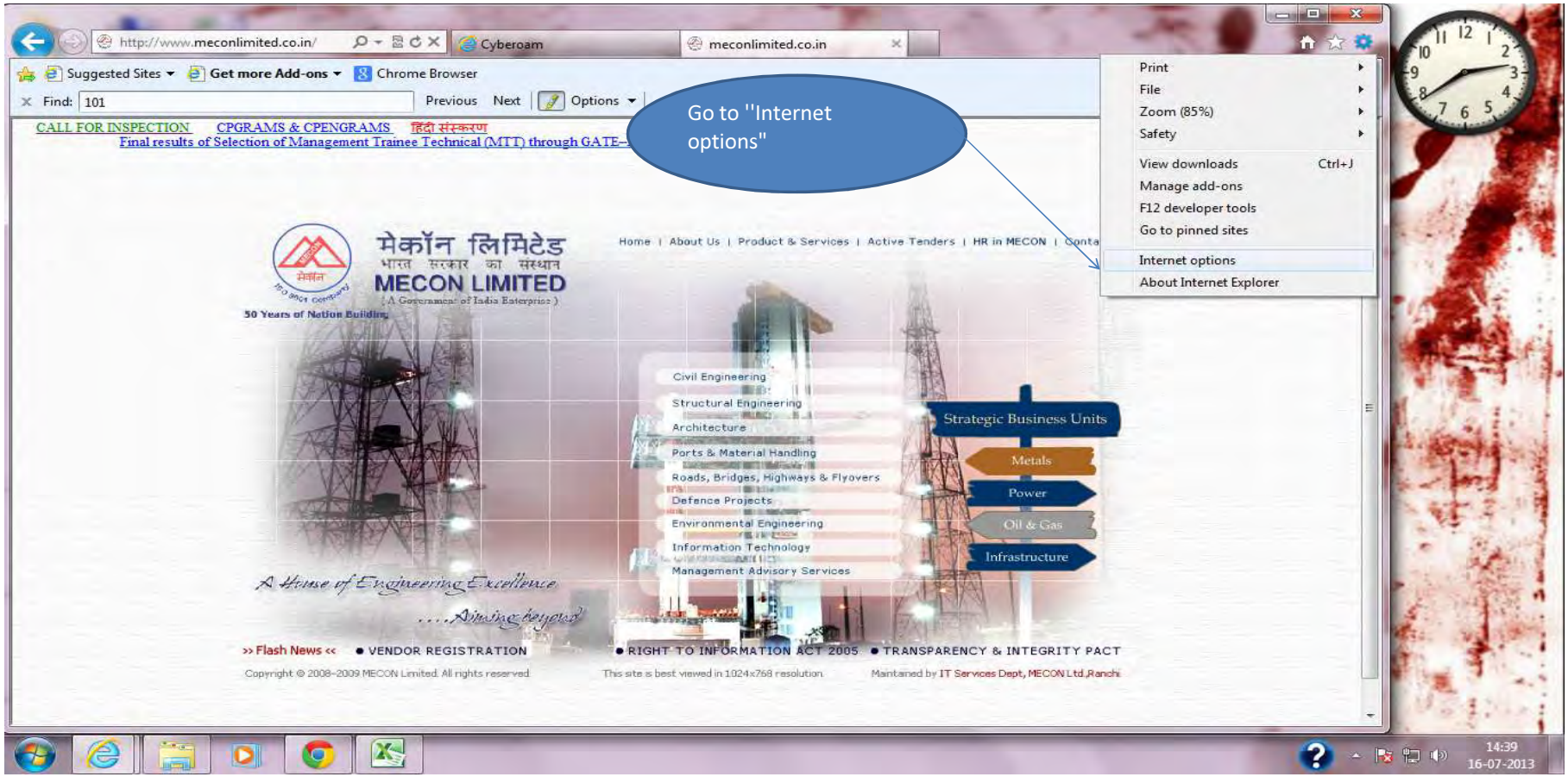
Call No.	Date	Details	Sub Contractor	Contact Person	Type	Status	
101	16-Jul-2013	PUMP M&P KOLHAPUR	Mather & Platt	Bhosle M: 9356845296632 sdhdsjdj : 2125453232 bhosle @ matherplatt.com	Final	Call Received	View
qwww	06-Jul-2013	inspection	wwww	444	Final	Call Received	View
12	06-Jul-2013	hghg	hghghg	gfgfg bjhjhjh	Final	Call Received	View
jadjlasj	05-Jul-2013	ads	adasda	asdasf	Final	Call Received	View
sdsdsd	05-Jul-2013	sdsdsd	sdsdsds	dsdsdsds	Final	Call Received	View

11:51 16-07-2013

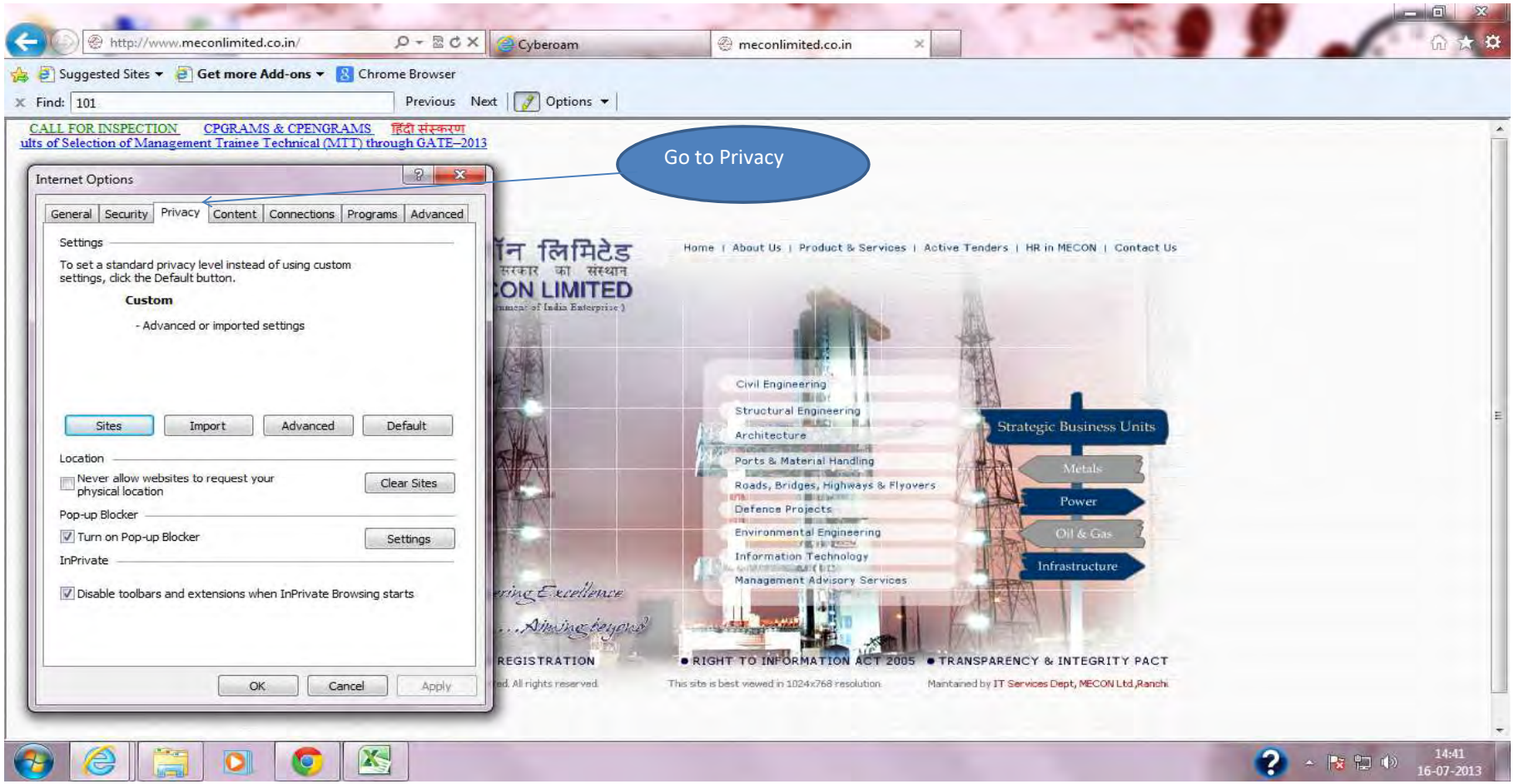


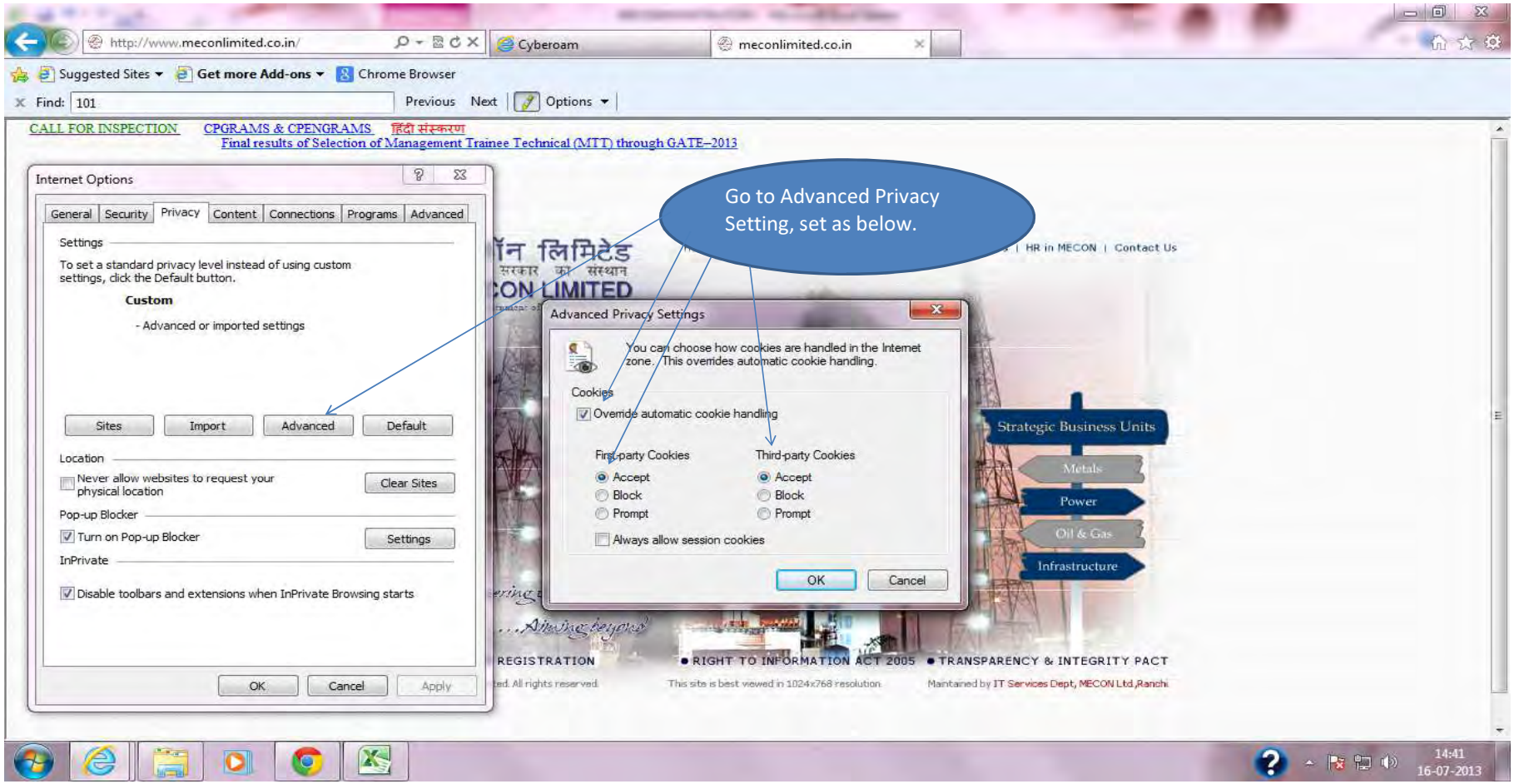
test1 rev.1	Jul-2013	KBL PUNE	ajsgajhshgasas	mbhjshjsnhmsns, M-214554655235256454121	Final	Processed	317	
10	06-Jul-2013	aa	aa	aa	Final	Processed	331	View
CALL2	06-Jul-2013	CALL REMARKS	JJJ	KKK	Final	Processed	337	View
CALL 3	06-Jul-2013	CALL REMARKS	LLL			Processed	338	View
CALL 3	06-Jul-2013	ON TOUR TO MUMBAI	KKK			Processed	339	View
101	16-Jul-2013	PUMP M&P KOLHAPUR	Mather & Platt	Bhosle M: 9356845296632 sdhdsjdj : 2125453232 bhosle @ matherplatt.com	Final	Processed	432	View


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Find: 101
Previous
Next
Options
Click 'TOOLS' or Type (Alt+X) in Internet Explorer.
CALL FOR INSPECTION
CPGRAMS & CPENGRAMS
हिंदी संस्करण
inal results of Selection of Management Trainee Technical (MTT) through GATE–2013
मेकॉन लिमिटेड
भारत सरकार का संस्थान
MECON LIMITED
(A Government of India Enterprise)
50 Years of Nation Building
Home | About Us | Product & Services | Active Tenders | HR in MECON | Contact Us
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
Power Plant-Thermal & Hydel
Transmission & Distribution
Renovation & modernization of Power Plant
Energy Audit
Blowers, TRT, Compressors & Dryers
A House of Engineering Excellence
....Aiming beyond
>> Flash News <<
• VENDOR REGISTRATION
• RIGHT TO INFORMATION ACT 2005
• TRANSPARENCY & INTEGRITY PACT
Copyright © 2008-2009 MECON Limited. All rights reserved.
This site is best viewed in 1024x768 resolution
Maintained by IT Services Dept, MECON Ltd,Ranchi
14:45
16-07-2013


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Find: 101
Previous
Next
Options
Go to "Internet options"
Print
File
Zoom (85%)
Safety
View downloads Ctrl+J
Manage add-ons
F12 developer tools
Go to pinned sites
Internet options
About Internet Explorer
CALL FOR INSPECTION
CPGRAMS & CPENGRAMS
हिंदी संस्करण
Final results of Selection of Management Trainee Technical (MTT) through GATE
मेकॉन लिमिटेड
भारत सरकार का संस्थान
MECON LIMITED
(A Government of India Enterprise)
50 Years of Nation Building
Home | About Us | Product & Services | Active Tenders | HR in MECON
Civil Engineering
Structural Engineering
Architecture
Ports & Material Handling
Roads, Bridges, Highways & Flyovers
Defence Projects
Environmental Engineering
Information Technology
Management Advisory Services
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
A House of Engineering Excellence
....Aiming beyond
>> Flash News <<
VENDOR REGISTRATION
RIGHT TO INFORMATION ACT 2005
TRANSPARENCY & INTEGRITY PACT
Copyright © 2008-2009 MECON Limited. All rights reserved
This site is best viewed in 1024x768 resolution
Maintained by IT Services Dept, MECON Ltd,Ranchi
14:39
16-07-2013


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Find: 101
Previous
Next
Options
CALL FOR INSPECTION
CPGRAMS & CPENGRAMS
हिंदी संस्करण
Final results of Selection of Management Trainee Technical (MTT
Internet Options
General
Security
Privacy
Content
Connections
Programs
Advanced
Home page
To create home page tabs, type each address on its own line.
http://google.com/
Use current
Use default
Use blank
Browsing history
Delete temporary files, history, cookies, saved passwords, and web form information.
Delete browsing history on exit
Delete...
Settings
Search
Change search defaults.
Settings
Tabs
Change how webpages are displayed in tabs.
Settings
Appearance
Colors
Languages
Fonts
Accessibility
OK
Cancel
Apply
Home | About Us | Product & Services | Active Tenders | HR in MECON | Contact Us
Civil Engineering
Structural Engineering
Architecture
Ports & Material Handling
Roads, Bridges, Highways & Flyovers
Defence Projects
Environmental Engineering
Information Technology
Management Advisory Services
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
REGISTRATION
RIGHT TO INFORMATION ACT 2005
TRANSPARENCY & INTEGRITY PACT
This site is best viewed in 1024x768 resolution
Maintained by IT Services Dept, MECON Ltd,Ranchi
14:40
16-07-2013


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Find: 101
Previous
Next
Options
CALL FOR INSPECTION
CPGRAMS & CPENGRAMS
हिंदी संस्करण
ults of Selection of Management Trainee Technical (MTT) through GATE--2013
Go to Privacy
Internet Options
General
Security
Privacy
Content
Connections
Programs
Advanced
Settings
To set a standard privacy level instead of using custom settings, click the Default button.
Custom
- Advanced or imported settings
Sites
Import
Advanced
Default
Location
Never allow websites to request your physical location
Clear Sites
Pop-up Blocker
Turn on Pop-up Blocker
Settings
InPrivate
Disable toolbars and extensions when InPrivate Browsing starts
OK
Cancel
Apply
Home | About Us | Product & Services | Active Tenders | HR in MECON | Contact Us
Civil Engineering
Structural Engineering
Architecture
Ports & Material Handling
Roads, Bridges, Highways & Flyovers
Defence Projects
Environmental Engineering
Information Technology
Management Advisory Services
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
REGISTRATION
RIGHT TO INFORMATION ACT 2005
TRANSPARENCY & INTEGRITY PACT
This site is best viewed in 1024x768 resolution
Maintained by IT Services Dept, MECON Ltd,Ranchi
14:41
16-07-2013


http://www.meconlimited.co.in/
Cyberoam
meconlimited.co.in
Suggested Sites
Get more Add-ons
Chrome Browser
Find: 101
Previous
Next
Options
CALL FOR INSPECTION
CPGRAMS & CPENGRAMS
हिंदी संस्करण
Final results of Selection of Management Trainee Technical (MTT) through GATE–2013
Internet Options
General
Security
Privacy
Content
Connections
Programs
Advanced
Settings
To set a standard privacy level instead of using custom settings, click the Default button.
Custom
- Advanced or imported settings
Sites
Import
Advanced
Default
Location
Never allow websites to request your physical location
Clear Sites
Pop-up Blocker
Turn on Pop-up Blocker
Settings
InPrivate
Disable toolbars and extensions when InPrivate Browsing starts
OK
Cancel
Apply
Go to Advanced Privacy Setting, set as below.
Advanced Privacy Settings
You can choose how cookies are handled in the Internet zone. This overrides automatic cookie handling.
Cookies
Override automatic cookie handling
First-party Cookies
Accept
Block
Prompt
Third-party Cookies
Accept
Block
Prompt
Always allow session cookies
OK
Cancel
HR in MECON
Contact Us
Strategic Business Units
Metals
Power
Oil & Gas
Infrastructure
REGISTRATION
RIGHT TO INFORMATION ACT 2005
TRANSPARENCY & INTEGRITY PACT
This site is best viewed in 1024x768 resolution
Maintained by IT Services Dept, MECON Ltd,Ranchi
14:41
16-07-2013

A sample details are filled for reference.

Sl. No.	Project	Package No.	Package description	Contractor details.	Contact person details	User Id	Password	e-mail id & Mobile No.
1	BSP Expansion	26	Continuous Casting Plant	M/s.SVAI	Mr.X	XYZ123	TRF1223	x@svai.co.in
2								

FORM NO. 11.20 (DQM) F-09, Ed.-3 REV-1

	CONTRACTOR	MECON Limited	QUALITY ASSURANCE PLAN	WORK ITEM NO.	
	ORDER NO. & DATE		FOR	PROJECT	
	SUB - CONTRACTOR/ MFR		STRUCTURAL & MECHANICAL EQUIPMENT	PACKAGE NO.	
	ORDER NO. & DATE			PACKAGE NAME	

INSTRUCTIONS FOR FILLING UP :

1 QAP shall be submitted for each of the equipment separately with break up of assembly / sub-assembly & part/component or for group of equipment having same specification.

2 Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment.

3 Separate identification number with quantity for equipment shall be indicated wherever equipment having same specification belonging to different facilities are grouped together.

4 Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATIONS USED :

RS: RANDOM SAMPLING
CONTR : CONTRACTOR
MFR : MANUFACTURER
W : WITNESS
R: REVIEW
RS1: One/type/Size/Lot
RS2: 10%/type/Size/Lot

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS :

Code Description

1. Visual(Welding etc.)
2. Dimensional
3. Fitment & Alignment
4. Physical Test(Sample)
5. Chemical Test (Sample)
6. Ultrasonic Test
7. Magnetic Particle Test(MPT)
8. Radiography test
9. Dye Penetration Test
10. Metallographic Exam.
11. Welder's Qualification & Weld Procedure Test
12. Approval of Test and Repair Procedure
13. Heat Treatment
14. Pressure Test
15. Leakage test
16. Balancing
17. Vibration Test
18. Amplitude test

Code Description

19. Sponge test
20. Dust/Water Ingress test
21. Friction Factor Test
22. Adhesion Test
23. Performance Test/ Characteristic curve
24. No. Load/Free running Test
25. Load/Overload Test
26. Measurement of speeds
27. Accoustical test
28. Geometrical Accuracy
29. Repeatability and Positioning Accuracy
30. Proving Test
31. Surface Preparation
32. Manufacturer's Test Certificate for bought out items
33. IBR/Other statutory agencies compliance certificate

Code Description

34. Internal Inspection report by Contractor
35. Hardness test
36. Spark test for Lining
37. Calibration
38. Safety device test
39. Ease of Maintenance

D1. Approved GA drawings
D2. Information and other reference drg / stamped drgs released for mfg.
D3. Relevant catalogues
D4. Bill of Matl./ item no./ identification.
D5 Matchmark details
D6 Line/Layout diagram
D7 Approved erection procedures
D8 Unpriced sub P.O.with specification and amendments, if any
D9. Calibration Certificate of all measuring instrument and gauges.
D10 Guarantee certificate

	EQUIPMENT DETAILS						INSPECTION AND TESTS								
							Raw Material and Inprocess stage Inspection			Final Inspection / Test by			Test Certificates & documents to be submitted	Acceptance Criteria Standards/IS/BS/ ASME/Norms and Documents	REMARKS/ SAMPLING PLAN
Sl. No.	Description (with equipment heading,place of use and brief specification)	Identification No.	Quantity No / M	Quantity T	Manufacturer's Name and Address	Expected Schedule of Final Inspn	MFR	CONTR	CLIENT / CONS	MFR	CONTR	CLIENT / CONS			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

For Sub Contractor/MFR (Stamp & Signature)

For Contractor (Stamp & Signature)

QAP NO.	REV. :- 0
SHEET : 1 of 2	

CONTINUATION SHEET

FORM NO. 11.20 (DQM) F-09, Ed.-3 REV-1

	EQUIPMENT DETAILS						INSPECTION AND TESTS								
Sl. No.	Description (with equipment heading,place of use and brief specification)	Identification No.	Quantity		Manufacturer's Name and Address	Expected Schedule of Final Inspn	Raw Material and Inprocess stage Inspection			Final Inspection / Test by			Test Certificates & documents to be submitted	Acceptance Criteria Standards/IS/BS/ ASME/Norms and Documents	REMARKS/ SAMPLING PLAN
			No / M	T			MFR	CONTR	CLIENT / CONS	MFR	CONTR	CLIENT / CONS			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**

NOTES to Contractor and / or Manufacturer:

(1) Ultrasonic test of plates (lamination check) will be done as per ASTM A-435 (or equivalent) for equal to and above 20mm thick plate.
(2). Ultrasonic test of forged & Rolled rounds will be done as per ASTM A - 388 (or equivalent) for equal to and above 50 mm dia round and acceptance standard to be mutually agreed upon.
(3). All the relevant test reports/certificates shall be submitted during inspection.
(4) Dye penetration test shall be as per Art - 24, Sub section B, code SE 165, ASME Section - V.
(5) All NDT - DPT / UT / RT / MPT/ Leak test / pressure test of weld joints are to be carried out wherever drawing / TS calls for as per applicable standards.
(6) Mill TC for major raw materials to be submitted. In absence of which physical & chemical testing reports will be submitted from NABL accredited laboratory.
(7).WPS/PQR/WPQ to be submitted for review wherever required. All welding shall be done by qualified welders. Duly endorsed documents will be submitted to MECON.
(8) Electrical & refractory items / equipments coming under this QAP should be followed as per relevant electrical & refractory QAP.
(9) Column '14' will be inclusive for all the inspection check points under column 'Inspection & Tests' (Column No. 8-13) and all documents of (Column 15) Acceptance Criteria.
(10). All statutory items including CCOE / IBR items etc. shall be generally under waiver category of MECON. Inspection documents for such items will be submitted for review in accordance with the reference codes.
(11). D9 to be submitted for measuring instruments.
(12). Painting shall be done as per approved Specification.
(13). List of equipments with quantity to be furnished under the unit 'set' or 'lot' as annexure along with inspection call.
(14). Manufacturer's 'Quality Control Procedure' shall be submitted along with inspection call, wherever in existence.
(15) Only type test certificate of same design and same Material of Construction of equipment to be sumbmitted, wherever required.
(16) All the manufacturers shall be from prefered make list of General Technical Specification (GTS) / Contract Technical Specification (CTS) / Approved drawing/datasheet.
(17) Relevant Tests, required as per Approved- drawing / technical datasheets / relevant standards /codes/procudure; to be carried out by Manufacturer and/or Contractor (as applicable) and reports shall be submitted.
(18) Contractor/Manufacturer's scope is not limited to test codes indicated herewith and contractor to ensure compliance to all requirments stipulated in approved drawing/datasheet/TS and CTS.
(19) Correct & proper entry of Billing Schedule / Identification No. and quantity is the sole responsibility of the contractor.
(20) Inspection Call to be raised only after the respective approved drawing / datasheet is submitted by contractor and processed (A / AAN) by MECON.
(21) QAP approval does not give approval of Manufacturer/Vendor.

For Sub Contractor/MFR (Stamp & Signature) **For Contractor (Stamp & Signature)**

QAP NO. **REV. :- 0**

SHEET : 2 OF 2

FORM NO.11.20(DQM) F-10, Ed.-3 REV-1

	CONTRACTOR	*	QUALITY ASSURANCE PLAN	WORK ITEM NO.	*
	ORDER NO. & DATE	*	FOR	PROJECT	*
	SUB - CONTRACTOR		ELECTRICAL & INSTRUMENTATION EQUIPMENT	PACKAGE NO.	*
	ORDER NO. & DATE			PACKAGE NAME	*

INSTRUCTIONS FOR FILLING UP :

1 QAP shall be submitted for each of the equipment separately with break up of assembly / sub-assembly & part/component or for group of equipment having same specification.

2 Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment.

3 Separate identification number with quantity for equipment shall be indicated wherever equipment having same specification belonging to different facilities are grouped together.

4 Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATIONS USED :

CONTR : CONTRACTOR R : Review

MFR : MANUFACTURER W : Witness

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS :

Code Description

1. Visual
2. Dimensional
3. Fitment & Alignment
4. Physical Test(Sample)
5. Chemical Test (Sample)
6. Ultrasonic Test
7. Magnetic Particle Test(MPT)
8. Radiography test
9. Dye Penetration Test
10. Measurement of IR Value :
    a) Before HV Test
    b) After HV Test
11. High voltage test/Dielectric test.
12. Routine test as per relevant IS/other standard.
13. Type tests as per relevant IS/ other standard.
14. Impulse Test.
15. Partial Discharge Test.
16. Heat run test/Temp. rise test.
17. Enclosure protection Test.
18. Calibration.
19. Noise & Vibration.
20. Test Certificates for bought out components.
21. Tank pressure
22. Paint shade & thickness verification.
23. Short time rating.
24. Operation & functional check.
25. Overspeed Test.
26. Flame proof test
27. Clearance and creepage distance.
28. Acceptance Test
29. Verification of BOM
30. PI Value check
31. Earthing provision & Ferruling Check
32. HV &IR test of BTD, RTD & Space heater
33. Galvanization test
34. Continuity test
35. FRLS test
36. Dynamic balancing test
37. Shaft voltage measurement
38. SFRA test
39. Functional test for RTCP
40. Load/overload test
41. Specific fuel consumption rate check
42. Tan delta test
43. Harmonic test

DOCUMENTS :

D1. Approved L-2 drawings
D2. Approved single line / schematic diagram.
D3. Approved Catalogues / Approved data sheet.
D4. Approved bill of materials.
D5. Unpriced P.O.copy and approved BS copy
D6. Calibration Certificate of all measuring instruments and gauges.
D7 . Approved FAT procedure
D8 . Manufacturer TC /Certificate of compliance
D9 . Inspection report for contractor
D10. Conformity certificate
D11. Gurrantee/Warranty certificate
D12. Compatibility certificate
D13. Screenshot of FAT

	EQUIPMENT DETAILS						INSPECTION AND TESTS								
							Raw Material and Inprocess stage Inspection			Final Inspection / Test by			Test Certificates & documents to be submitted to MECON	Acceptance Criteria Standards/IS/BS/ ASME/Norms and Documents	REMARKS/ SAMPLING PLAN
Sl. No.	Description (with equipment heading,place of use and brief specification)	Identification No./ Billing Schedule No.	Quantity No / M	Quantity T	Manufacturer's Name and Address	Expected Schedule of Final Inspn	MFR	CONTR.	MECON	MFR	CONTR.	MECON			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
*	*		*	*						*	*	*	*	*	

* Mandatory field

for MECON (Stamp & Signature)

For contractor/sub-contractor (Stamp & Signature)

(QAP No. to be alloted by MECON)
MECON QAP NO.
SHEET : OF
REV. :

CONTINUATION SHEET

FORM NO.11.20(DQM) F-10, Ed.-3 REV-1

	EQUIPMENT DETAILS						INSPECTION AND TESTS								
							Raw Material and Inprocess stage Inspection			Final Inspection / Test by			Test Certificates & documents to be submitted to MECON	Acceptance Criteria Standards/IS/BS/ ASME/Norms and Documents	REMARKS/ SAMPLING PLAN
Sl. No.	Description (with equipment heading,place of use and brief specification)	Identification No.	Quantity		Manufacturer's Name and Address	Expected Sche-dule of Final Inspn									
			No / M	T			MFR	CONTR.	MECON/NMDC	MFR	CONTR.	MECON/NMDC			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

(QAP No. to be alloted by MECON)

MECON QAP NO.

SHEET : OF

REV. :

for MECON (Stamp & Signature)

For contractor/sub-contractor
(Stamp & Signature)

08.00 PAINTING

08.01 Painting and Protective Coatings

All carbon steel surfaces, fittings, supports and structural steel skid shall be coated in accordance with protective coating and painting specifications. All equipment shall be final painted at vendor's shop, except Stainless steel components; which shall not be painted.

The hot process piping from compressor discharge to coolers including discharge pulsation dampeners shall be insulated with Aluminium cladding, wherever the surface temperature exceeds 60 °C.

Painting protective coating and the procedures used for the preparation of surface shall be specified in the Painting Specifications. Where painting is specified, the entire vessel shall be painted, including inside any skirt, outside bottom head, the entire base ring and all skit, outside bottom head, the entire base ring and all skirt attachments. Nozzles shall be painted on the flange edges, inside bolt-holes, and upto the gasket surface. Fireproofed or insulated surfaces shall be grit blasted and given one coat of primer only.

08.02 Internal and External Coating

Surface coatings shall be applied as required to achieve the design life of each specific vessel. Internal Coatings and External Coatings should also comply with Painting Specifications.

All exposed carbon steel parts to be painted shall be thoroughly cleaned from inside and outside to remove scale, rust, dirt and other foreign materials by wire brushing and sand blasting, as applicable. Minimum acceptable standard in case of power tool cleaning shall be St. 3 and in case of blast cleaning shall be Sa $2^{1/2}$ as per Swedish Standard SIS: 055900 (latest edition).

Non-ferrous materials, austenitic stainless steels, plastic or plastic coated materials and insulated surfaces of equipment not are painted.

Stainless steel surfaces both inside and outside shall be pickled and passivated.

Machined and bearing surface shall be protected with rust preventive agent like varnish or thick coat of grease.

Depending on the environment, following primer and finish coats shall be applied.

Sl. No.	Environment	Description		
1.	Normal Industrial	Primer	:	2 coats of Red oxide zinc chromate, each 25 microns (min.) thick.
		Finish	:	2 coats of Synthetic enamel, each 25 microns (min.) thick.
2.	Corrosion Industrial	Primer	:	2 coats of Epoxy zinc chromate each 35 microns (min.) thick.
		Finish		2 coats of Epoxy high build paint, each 100 microns (min.) thick.
3.	Coastal and Marine	Primer	:	2 coats of High build chlorinated rubber zinc phosphate each 50 microns (min.) thick.
		Finish	:	2 coats of Chlorinated rubber
4.	All environments (Temp. 80250ºC)	Finish	:	2 coats of Heat resistant Aluminium paint suitable for 250ºC each of thickness 20 microns.
5.	All environment (Temp. 250400ºC)	Finish	:	2 coats of Heat resistant Aluminium paint suitable for 400ºC each of thickness 20 microns.

09.00 PROJECT SCHEDULE & PROGRESS MONITORING

09.01 The project envisages installation of natural gas compressor station near Guwahati for compression of the natural gas (being received at NEGG battery limit) that it is delivered at NRL (Numaligarh Refinery Limited) battery limit at 40 Kg/cm2. The location of the station is at Barpalaha near Guwahati, Assam. The natural gas compressor station along with auxiliary equipment and facilities shall be commissioned in 18 months from Zero date which shall be reckoned as effective date of contract on a TURNKEY supplier. Zero date and commissioning as mentioned above and shown in the schedule shall be same as defined in the technical and commercial part of the specification.

An indicative Implementation Schedule, in line with the total time period and indicating the major activities, is shown in drg. no. MEC/11/PY/23UU/TS/0001/R-0 for reference.

09.02 Project Schedule

09.02.01 The Tenderer shall submit the following along with the offer.

i) Overall bar-chart schedule

The overall bar-chart schedule should be planned in weeks. The heads to be covered in the schedules shall broadly be as follows:

- Basic engineering and approval
- Preparation and issue of ordering / technical specifications for sub-vendors
- Placement of orders on sub-vendors
- Detailed design and engineering
- Submission and approval of drawings for civil & structural works
- Manufacture and supply of all equipment/ piping/ cables etc
- Fabrication and supply of building and technological structures
- Submission and approval of erection drawings and manuals
- Civil work
- Erection of building and technological structures
- Erection of equipment, piping, cables etc.
- Testing and commissioning

The major milestones for the project are to be highlighted in the schedule.

ii) The overall erection plan

- Provision of construction water and power shall be arranged by tenderer.
- Area within Battery limit should be utilized for construction and storage area. However, if additional area outside the battery limit is available, the client may permit the bidder to utilize the same.

iii) Off-site/ on-site organization chart for execution of the project

09.02.02 The Tenderer shall submit the following before finalization of contract.

i) Deployment schedule of construction man power

ii) Deployment schedule of equipment and machinery, tools & tackles, etc.

In case simultaneous erection work is carried out along with civil and structural works, the movement of men, machine and materials at site shall be planned suitably.

09.02.03 The successful Tenderer shall have to submit the following -

i) The Level-II network (Detailed Project Schedule) both in hard and editable soft copy in Primavera covering further details of project activities, area-wise, within 1 month from effective date of contract for approval and finalization of the Purchaser / Consultant.

ii) The format of progress report to be discussed and agreed upon within 1 month of effective date of contract.

iii) Updated Level-II network (Detailed Project Schedule) in hard & soft copies shall be submitted every month.

iv) The progress report (in approved format) shall be submitted every month.

09.03 Progress Monitoring

09.03.01 An effective system of progress monitoring is to be evolved by the contractor to ensure timely completion of all project activities. A monthly progress report showing current status of various activities shall be submitted by the Contractor to the Purchaser and his consultant. The monthly progress report shall indicate progress of various activities against targeted dates and targeted quantities. Reasons for shortfalls, if any, shall be clearly brought out

and proposed remedial measures to arrest the delays shall be indicated by the Contractor in the progress report, wherever applicable.

In general, progress of the following major activities is to be reported.

- Issue of ordering / technical specifications and placement of orders on sub-vendors for bought out items / components
- Detailed design and engineering including submission of drawings and their approval, subsequent revisions and resubmissions
- Manufacturing activities at the works of the contractors / associates / sub-vendors
- The progress report on inspection status
- Dispatch of equipment to site
- Site activities including receipt of material / equipment at site, construction and erection, testing and commissioning

Two months prior to start of site activities, the contractor shall submit a schedule for site-execution, along with quantitative program of month-wise physical targets. After the site activities are started, the contractor shall furnish information on site activities viz: daily, weekly and monthly progress reports on construction / erection, receipt of equipment against the monthly construction / erection plan, etc. The contractor shall also indicate resource deployment at site, highlights of critical areas and constraints faced, in the site progress reports.

Other information related to site activities as may be required by the Purchaser and Consultant, shall also be submitted by the contractor.

In the interest of timely completion of the project, if required, the priority of construction / erection may be altered by the Purchaser and Consultant, in consultation with the contractor.

09.03.02 The Purchaser / Consultant shall also have the right to:

- Invite the Contractor for daily / weekly / monthly meetings to review the progress of the project.

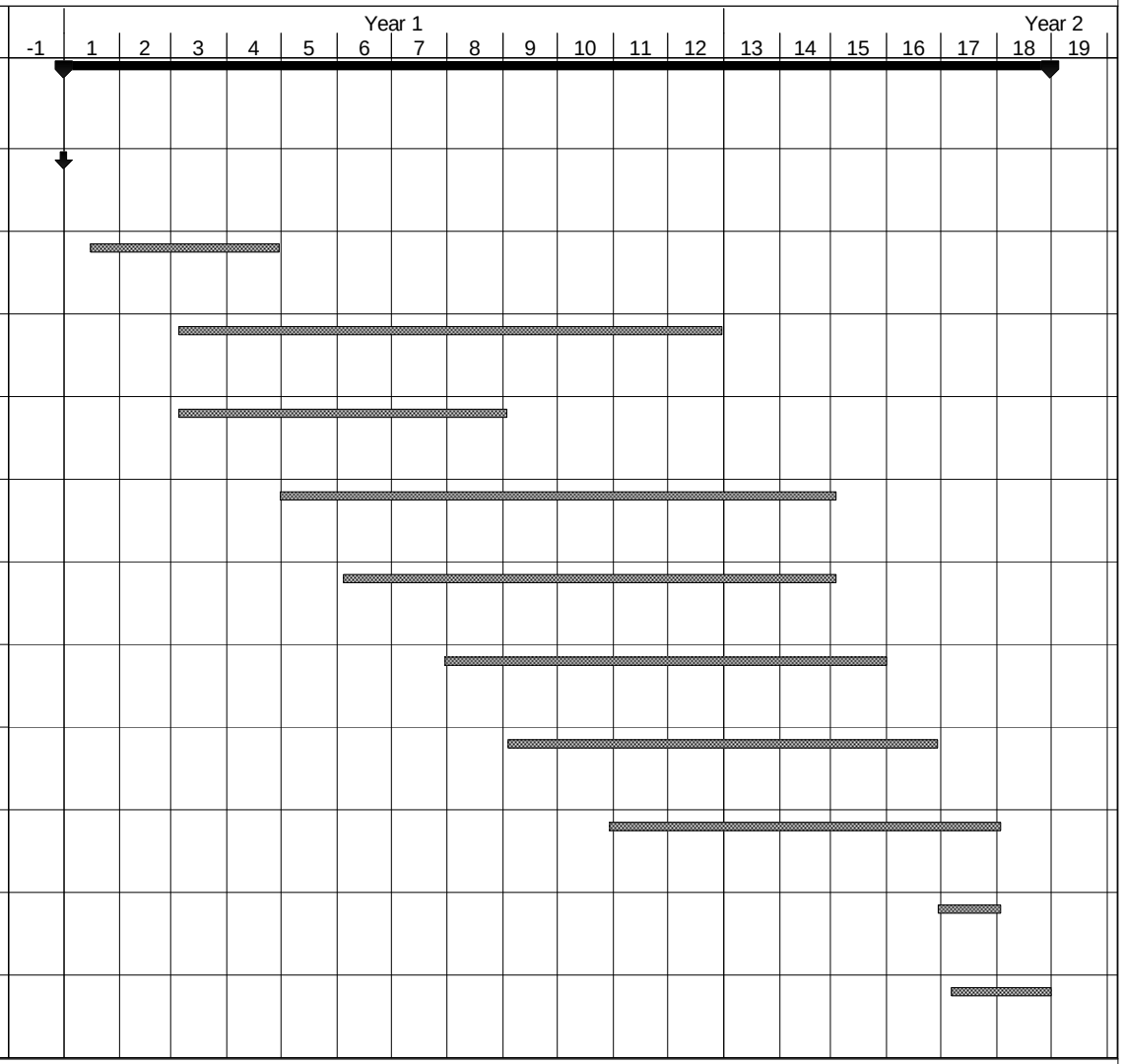
- Depute Purchaser's authorized representatives for ascertaining / expediting progress at contractor's works.

- Suggest remedial actions to bridge-up time gap between planned progress & observed progress.

INDRADHANUSH GAS GRID LIMITED(IGGL)
North East Gas Grid (NEGG) Pipeline Project (Phase -I & Phase-II)
Natural Gas Compressor Station

Project Implementation Schedule

ID	Activity	Dur (wks)
1	**M/s IGGL - Natural Gas Compressor Station for North East Gas Pipeline Project (PH-1)**	**78 w**
2	**Zero Date (Order placement on Turnkey Contractor)**	**0 w**
3	**Basic Engineering and Approval**	**15 w**
4	**Detailed Design & Engineering**	**43 w**
5	**Tendering and Ordering on subvendors**	**26 w**
6	**Civil Work**	**44 w**
7	**Fabrication & Delivery of Structures**	**39 w**
8	**Erection of Structures**	**35 w**
9	**Delivery of Equipment**	**34 w**
10	**Erection of Equipment incl. Technological Structures**	**31 w**
11	**Testing, Trial-run & Commissioning - Auxillaries**	**5 w**
12	**Testing, Trial-run & Commissioning - Natural Gas CompressorStation**	**8 w**



23UU_NEGG_TS_Imp Sch_18 M

Task Milestone Summary Zerodate

DRG NO: MEC/11/PY/23UU/TS/0001/R-0

Prepared By : R.Roobikala I Checked & Approved By : M.K.Tigga

10.00 ERECTION, TESTING, COMMISSIONING AND HANDING OVER

The Tenderer shall be fully responsible for erection, testing and commissioning of the facilities as per scope of work. Unless otherwise specified, during commissioning of the plant, necessary spares, consumable and tools/ tackles required are deemed included in Tenderer's scope of work.

During all testing and commissioning activities, the Tenderer shall involve Purchaser and impart necessary techniques and know-how required for operation and maintenance of the facilities provided under the scope.

10.01 Erection

a) The Tenderer shall perform the following with respect to the erection of the Plant and equipment supplied.

b) The scope of work of the Tenderer shall be complete erection of the Plant and Equipment as given in the Scope of work. The Tenderer shall make all arrangements to deliver the equipment at site by wagons / trucks / trailers, build his own stores (covered, uncovered, air-conditioned, if necessary) for the proper storage of equipment, maintain the stores and all related documents and records, transport the equipment to site for erection purpose. All security (watch & ward) arrangements also shall be made by the Tenderer.

c) The Tenderer shall unpack and do visual checking against physical damages to the equipment / cases, clean equipment before start of erection. Damage shortage, if any, shall be reported to the Purchaser / Consultant and shall be rectified / replaced expeditiously, so as not to upset the erection and commissioning shall not be considered an excuse for delay in completion of the work.

d) The Tenderer shall provide all necessary erection equipment and tools & tackles including material handling equipment, cranes, compressors and other equipment and instruments and consumables, all commissioning equipment and theodolite, etc. which may be required for carrying out the erection and commissioning work efficiently. All instruments shall be properly calibrated before use. Unless otherwise specified, the above erection equipment / material shall be the property of the Tenderer. However, Purchaser's prior permission shall be required for removal of these erection equipment / materials from the site. The tenderer shall ensure that proper procedure and documentation maintained at entry gate of

Purchaser's premises for such items as may be carried back by the Tenderer after completion of work.

e) The Tenderer shall provide all temporary ladders; scaffolding materials; platforms, supports and other necessary facilities required for handling, erection, testing and visual inspection of suppliers at the point of installation and shall also provide necessary packing plates, wedges, shims, leveling screws etc. required for erection of equipment and structures.

f) The Tenderer shall provide erection consumable like oxygen and acetylene gas, welding rods, solder lugs, oil, grease, kerosene, cotton waste, etc. required for erection of equipment and related steel structures and minor civil work.

g) The Tenderer shall erect and maintain his own site offices and stores as required for the work and arrange for maintaining in neat manner of the area placed at the Tenderer's disposal. The site office shall be handed over to Purchaser free of cost after completion of the project or dismantled and handover vacant land as directed by Purchaser.

h) The Tenderer shall provide sufficient fencing, notice boards and lights to protect and warn others as may be considered necessary by the Purchaser / Consultant. All materials used for providing these facilities shall be properties of the Tenderer.

i) The Tenderer shall organize the work in a manner that other work being carried out simultaneously at site is not affected and the workmen not endangered and shall arrange all temporary access as required for the erection work.

j) The Tenderer shall carry out base / primer and final painting of all Plant & Equipment, Structures, Pipe lines, Tanks & Vessels etc. supplied. The painting including its process shall be carried out as per the requirement as have been laid down in the detailed technical specification. Where not specified, the same shall be as per the standard codes & practices normally applicable and adopted internationally for the type of Plant & Equipment offered.

k) All civil work including chipping, grouting of the equipment and steel structures foundations with approved non-shrink-grouting compound shall be the responsibility of the Tenderer. The materials required shall be supplied by the Tenderer.

l) All safety, health and pollution control measures as required to be adopted as per the Statutory Regulations and the Safety Codes for projects issued along with the tender or otherwise required or implied by statutory regulations or the Technical specification. The Tenderer shall set up a suitable safety organization of his own at site in this regard.

m) The erection of all plant and equipment shall be carried out according to the latest engineering practices and according to the working drawings, specification, and instructions etc. duly approved by the Purchaser. The Tenderer shall carry out the work in the presence of / as per the instructions of the site engineer / supervisory personnel deputed by the Purchaser. The erection shall be carried out by highly skilled work men.

n) The Tenderer shall supply all required consumables, construction and erection materials such as grouting material, welding materials, flushing & initial fills of lube oils (as per manufacturers / suppliers recommendation), petrol, diesel, Kerosene, bolts, nuts, packing sheets, gaskets, jute, cotton waste, emery papers etc. as required for the satisfactory completion of work. Welding electrodes shall conform to the latest revision of the standards / codes.

o) The Tenderer shall provide adequate nos. of skilled, semi-skilled and unskilled labours including riggers, welders, filters, mechanics, supervisory staff; tools & tackles etc for completion of all equipment and piping systems within scheduled time.

p) The Tenderer shall take care of positioning, leveling and plumbing of all equipment & pipelines within required accuracy and tolerance limit as specified by codes, manufacturer, purchaser and consultant. It shall be deemed as a contractual obligation that equipment are not thrown out of alignment or lifted off during commissioning and subsequent operation.

q) The Tenderer shall be responsible for paying strict attention to statutory regulations for prevention of accidents and other safety rules.

r) The Tenderer shall be responsible for safe handling of all equipment. If any damage takes place during erection and testing work, the same shall be repaired / replaced by the Tenderer to the satisfaction of purchaser without any financial implication.

s) Before erection all parts of equipment, pipes, valves, fittings etc. shall be cleaned, checked, lubricated and inspected for ease of operation and any possible damage during transportation.

t) After installation of equipment on the foundations, they shall be leveled and aligned by means of sensitive sprit level, screw jack, dial and feeler gauges etc. as per tolerances specified by equipment manufacturer / supplier. Number of packing plates / shims shall be as minimum as possible.

u) After alignment and leveling, equipment foundations shall be chipped to remove any traces of oil & grease. The base frames shall be grouted with the help of quick setting, non shrink cement. Sufficient time shall be given for proper setting / curing before tightening the nuts of the foundation bolts. Tightening of the foundation bolts shall also be done uniformly and diagonally.

v) After complete installation of equipment on foundations, alignment shall have to be checked again to ensure tolerances. The equipment shall be first rotated manually.

w) All the pipelines shall be provided with suitable slopes. Suitable vent with valve at the highest points and drains/ trap with by pass arrangement at the lowest points shall be provided in the pipelines by the Tenderer. Welded joints shall be located at a distance equal to pipe diameter but not less than 100mm from the beginning of the curve or pipe support locations. Radius of smooth bends of pipe shall be at least 3 times the pipe diameter unless otherwise specified.

x) Hooking up of all pipelines / services including supply of all fittings as required for the same for all pipelines / services with existing pipelines / services at battery limits shall be the responsibility of the Tenderer.

y) The Tenderer shall intimate the purchaser at least one month in advance for requirement of any shutdown of the existing services for hooking up purpose. The Tenderer shall also prepare shutdown plan indicating time required, manpower and equipment planning, availability of all fittings etc. well in advance to purchaser for approval.

z) Access platforms & ladders are to be provided for the equipment, instruments, valves etc. which are not approachable from ground for operation & maintenance purpose.

aa) The Tenderer shall return to the purchaser all crates, packing boxes, packing materials and all surplus material brought to the site after completion erection, testing & commissioning of the plant & equipment. All these materials shall be kept at place and manner designated by the purchaser.

bb) The Tenderer shall clean and remove all surplus material, debris scraps, foreign material, metal chips etc. from the plant area after completion of erection & testing and before commissioning.

10.02 **Construction Water and Construction Power**

Construction water and power shall be arranged by Tenderer.

10.03 **Allotment of land**

Land shall be allotted for the purpose of Site Office, Stores and fabrication yard. The allotment shall remain valid till the period of contract and shall automatically cease after expiry of the guarantee period of the contract. The validity shall also automatically cease on termination of contract due to any reason whatsoever.

The Tenderer may build only temporary structures on the land allotted to him.

On completion of the work and expiry of the guarantee period, the Tenderer shall remove all temporary structures built by him and restore the land to its original condition unless otherwise advised by the Purchaser.

10.04 Testing

Tenderer shall ensure, either directly or through his sub-Tenderer, that all the tests / inspection specified in specifications, codes, data sheets etc. are carried out in full.

Purchaser / Consultant or its authorized agents may, at their option witness performance test of equipment at the works and erection and testing at site.

In case Tenderer is not able to meet any specific test / inspection requirement it shall be clearly brought out in the deviation list in his offer.

After completion of erection the following test shall be conducted at site.

Site Tests

The Tenderer shall prepare and submit detailed quality plans for each equipment under this specification from the receipt of material at site, during storage, erection, pre-commissioning to final commissioning of the plant. These procedures shall necessarily include all check/tests conducted at site for preservation, assembly, alignment, positioning of the equipment, foundation preparation, welding/bolting, heat treatment, non-destructive examination, hydraulic test, running test, performance test etc. The above shall be discussed and finalized with the Purchaser/ Consultant. The Tenderer shall also furnish detailed quality procedures proposed by him for storage, preservation, painting, hydraulic test, air / gas tightness test, performance test etc. to the Purchaser/ Consultant. The same shall be discussed, finalized and approved by the Purchaser/Consultant before the commencement of respective site tests and such approved copies shall be submitted in six copies.

Hydraulic Tests of Pressure Parts

a) On completion of erection of pressure parts, the unit with its fittings and mountings in position and pipelines shall be subjected to hydrostatic pressure test in accordance with requirements of Indian Boiler Regulations.

b) Water used for hydraulic test shall be made alkaline by addition of suitable chemicals.

c) Hydrostatic test of all pipelines shall be done at 1.5 times the max. working pressure. However, pneumatic test of gas pipelines, as applicable shall be done at a pressure not less than 0.2 kg/cm2g.

System Checking / Reliability Trials

Tenderer shall carry out tests at site to prove to the Purchaser that each equipment of the plant complies with requirements stipulated and is erected in accordance with requirements. Before the plant is put into trial operation the Tenderer shall be required to conduct tests to demonstrate to the Purchaser that each item of the plant is capable of correctly performing the functions for which it was specified.

These tests may be conducted concurrently with those required under commissioning sequence.

10.05 Acceptance Tests

After erection of the equipment at site acceptance test shall be conducted in accordance with latest codes or any other approved equal international standards. A detailed test procedure shall be prepared and submitted to the Purchaser / his Consultant for approval at least one month prior to testing. All instrument and accessories for the test shall be arranged by the Tenderer.

10.06 Definitions

a) Mechanical Completion

When all the design and engineering is completed, all factory inspection tests have been completed, all the building work has been completed, all equipment and machinery are installed and aligned all piping and instrumentation work is completed, all hydrostatic / pneumatic testing is done, speed and direction of rotation of all prime movers is checked, relays are set and all scales, meters, measuring devices and recorders are calibrated, all operating procedures and maintenance procedures have been forwarded to the purchaser for review, all items for which Contractor is responsible for obtaining third party, regulatory or purchaser's approval have been obtained and confirmation documentation has been provided to the purchaser, the Tenderer shall notify purchaser in writing that the plant is ready for occupation in all respect and is ready to start.

b) Preliminary Acceptance

Preliminary Acceptance of the Facilities means that the Facilities have been completed operationally and structurally and put in a tight and clean condition, and that all work in respect of Pre-commissioning of the Facilities have been completed.

c) Pre-commissioning Activities

Pre-commissioning means the checking, testing including conducting of integrated trial runs (cold integrated trial runs in case of Facilities involving operation at high temperature) and meeting other requirements specified in the Technical Specifications that are to be carried out by the Tenderer in preparation for Commissioning.

Pre-commissioning activities are required to be performed after erection / installation, hydro testing, etc. of an equipment / system to make them ready for commissioning. This shall include but not limited to the activities like system checking as per P & I drawings, site modification, inspection of equipment, calibration of instruments, loop checking, checking of the electrical equipment for proper earthing, continuity, insulation resistance, primary and secondary injection test of relays after insulation resistance, conducting operability test on individual equipment / systems, supply and charging of lube oil and other chemicals, complete checking of the safety system, removal of all debris and construction equipment from site, etc. Fabrication and supply of such temporary facilities as for example, temporary bypasses, spools, blinds, jump over, vents, etc., which shall be required to carryout pre-commissioning activities are to be provided by the tenderer.

d) Ready for Commissioning

The plant shall be considered "Ready for Commissioning" when all the facilities have been completed along with its auxiliaries and support facilities in every respect including charging of lube oil, any last minute modifications as recommended by the Purchaser / Consultant, all temporary structures, scaffolding, etc. used for carrying out pre-commissioning works have been removed, all the blinds / blanks have been put in position as required by process, all systems as recommended have been purged and pressurized, and the plant has reached to a stage of ready for commissioning and acceptable to the Purchaser / Consultation.

The Tenderer shall issue a certificate of "Ready for Commissioning" of plant, for acceptance by Purchaser.

e) **Commissioning** means operation of the facilities by the Tenderer to a level of output not less than 66% of the Guaranteed Production Capacity.

f) **"Taking Over"** means, on commissioning, the Purchaser shall be responsible for the care & custody of the Facilities together with the risk of loss or damage thereto, and shall thereafter take-over the Facilities.

g) **"Performance Guarantee Test"** means the test(s) specified in the Technical Specifications to be carried out to ascertain whether the Facilities are able to attain the Performance Guarantees specified in Clause no. 11.02.01.

h) **"Final Acceptance"** shall occur in respect of the Facilities when:

i) The performance guarantee tests have been successfully completed or the amount of Liquidated Damages, if recoverable, has been recovered by the Purchaser from the Tenderer.
ii) The Tenderer has submitted all final drawings & documents for the respective Facilities including As-Built.
iii) The Tenderer has fulfilled all the obligations under the Tender.

10.07 Pre-commissioning & Commissioning

Tenderer shall be responsible to carry out pre-commissioning and commissioning of complete Plant and equipment supplied. Tenderer shall document elaborating different activities with schedule for pre-commissioning and commissioning. The document shall cover the following as minimum.

i) Description of facilities / Equipment layout drawings with clear legends
ii) Start up procedures
iii) Normal operation procedures
iv) Shut down procedures (normal / emergency)
v) Operating parameters and set points of different alarms and trips.
vi) Summary of utilities consumption (normal & maximum)
vii) Lubrication schedules and identification of equivalent available in India.
viii) Fire and safety system.

The manual shall have the following attachments as a minimum :

i) Reduced size copies of line lists and valve schedules
ii) Equipment and instrument data sheets
iii) Electrical single line diagram
iv) Area classification drawings
v) Pump characteristics curves
vi) Piping and instrumentation diagrams
vii) All shut down schemes
viii) Safety logic diagrams
ix) Recommended proforma of log books for major equipment

10.08 Commissioning

It shall be the responsibility of the Tenderer to carry out the commissioning activities of the plant (after successful mechanical completion and pre-commissioning activities duly witnessed by the Purchaser / Consultant), under

necessary guidance and overseeing of Licensor, if any.

One month in advance of starting the commissioning, the Tenderer shall submit proposal to the Purchaser giving details of the programme to be followed during commissioning. This shall be checked by Purchaser / Consultant. Tenderer shall depute trained operation team to carry out plant start up and commissioning and process operations and maintenance under the overall guidance of the Purchaser / Consultant. Tenderer also be required to associate Purchaser's operation and maintenance personnel in all the day to day pre-commissioning, commissioning, maintenance activities and process operations. However, responsibility for adequate manning and commissioning of the plant shall be that of the Tenderer.

The plant shall be considered to be commissioned successfully when all the systems, with instrumentation / control systems, process utilities and support systems have been on uninterrupted stable operation at rated parameters, under specified conditions for not less than 72 hours. Whether the 72 hours operation has been successful or not, shall be decided by Purchaser based on observations recorded during the 72 hours. The count down for the 72 hours operation shall start only after the plant has been on stable operation with all controls and safety system in normal operation for a period of not less than 24 hours.

10.09 Acceptance & Handing over

a) The Tenderer shall supervise the Acceptance Tests to ensure that the plant and equipment supplied by them meet Purchaser's system requirement.

b) Acceptance Test for system, equipment and pipelines covered in this specification shall be conducted unit wise or group wise within a reasonable period after the completion of erection work which shall be mutually agreed upon.

c) Commissioning certificate of the plant as a whole shall be issued only after complete facilities have been commissioned and satisfactory operated for a period of 72 hours continuously at required parameters at rated output.

d) Any defects found in the supplied plant & equipment during commissioning shall be rectified by the Tenderer at his own cost failing which the Purchaser reserves the rights to take remedial measures at the Tenderer's cost or reject the plant and equipment as deemed necessary.

After successful commissioning of the plant and equipment, there shall be formal handling over and taking over of the plant between Tenderer and the Purchaser. Final

taking over certificate shall not be issued unless Purchaser is fully satisfied with the supply work in every respect as per requirement and all documents, drawings, manuals, etc. are furnished by the Tenderer as per the terms of the technical specification.

10.10. **Deputation of experts for Erection, Commissioning and Performance Guarantee Tests**

The Tenderer shall depute site Engineers / Specialists from various disciplines for erection, commissioning, testing and performance guarantee tests of the Plant and equipment with their auxiliaries in addition to the complete team of personnel posted for carrying out site activities.

If some of the experts deputed for erection, commissioning and Performance Guarantee Tests are required by the Purchaser beyond the contract period, the Tenderer shall provide such services in accordance with the terms and rates to be agreed upon between the Purchaser and the Tenderer.

10.11. **Manufacturer**

It shall be the responsibility of the Tenderer to arrange to get service of Manufacturer's installation / commissioning engineer at site during mechanical completion / commissioning of all the major equipment and systems for the plant.

The Tenderer shall plan availability of personnel / experts indicated above, well in advance to match with the requirement. Also the Tenderer shall ensure the continuity for concerned experts / personnel till completion of the work. Short time deputations of different persons shall be avoided.

10.12. **Spares and Consumables**

The Tenderer shall be responsible for the supply of all spares till the plant is handed over to the Purchaser. In addition to this, itemized price list for two years **spares** for operation of plant shall be supplied by the Tenderer to the Purchaser.

The Tenderer shall be responsible for supply of all the consumables for startup and commissioning till the plant is handed over to the purchaser.

11.00 PERFORMANCE GUARANTEE & LIQUIDATED DAMAGE

11.01 Performance Tests

The successful Tenderer shall conduct Performance Guarantee Tests (PGT) of the compressors in unit wise manner. Duration of tests shall be as mentioned below:

i) Duration of test run of Individual compressor shall be 72 hours.

The objective of performance test of the Natural Gas Compressors shall be to establish:

Natural Gas delivery capacity, discharge pressure and temperature, power consumption of each compressor. Each compressor shall be run and be tested for all the interlocks, audio-visual alarms & trips etc. All the test for compressors shall be carried out as per relevant codes.

11.02 Guarantee

11.02.01 Guarantee Parameters

Table – 11.01

Performance Guarantee under Demonstration

Sl. No.	Description	Parameter (Guaranteed)	Tolerance
1.	Rated Capacity	1.25MMSCMD	**No negative tolerance Acceptable**
2.	Rated discharge pressure at the outlet of after cooler	55 kg/cm^2(g)	**No negative tolerance Acceptable**
3.	Discharge temperature after after-cooler at rated capacity and pressure	55^0 C	**No positive tolerance Acceptable**
4.	Power consumption of each compressor at the above rated conditions of compressor as measured at PLC/DCS in the control room.	To be indicated by the Tenderer	**Acceptable upto 2% above the guaranteed value for each compressor with LD as per clause no. 11.02.02**

In case of non achievement of the above guaranteed parameters, the successful Tenderer shall carry out all rectification works at his own cost. Even after two such consecutive rectification works, particular equipment fails to achieve the guaranteed parameters, it will be assumed that the plant and equipment supplied is defective in its design and the Purchaser may reject the Facility and recover the entire cost paid to the Tenderer or alternatively the Purchaser may proceed for commercial settlement with the Tenderer for acceptance of the Facilities at the negotiated Price.

11.02.02 Liquidated Damages (LD)

The power consumption of running compressors shall be measured at PLC/DCS in the control room.

For each kWh or part thereof increase in power consumption above the guaranteed value of all the running compressors, penalties will be applicable at the rate of Rs. 5,51,660 per kWh.

LD shall be applicable for worst performance of running compressors.

In case of power consumption increases above 2% of the guaranteed value for each of the running compressor, the Tenderer shall be advised for necessary rectification works at his own cost. Even after two such consecutive rectification works, particular equipment fails to achieve the guaranteed power consumption, it will be assumed that the plant and equipment supplied is defective in its design and the Purchaser may reject the Facility and recover the entire cost paid to the Tenderer or alternatively the Purchaser may proceed for commercial settlement with the Tenderer for acceptance of the Facilities at the negotiated Price.

12.00 DRAWINGS / DOCUMENTS / INFORMATION TO BE SUBMITTED ALONG WITH THE TENDER

i) Layout showing locations of all the equipment/ system/ facilities and cross sectional view of each major equipment/ system including dimensions.

ii) System scheme, Process Flow Diagrams and P & I diagrams

iii) Descriptive information, catalogues, drawings etc. of all equipment offered under these specification and pertinent engineering data as per Technical particulars so that Purchaser/ Consultant may have full and complete knowledge/assessment of equipment offered.

iv) A detailed experience list about supply and execution of similar type of plant by the Tenderer.

v) A comprehensive write up or brochures on details of manufacture and testing facilities and quality control procedures in the shops of the manufacturer/supplier.

vi) Layout of various services including pipelines, cabling, power supply distribution, etc. indicating terminal points.

vii) Technical particulars as per Chapter-15**.**

viii) List of O&M spare parts for two years of operation.

ix) List of commissioning spares.

x) List of tools and tackles for repair and maintenance.

xi) Schedule of submission of drawings for Purchaser's/ Consultant's approval.

xii) Schedule of design, manufacture, shop testing and delivery at site.

xiii) Any start-up, shutdown or operating restrictions required to protect the integrity of the equipment.

xiv) Any limitations of vendor’s test facilities to carry out the specified tests.

13.00 DRAWINGS/ DOCUMENTS TO BE SUBMITTED AFTER PLACEMENT OF ORDER

13.01 General

13.01.01 The Tenderer shall furnish a comprehensive programme of submission of drawings for Purchaser's approval. Submission of drawings shall commence within two weeks after placement of order and shall be completed keeping in view the overall completion schedule of the project.

13.01.02 The Tenderer shall submit requisite number of sets of all the drawings, documents, performance curves and manuals for Purchaser's approval, records and use. After erection of equipment the Tenderer shall submit all final and as-built drawings.

13.01.03 The Tenderer shall observe strict logical sequence in submission of drawings for Purchaser's approval. The drawings shall be fully dimensioned and complete to the extent that may facilitate Purchaser's approval in conjunction with other drawings submitted earlier by the Tenderer. Each set of drawings submitted for approval shall be accompanied by detailed bill of materials giving quantity, material specification, unit and total weights and applicable standard code in respect of each item.

13.01.04 Shop test certificates, test reports and curves for various pumps, motors and equipment shall be submitted for approval before clearance for despatch of equipment.

13.02 Submission of Drawings

Following drawings/documents shall be submitted in soft copy within four weeks from the date of placement of order for Purchaser's approval/information/further working.

13.02.01 Technological

Drawings / documents for approval

1. List of drawings with schedule of submission (Technological, Mechanical, Electrical, Instrument & Control, etc.) within four weeks from the date of placement of order.

2. QC & QA plan.

3. Equipment layout drawing showing the location of Plant & equipment & its auxiliaries, pipelines, ducts, trenches, etc. (plan and cross section) within four weeks from the date of placement of order.

4. G.A. and Cross Sectional drawings indicating the following:-

- Outline dimensions (minimum three views) (all principal dimensions).
- Location (in all three planes), size, type, rating and identification of all hook-up / interface connections including those of vents, drains, fuel, cooling water & electrical / instrumentation.
- Direction of rotation viewing from the driving end.
- Weight of each assembly / component.
- The weight & location of centre of gravity of the heaviest assembly / components that must be handled for erection.
- Identification and weight, dimensions of the heaviest assembly / subassembly / component required to be handled for maintenance.
- Maintenance clearance and dismantling clearances.
- Speed
- Layout of auxiliary equipment and operating platform.
- Make Type and Size of couplings and the location of guards.
- A list of reference drawings, if any.
- Material of construction
- Bill of material
- Specification
- A list of any special weather – protection and climatic features.

5. Foundation Drawings

A foundation drawing shall indicate complete information required for foundation design including the following:

i) Foundation bolt sizes, pocket sizes and locations.
ii) Grouting thickness and other necessary technical details.
iii) Static weight of each skid / independently grouted item and location of center of gravity of each of such skid / items in all three planes.
iii) Weight distribution for each bolt / sub-sole plate location and total static weight.
iv) Dynamic loading caused due to various items grouted independently.
v) Maximum permissible amplitude of vibration of the foundation at base level.

vi) Suggested dynamic factor and ratio of foundation weight to weight of skid / equipment as per vendor experience.

6. Field Alignment Diagram

The diagram shall indicate the relative displacement to be kept between the centerlines of various equipment at the time of installation, so that under normal running conditions the equipment get fully aligned.

This relative displacement should be decided on the basis of centerline temperature rise data of drive, gear box / transmission system, driven equipment.

7. Flexibility analysis of pipelines with isometric drawings as applicable.

8. Schedule and Specification of pipes, valves, pipe fittings, thermal insulation, etc.

9. Final design calculations and assumptions.

10. Actual performance data based on the testing at site.

11. Technical specifications of major Plant & equipment and all other accessories.

12. System scheme, Process Flow Diagrams and P & I diagrams indicating battery limits.

13. Characteristics curves of all the equipment.

14. Final list of drawings.

15. As built drawings.

Technical document for Reference / Information

1. Civil foundation drawings with static & dynamic load data of all equipment indicating cable trench, pipe trench, conduits, inserts, cable entries to motors, field devices etc.

2. Technical literature and catalogue of bought out items.

3. Drive list.

4. List of special tools & tackles to be supplied

5. Test certificates.

- Material test certificates of all equipment & their components
- Hydrostatic test certificate of valves, pipes, shells, fittings, etc.
- Static and dynamic balancing of all rotor parts / equipment as applicable.
- Shop test performance data of Plant & Equipment, etc.

6. Part number and description of all spare parts.

7. Installation, operation & maintenance manual.

8. Reproducible of all final drawings.

10. Total list of all equipment with dispatch schedule.

11. All other relevant drawings / documents / certificates not specifically mentioned above but deemed essential for successful functioning of the equipment.

13.02.02 **Electrical**

As per Electrical specification**. (Chapter –05)**

13.02.03 **Instrumentation**

As per C&I specification**. (Chapter – 06)**

13.02.04 Please refer to the chapters on various facilities/systems for the list of drawings to be submitted after award of the contract and submit these drawings accordingly.

13.03 **Submission of Operation & Maintenance Instruction Manuals**

The Tenderer shall furnish 12 sets of operation and maintenance instruction manuals meeting the following requirements :-

a) Instruction manuals shall present the following basic categories of information in practical, complete and comprehensive manner prepared for use by operating and/or maintenance personnel.

- Instruction for initial installation

- Instructions for operation, maintenance, repair and safety regulations.

  - Ordering information for all replaceable parts.

  - Lubrication chart.

- Recommended inspection points/ areas and period of inspection.

b) Information shall be organised in a logical and orderly sequence. A general description of all systems and equipment including detailed drawings identifying parts / items and significant technical characteristics shall be included to familiarise operating and maintenance personnel with the equipment.

c) A parts list shall be included showing nomenclature, manufacturer's part numbers and/ identification and ordering of replaceable parts.

d) Instruction and parts list shall be clearly legible and prepared on good quality paper. Instruction manuals shall be securely bound in durable folder.

e) If a standard manual is furnished covering more than the specific equipment purchased, the applicable model(or other identification) number, parts number and other information for the specific equipment purchased shall be clearly identified.

f) Instruction manuals shall include list of all special tools and tackles furnished with complete drawings and instructions for use of such tools and tackles.

14.00 LIST OF PREFERRED MAKES

The makes of various equipment and supplies in respect of imported or indigenous equipment/components/materials are listed out in this document. It is essential that the equipment/component/materials to be supplied from imported or indigenous sources by the Tenderer will be of any one of the makes listed against that particular equipment/ component/material in this document.

In case the Tenderer intends to substitute any particular make of equipment / components/ materials by a make other than that listed in this document, the Tenderer shall clearly bring out the same in his offer along with justification and indicate the alternative makes offered by him. It will be prerogative of the Purchaser to accept or reject the alternative makes so offered.

If any items are not mentioned in the list provided herein but the same are required to complete the system, the said make of that item should have been already used in Oil & Gas Industrial Installations (Refinery/Gas Compressor Complex/POL Terminals of PSUs). Only in such cases the same makes of that item shall be acceptable subject to approval of Purchaser after submission of Performance Certificate of End User especially for equipment to be located in Hazardous Area.

14.01 Valves for Natural Gas, Nitrogen, Instrument Air

Item Description		Manufacturers
CS, FS, SS Valves (Gate, Globe, NRV)	:	L&T (Audco Div), Fouress, BHEL, KSB, GM Dalui, Leader, BDK, NECO, Associated Tooling, Hawa Egr., Vass Ind, Advance Valves, Kalpana Valves.
CI, CS, SS & FS Plug Valves	:	Vass Ind., Xomox, Virgo, BDK, Leader, Steam and Mining, GM Dalui, H.Sarkar, Audco
Ball Valves	:	Audco, Vass Ind, KSB, BDK, Microfinish, Niton,AL Saunders, Xomox, Virgo, United Engineers, Steam & Mining, Hi-Tech B.Valves
GM Valves	:	Bombay Metals, GM Dalui, Leader, NECO, Kalpana Valves
Butterfly Valves	:	Audco, Fouress, Kirloskar Brothers, IVPL, Inter Valve, Virgo, AL Saunders, Keystone, BDK, Leader, AVC Engg., Crowley & Ray, Xomox, Tyco, Hi-Tech.
Diaphragm Valves	:	AL Saunders, Fluid System, Leader, BDK, Xomox, Steam & Mining
Pressure Control Valve/Pressure Reducing Valve	:	JNM, Fouress, Bestobell, IL, Mazda, Nirmal Ind., Vanaz, Kosan Metal, Vass Ind., RK Control, Fluid Line, Forbes Marshal, Leader.
Large Diameter Goggle Valve	:	Audco, Fouress, Cimmco, L&T

Fabricated Gate Valves	:	Fouress, Cimmco, BECO, Beekay, L&T, Kalpana Valves
Safety Relief Valve (Pressure relief Valves)	:	BHEL, Keystone, Bliss Anand, L&T (Audco Div.), Sempell, Fainger, Leser Valves (P) Ltd., IL, Anderson, Kosan.

14.02 Natural Gas Facility & Compressed Air Equipment

Item Description		**Manufacturers**
SS Bellows Expansion Joints	:	Flexican, Flexatherm, SURR Ind., Pressel (Cuttack), BD Engr., Eludyne Engr., SPB, SEPL, PEBI, Lonestar, GBM Mfg., TI Flexible Tube.
Air Compressors	:	Ingersoll Rand, Atlas Copco, KG Khosla, Kirloskar Pneumatic, Chicago Pneumatic, Mannesman Demag, Eliat, Cooper, Sulzor, Corken (USA)
Hoses	:	Flexican, Gaytri Industrial Corpn., Inalsa, Teksons, Sudeep Industries, Markwell
Air Drying Uuit	:	Chemech, Cleanair, Delair, Indcon, Mellcon, Mirch Mirex, Gasoenergy System Pune.
Trap & Strainer for Compressed Air	:	Uniklinger, ESCO, JNM, Dryton Greaves, Forbes Marshall, Hawa Engrs., Mazda
Electrical Actuators		AUMA India, Beacon Rotork Controls, Continental Profiles, Emtork Actuators, Limitorque
Pneumatic Actuators		Marsh Engg., Keystone, IL, Massoneilan, EL-O-MATIC, Virgo, AL Saunder, L&T, Flocan

Heat Exchanger (Shell & Tube Type)		BHPV, Kaveri, Texmaco, Thermax, Babcock & Wicox, Parkair Engg., Rhine, Universal Heat Exchanger, Godrej, L&T, GEI Godavari, Patel Air Temp., Hindustan Radiaton
Control Valves	:	Blue Star, Fouress Engg., IL, JNM, Mazda, Forbes Marshall
Pressure Vessel & Tanks	:	Beekay Engg., BHPV, ISGEC, Kaveri Engg., TSL, Lloyds Steel, Mukand, Parkair Engg., Grasim Industries, Anup Thermal System, Texmaco, SV Tank, Grasim Industries, Hyderfuel Industries.
Thermal Insulation	:	Hyderapad Industries, Lloyds Insulation, Rockwool, Thermax Heat Tracers, U.P. Twiga Fibreglass.

14.03 **Pipes & Fittings for Natural Gas Facilities and Instrument Air Facilities**

Item Description		**Manufacturers**
SW/SAW, ERW/EFW MS Pipes	:	SAIL, BHEL, TISCO, Jindal, Ajanta, Zenith, Saw Pipes, Welspun, Man Industries, Surindra Engg., Maharastra Seamless, Indian Seamless, BST, Advance Steel, Good Luck, Indus Tubes, Mukat, Lloyds, Poonam Enterprises, Soor Neogi Koumar.
SS Pipes / SS Fittings	:	Heavy Metal Tubes, Nobel Tubes, Rajendra Mech. Ind., Sterling Supply Agency, Vitrag, SAIL, Poonam Enterprises, N.L.Hazra, M.S.Fittings
Seamless, Stainless Steel Pipes/Tubes	:	Amardeep Steel, Choksy Tubes, MJ Patel, Nagardas Kanji, Poonam Enterprises, Sandulk Asia, MEC Tubes, Nagardas & Kusai, Noble Tubes, Allied Steel, Kamlesh Tube, Menilal & Bro, Uday Tubes, SAIL, Maharastra Seamless (P) Ltd, Imperial Steel,

		Soor Neogi Koumar.
Fittings for the above Pipes/Tubes	:	EBY Ind., High-Tech, Hydro technic, Hydro-Air Engg., Project Toolings, Shivananda, M.J.Patel, Nagardas & Kusai, MEC Tubes, Nobles Tubes, Amardeep Steel, Allied Steel, Kamlesh Tube, Menilal & Bros, Poonam Enterprises, N.L.Hazra, M.S.Fittings
RCC Pipes & Fittings	:	SUR Industrial Pipes, Hind Ceramics, Indian Hume Pipes, Daya Cuncrching.
HDPE Pipes & Fittings	:	EMCO, KWH Heliplastic Polyolefins, Oriplast
PVC Pipes & Fittings	:	Oriplast, Finolex, Bharat Pipe & Fittings, Supreme Industries.

14.04 Diesel Generating Set

Diesel Engine : Mitsubishi, MTU, Germany, Caterpillar, Wartsilla, Rolls Royce (Bergen), Man Diesel, Perkins Cummins, Ashok Leyland, Ruston, Kirloskar, Crompton Greaves

Alternator: Stamford, AVK-SEG, ABB, BHEL, Leroy-Somer, Toyo Denki Power System (TDPS), KIRLOSKAR ELECTRIC, JYOTI, AWK, JAKSON

14.05 Water System

Sl. No.	Item Description	Manufactures
1.	Submersible pump-motor set for bore-well	KSB, SU Motors, Kirloskar Brothers, WILO (M&P), Grundfoss, Darling
2.	Horizontal centrifugal Pumps	Kirloskar Brothers, KSB, Beacon Weir, WPIL, WILO (M&P), Sam Turbo, Grundfoss
3.	Vertical centrifugal pumps	Kirloskar Brothers, WILO (M&P), KSB, Su Motors, Grundfoss
4.	Diesel engine for pumps/fire	Cummins, Kirloskar, Ashok Leyland, Caterpillar, Greaves

Sl. No.	Item Description	Manufactures
	water pumps	
5.	CS valves (gate, NRV)	L&T Valves, Kirloskar Bothers, Intervalve, S&M industrial valves pvt. Ltd, Advance, Del val, BDK, Microfinish
6.	Ball valves	L&T Valves, Kirloskar Bothers, Intervalve, S&M industrial valves pvt. Ltd, Advance, Del val, BDK, Microfinish
7.	Butterfly valves	L&T Valves, Kirloskar Bothers, Intervalve, S&M industrial valves pvt. Ltd, Advance, Del val, BDK, Microfinish, Valve Tech Industries (VTI)
8.	Air release valve	Leader valve, Kalpana Valves, Kirloskar Bothers
9.	Pipe- MS/GI	SAIL, TATA, Jindal, MAN, SAW, Welspun, Prakash, PSL Limited, MSL
10.	MS/GI pipe fittings	Tube bends, Engineering service enterprises, MS fittings manufacturing pvt. Ltd., NL Hazra & sons
11.	Rubber expansion joints	Cori Engineers, BDX, Aphrodite polyprene pvt. Ltd.,
12.	Cooling Tower	Paharpur Cooling Towers Ltd Paharpur House, Southern Cooling Towers Pvt. Ltd., Hamon Cooling Systems Pvt. Ltd.,
13.	Chemical Dosing System	M/s Thermax, M/s Nalco Chemical India Ltd.,M/s Ion Exchange

14.06 ELECTRICAL

A) Power Distribution Equipment

SL. NO.	EQUIPMENT	PREFERRED MAKES
1.	TRANSFORMERS	
a)	POWER TRANSFORMER (OIL TYPE) (33/6.6 kV)	ABB / SCHNIEDER / CGL / BHEL / BHARAT BIJLEE / VOLT AMP/TRANSFORMER RECTIFIER
b)	ONLOAD TAPCHANGER	EASUN MR/ MR GERMANY/ BHEL/ CTR
C)	DRY TYPE TRANSFORMER	ESSENAR / VOLTAMP / ABB/RAYCHEM RPG
2.	ACSR	HINDUSTAN/LUMINO/OMEGA CABLES/CABCON
3	INSULATORS	ALSTOM/ BHEL/ / WS INDUSTERIES/ JAYSHREE INSULATORS(BIRLA)/ ASSOCIATED PORCELEIN
4.	HT SWITCHBOARD (33 kV &6.6 kV)	SIEMENS/ABB/SEIL/BHEL
6.	NEUTRAL GROUNDING RESISTOR	RSI/ PEFFCO/RESITECH/NARKHEDE
7.	HT SOFT STARTER(REACTOR BASED)	JAYSHREE/ELTECH/INNOVATIVE
8	HT CAPACITORS	ABB(HITACHI)/ UNISTAR (UNIVERSAL CABLES)/ BHEL/ /EPCOS
9	REACTOR (AIR CORE)	QUALITY POWER ELECTRICALS EQUIPMENTS LTD./ SHRIHANS ELECTRICALS/ CGL/ BHEL
10	33 kV/6.6 kV ISOLATOR/ DISCONNECTING SWITCHES R	HIVELM-INDUSTRIES/SIEMENS /CGL/ ALLIENCE/PANIKKAR/A BOND STAND
11	OUTDOOR CTS/PTS	ABB/BHEL/CGL/MEHRU/TELK/PRAGATI

SL. NO.	EQUIPMENT	PREFERRED MAKES
12.	OUTDOOR LIGHTNING ARRESTORS	ELPRO(SIEMENS)/JAYSHREE/LAMCO/OBLAM/ WSI
13.	SAS /POWER SCADA	SIEMENS/ABB/SCHNIDER
14.	BATTERY	
a)	NICKEL - CADMIUM	AMCO / HBL NIFE
b)	VALVE REGULATED LEAD ACID MAINTENANCE FREE BATTERY (VRLA)/ SMF	HBL NIFE / AMARARAJA / EXIDE
c)	BATTERY (PLANTE)	EXIDE
15.	BATTERY CHARGER/ DCDB	CHHABI / HBL NIFE/ CALDYNE / AMARA RAJA / CHLORIDE
16.	PROTECTIVE RELAYS	ALSTOM/SEIL / ABB / SIEMENS
17.	AUXILIARY RELAYS	ABB / ER / SIEMENS / ALSTOM/SEIL
18.	HEAT SRINKABLE & COLD SRINKABLE CABLE JOINTING KITS/ STRAIGHT THROUGH JOINTS (H.T)	RAYCHEM / 3M
19.	METER (ANALOGUE TYPE)	IMP / AE / MECO / L&T / RISHAVH
20.	CURRENT TRANSFORMERS & POTENTIAL TRANSFORMER (INDOOR)	ABB / PRAGATI / SEIL/SIEMENS/ECS
21.	DIGITAL TYPE MULTIFUNCTION METER	SCHNIDER / L&T / SECURE / ER / RISHAVH
22.	SOLAR MODULES	TATA BP SOLAR (I) LTD. , REIL JAIPUR, CEIL SAHIBABAD, HBL POWER
23.	SOLAR CHARGE CONTROLLER	HBL POWER SYSTEMS LTD. , UNIVERSAL INSTRUMENT MGF CO PVT LTD BANGALORE, SIGNOTRON (INDIA) PVT LTD KOLKATA
24.	SOLAR PCU / INVERTER	DELTA ELECTRONICS, ABB LTD, KACO, SMA, SCHNEIDER

B. LV EQUIPMENT

SL. NO.	EQUIPMENT	PREFERRED MAKES
1	LT AIR CIRCUIT BREAKERS	L&T/ SIEMENS/ SCHNEIDER/ ABB/ GE POWER CONTROL/
2	MOULDED CASE CIRCUIT BREAKER (MCCB)	SCHNEIDER (MG)/ L&T/ ABB/ SIEMENS/ GE POWER CONTROL / BCH
3	MOTOR PROTECTION CIRCUIT BREAKERS. (MPCB)	SCHNEIDER/ L&T/ ABB/ SIEMENS/ GE POWER CONTROL
4	MINIATURE CIRCUIT BREAKER. (MCB)	SIEMENS/ L&T/ GE POWER CONTROL/ SCHNEIDER (PROTEC / MG)/ STANDARD/ INDOASIAN/ HAVELLS/ MDS (LEGRAND)/ ABB
5	EARTH LEAKAGE CIRCUIT BREAKER / RCCB	GE POWER CONTROL/ STANDARD/ HAVELLS/ ABB/ SIEMENS/ SCHNEIDER/ MDS (LEGRAND)/L&T/INDOASIAN
6	HRC FUSE FOR LT APPLICATION	GE POWERCONTROL/ L&T/ SIEMENS/ INDO ASIAN/ HAVELLS/ STANDARD/ BUSSMAN/ CONTROL & SWITCH GEAR/ ABB/ AREVA
7	POWER CONTACTOR / AUX. CONTACTORS	ABB/ SIEMENS/ SCHNEIDER (TELEMECANIQUE)/ L&T/ GE POWER CONTROL/ CONTROL & SWITCHGEAR/ BCH
8	VACUUM CONTACTOR	SIEMENS/ L&T/ ABB/ SCHNEIDER
9	ELECTRONIC OVER LOAD RELAYS	SIEMENS/ L&T/ BCH/ SCHNEIDER-SAMWHA/ LG
10	THERMAL (BIMETALLIC) OVER LOAD RELAYS	BCH/ L&T/ SEIMENS/ SCHNEIDER(TELEMECANIQUE)/ ROCKWELL AUTOMATION/ ABB/ CONTROL & SWITCHGEAR/ GE POWER CONTROL
11	MASTER CONTROLLER (STEP CONTROL TYPE)	EPCC/ INDUSTRIAL SYNDICATE/ STROM KRAFT/ SCHNEIDER (SQUARE D)/ SCHNEIDER (TELEMECANIQUE)/ ELECTROMAG/ SPEED O CONTROL

SL. NO.	EQUIPMENT	PREFERRED MAKES
12	RESISTANCE BOXES (FECHRAL EDGE WOUND)	EPCC/ ELECTROMAG/ BCH
13	ELECTROMAGNETIC DC BRAKE ASSEMBLY	EPCC/ BCH / INDUSTRIAL SYNDICATE
14	LT BUS-DUCT	STARDRIVE/ ECC/ GEPOWER / CONTROL & SWITCHGEAR/ UNITED ELECTRIC/ UNILEC ENGINEERS

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
C. POWER CONTROL / ELECTRONICS & AUTOMATION ITEMS		
1	SOFT STARTERS	ABB/ ROCKWELL AUTOMATION/ BHEL/ SIEMENS/ INNOVATIVE TECHNOMICS/ SCHNEIDER (Only for LT motor)
2	VVVF DRIVES	
	1. FOR LT MOTORS	ABB/ BHEL/ SIEMENS/ NELCO (HITACHI)/ VACON/ SCHNEIDER/ L&T (YASKAWA)/ ROCKWELL AUTOMATION/ TMEIC/ AMTECH/EUROTHERM
	2. FOR HT MOTORS MV DRIVE/ HI- LO-HI DRIVE	ABB/ ROCKWELL AUTOMATION/ BHEL/ SIEMENS/ CONVERTEAM (UK)/ TMEIC.
3	ROLLING MILL MAIN DRIVE VFD	SIEMENS/ABB/CONVERTEAM/ALSTOM/TMEIC GE/H ITACHI/ROCKWELL
4	UPS	EMERSON/DB-ELECTRONICS/ NUMERIC/ GE/ LIFELINE/ FUJI/ HI-REL
5	DIGITAL TYPE MULTI-FUNCTION METER	CONSERVE/ L&T/ SECURE/ RISHABH/ SIEMENS/ ABB
D. PANELS & PANEL COMPONENTS (LOW VOLTAGE)		

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
1	POWER CONTROL CENTRES	SIEMENS / L&T / SCHNEIDER / GE POWER
2	INTELLIGENT MCC (Drawout / Non- drawout with intelligent controller of approved make) / CONVENTIONAL DRAW-OUT MCC	SIEMENS / L&T / SCHNEIDER ELECTRIC / ABB * / GE POWER CONTROL*
3	INTELLIGENT CONTROLLER FOR INTELLIGENT MCC	SIEMENS / SCHNEIDER/ L&T/ ROCKWELL AUTOMATION
4	CONVENTIONAL NON DRAW OUT TYPE MCC / POWER DISTRIBUTION BOARDS (PDB) / ROLL TABLE DISTRIBUTION BOARDS	VENUS/ ANDREW YULE/ BCH/ SCHNEIDER ELECTRIC/ HAVELLS/ STANDARD/ TRICOLITE/ ADVANCE POWER CONTROL/ HINDUSTAN CONTROL/ CONTROL & SWITCHGEAR/ L & T/ SIEMENS/ GE POWER CONTROL/ ABB/ SWITCHING CIRCUITS/ KMG A TO Z SYSTEMS/ SEN & SINGH ENGINEERS/ MEDITRON
5	MAIN LIGHTING DISTRIBUTION BOARD (MLDB)/ SUB LIGHTING DISTRIBUTION BOARDS (SLDB)/ LOCAL CONTROL STATIONS	VENUS/ ANDREW YULE/ BCH/ SCHNEIDER ELECTRIC/ HAVELLS/ STANDARD/ TRICOLITE/ ADVANCE POWER CONTROL/ HINDUSTAN CONTROL/ CONTROL & SWITCHGEAR/ L & T/ SIEMENS/ GE POWER CONTROL/ ABB/ NGEF/ SWITCHING CIRCUITS/ KMG A TO Z SYSTEMS/ SEN & SINGH ENGINEERS/ TECHNO-COMMERCE/ POWER & PROTECTION/ ADLAC SYSTEM/ ECC/ MEDITRON/ CONTROL DEVICES/ TECHNOCRAT ENTERPRISES/ MDS
6	MIMIC PANELS & ANNUNCIATION PANELS	L&T/ ADVANI OERLIKON/ GE POWER CONTROL/ BHEL/ BCH/ TRANSRECT/ MINLEC/ TIRUPATI ELECTRONICS/ ADVANCE POWER CONTOL/ CONTROL DEVICES

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
7	CURRENT TRANSFORMER (LV)	ABB/ JAYSHREE/ PRAGATI/ KAPPA/ INTRAVIDHYUT/ INDCOIL/ PRECISE
8	INDICATING LAMPS	BINAY/ SIEMENS/ L&T/ ESSEN/ BCH/ VAISHNO/TECNIC/OSRAM/ TELEMECANIQUE/ AREVA/ ESBEE
9	PUSH BUTTONS	SALZER/ BCH/ L&T/ SCHNEIDER/ SIEMENS/ GE POWER/ VAISHNO/ CONTROL DEVICES/ ESSEN/ TECNIC/ CONTROL & SWITCHGEAR
10	TERMINAL BLOCKS	EPCC/ ELMEX/ PHOENIX CONTACT/ CONNECT WELL/ ESSEN DEINKI/ WAGO/ LAPP/ S&S/ HANSEL
11	SELECTOR SWITCHES & CONTROL SWITCHES	ABB/ GE POWER CONTROL/ BCH/ EPCC/ KAYCEE/ SIEMENS/ TEKNIK/ L&T/ CONTROL & SWITCHGEAR/ AREVA/ VAISHNO/ JYOTI/ SALZER
12	CRANE CONTROL PANEL (ABOVE 50	SIEMENS / ABB / SCHEIDER / L&T
E. <u>MOTORS</u>		
1	LT AC CRANE DUTY MOTORS	MARATHON/ KEC/ CGL/ SIEMENS/ ABB
2	LT AC ROLL TABLE MOTORS	KEC/ CGL/ ALSTOM/ ABB/ SEW/ IC-BAUER/ NORD/ SIEMENS
3	LT AC GEARED MOTORS	LAXMI HYDRAULICS PVT LTD/ SEW/ NORD/ IC- BAUER/ POWER BUILD/ DEMAG/ ROSI/ KEB, GERMANY
4	LT FLAME PROOF / INCREASED SAFETY SQUIRREL CAGE MOTOR	MARATHON/ BHARAT BIJLEE/ CGL/ KEC/ LAXMI HYDRAULICS PVT LTD.
5	LT SQUIRREL CAGE MOTORS	ABB/ BHARAT BIJLEE/ CGL/ KEC/ LAXMI HYDRAULICS PVT LTD./ MARATHON/ SIEMENS/ ELGI/ JYOTI/ WEG

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
6	ROLLING MILL MAIN DRIVE AC MOTORS	SIEMENS/ ABB/ TOSHIBA/ ALSTOM/ HITACHI/ WEG, BRAZIL
7	HT AC MOTORS (SQUIRREL CAGE/ SLIPRING & SYNCHRONOUS MOTORS)	MARATHON/ CGL/ KEC/ ABB/ BHEL/ JYOTI/ SIEMENS/ WEG/ TMEIC
8	ACTUATOR MOTORS	AUMA/ ROTORK/ LIMITORQUE/ MARSH
F. FIELD SWITCHES / SENSORS		
1	PROXIMITY SWITCHES (INDUCTIVE/ CAPACITIVE AND MAGNETO)	IFM/ SIEMENS/ SICK/ ROCKWELL AUTOMATION/ PEPPERL + FUCHS/ SCHNEIDER/ DELTA/ LINE & LEINDE
2	ENCODER	IFM/ HUBNER/ HEIDENHAINE/ LEONARD/ ROCKWELL AUTOMATION (ALLEN BRADLEY) / SICK (GERMANY)/ LEIN & LEINDE
3	ZERO SPEED SWITCH	JAYSHREE/ SCHNEIDER-SAMWHA/ IFM/ ROCKWELL AUTOMATION/ SIEMENS/ PEPPERL+FUCHS/ PYROTECH/ PROTO-CONTROL
4	SENSORS / SWITCHES * LIGHT BARRIERS * DISTANCE * LEVEL	IFM/ SICK/ ROCKWELL AUTOMATION/ PEPPERL + FUCHS/ SIEMENS/ SCHNIEDER/ DIMETIX AG/ DELTA
5	SWITCH MODE POWER SUPPLY	SIEMENS/ IFM/ ROCKWELL AUTOMATION/ SCHNEIDER/ HONEYWELL.
6	PULL CORD SWITCHES/ BELT SWAY SWITCHES	JAYSHREE / EPCC(KAKKU) / AG-MECHANIC/ TELEMECHANIQUE / STROMKRAFT / PROTO-CONTROL/ PYROTECH
7	LIMIT SWITCHES	SIEMENS/ ESSEN/ GE-POWER/ SCHNEIDER/ BCH/ JAYSHREE / EPCC(KAKKU) / AG-MECHANIC/ INDUSTRIAL SYNDICATE/ L&T/ ELECTROMAG/ PROTOCONTROL

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
8	ROTARY LIMIT SWITCHES	EPCC(KAKKU)/AG-MECHANIC/ TELEMECHANIQUE
9	TIMERS & TIME DELAY RELAY	ABB/ BCH/ L&T/ GEPOWER/ SIEMENS/ ESSEN/ ELECTRONIC AUTOMATION/ TELEMECANIQUE/ OMRON
S.N.	**ITEM DESCRIPTION**	**PREFERRED MAKES**
G. TELECOM EQUIPMENT & FDA SYSTEM		
1	INTELLIGENT DETECTORS (PHOTO ELECTRIC, HEAT, THERMAL) UL /FM /ULC APPROVED	SIMPLEX / NOTIFIER / EDWARDS/ SIEMENS
2	INTELLIGENT FIRE ALARM CONTROL PANELS UL /FM /ULC APPROVED	-DO-
3	ADDRESSABLE MANUAL CALL POINTS INCLUDING HAND SETS . UL /FM /ULC APPROVED	-DO-
4	MONITOR MODULES , FAULT ISOLATION MODULES, CONTROL MODULES (UL /FM /ULC APPROVED)	-DO-
5	UV FLAME DETECTORS UL /FM /LPC APPROVED	PATOL / DETRONICS / SPECTREX
6	BEAM DETECTORS UL /FM /ULC APPROVED	EDWARDS / NOTIFIER / SIMPLEX

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
7	IR FLAME DETECTORS SOLAR BLIND EMBER, FIRE UL /FM /LPC APPROVED	ODTI / PATOL / DET-TRONIX / SPECTREX
8	ANALOG LINEAR HEAT SENSING CABLE WITH METAL BRAID STEEL/ BRONZE, COPPER WITH NYLON BRAID UL /FM /LPC APPROVED	KIDDE / L.G.M / PATOL.
9	DIGITAL LINEAR HEAT SENSING CABLE WITH NYLON BRAID WITH METAL BRAID STEEL, BRONZE, COPPER UL /FM /ULC /MIL /LPC APPROVED CONTROL UNIT	KIDDE / L.G.M / PATOL
10	VIDEO DISPLAY UNIT INCLUDING CPU, PC, MONITOR, PRINTER ETC FOR FDA.	DELL / HP / HCL / WIPRO / IBM
11	SIGNAL CABLE FOR FDA	USHA BELTRON / HCL / DELTON / VINDHYA TELELINK
12	F.D.A SYSTEM SUPPLIERS	AGNICE FIRE PROTECTION LIMITED / TECHNICO (INDIA) PVT. LIMITED. / FIRE PRO SYSTEMS LTD. / TYCO / SIEMENS
13	IP-PBX	AVAYA / ALCATEL / AASTRA
14	IP-PBX SYSTEM SUPPLIER	AGCL / WIPRO / ABS / ITI / HCL
15	CCTV CAMERA	BOSCH / PELCO /SANYO /SHARP /SONY
16	CCTV MONITOR	SHARP / HITACHI / PHILIPS / LG / SONY / SAMSUNG / SANYO
17	C.C.T.V SYSTEM SUPPLIERS	NELCO LIMITED / POWER SYSTEMS LTD, KOLKATA /TOSHNIWAL INDUSTRIES / PANORAMA ELECTRONICS PVT LTD

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
18	LOUD SPEAKER TALK BACK(LSTB) / LOUD SPEAKER INTERCOMMUNICATION(LSIS)	BOSCH / PHI-AUDIOCOM / MEGA.
19	LOUD SPEAKER TALK BACK(LSTB) / LOUD SPEAKER INTERCOMMUNICATION(LSIS) SYSTEMS SUPPLIERS	PHI-AUDIOCOM / POWER SYSTEMS, KOLKATA / MEGA
20	TELEPHONE CABLE SUPPLIERS	DELTON CABLES / TELE-LINK NICCO /
21	VHF SYSTEM	MOTOROLA / YAESU / VERTEX –STANDARD
22	CCTV CABLES	POLYCAB/FINOLEX/THERMOCABLE/SUYUG
H. HT, LT POWER & CONTROL CABLES		
1	LT POWER CABLES (PVC / XLPE)	UNIVERSAL/ RPG CABLES (ASIAN)/ POLYCAB/ FINOLEX/ TORRENT/ HAVELLS/ KEI/ SPECIAL CABLES/ TCL / SPECIAL CABLES/ RALLISON/ PARAMOUNT/ CORDS/ LAPP/ CHANDRESH / RAVIN
2	PVC CONTROL CABLES	LAPP/ UNIVERSAL/ RPG CABLES (ASIAN)/ POLYCAB/ FINOLEX/ TOSHNIWAL/ DELTON/ KEI/ SPECIAL CABLES/ TCL SPECIAL CABLES/ RALLISON/ PARAMOUNT/ CORDS/ HAVELLS/ RAVIN
3	HEAT RESISTANT CABLES (EPR / CSP & SR)	LAPP/ UNIVERSAL/ RPG CABLES (ASIAN)/ FINOLEX/ TOSHNIWAL/ DELTON/ TORRENT/ SPECIAL CABLES
4	HT XLPE CABLES	UNIVERSAL/RPG CABLES (ASIAN)/TORRENT/ POLYCAB/ PARAMOUNT (UPTO 33 Kv)/ KEI
5	SCREENED CONTROL CABLES	REFER INSTRUMENT LIST
6	TRAILING CABLES	LAPP/ UNIVERSAL/ ASIAN

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
7	LIGHTING WIRE (PVC) FRLS	DELTON/ FINOLEX/ UNIVERSAL/ HAVELLS/ INCAB/ KEI/ GEMSCAB/ PARAMOUNT/ POLYCAB
9	OPTICAL FIBRE CABLE	MOLEX / LUCENT / FINOLEX / ERICSON / STERLITE
10	CABLE GLANDS	LAPP/ HANSEL/ PHOENIX/ COMET/ PRECISSION- QUALITY/ SUNIL & CO./
I. ILLUMINATION & MISCELLANEOUS ITEMS		
1	TEMP. SCANNER	ADVANI OERLIKON/ ECI/ INSTRUMENTATION LTD./ MASIBUS/ PYROTECH/ SIEMENS
2	LAMPS	BAJAJ/ CROMPTON/ GE LIGHTING/ PHILIPS/ OSRAM/ SIGMA
3	LIGHT FITTING (FIXTURES) COMPLETE WITH ALL ACCESSORIES EXCEPT LAMP	BAJAJ/ CROMPTON/ GE LIGHTING/ PHILIPS/ SIGMA/ HAVELLS
4	FLAME PROOF LIGHT FITTING	GOVAN/ BALIGA/ FLEXPRO/ SUDHIR/ CEAG/ FGG/ SIGMA/ EX-PROTECTA VITHAL UDHYOG
5	LIFTING MAGNETS	OHIO/ WALKER/ EPMS
6	LIGHTING TRANSFORMER	BHEL/ BHARAT BIJLEE/ AREVA/ CGL/ EMCO/ VOLTAMP/ KIRLOSKAR ELECTRIC COMPANY/SAI ELECT/UNIVERSAL
7	LIGHTING MAST	PHILIPS / BAJAJ / CGL/CROMPTON/GE
8	WELDING SOCKETS	BCH/ SCHNEIDER/ BEST & CROMPTON/ GEPOWER/ HAVELL/ JAIBALAJI/ HENSEL/ MDSLEGRAND
9	LAPTOP/NOTE-BOOK/ PC	HP/LENOVO/COMPAC/ DELL WIPRO/ IBM

Sl.No.	ITEM DESCRIPTION	PREFERRED MAKES
10	CONTROL TRANSFORMERS	AEI/ AEP/ VOLTAMP/INTRAVIDYUT/INDCOIL/ KAPPA/
11	5/15A PIANO SWITCH	ANCHOR/ ELLORA/ MDS LEGRAND/ CONA/ PRECISION/ CRAB TREE
12	SWITCH SOCKET OUTLET	ALSTOM/ ANCHOR/ BCH/ CGL/ ESSEN/ BEST & CROMPTON/ AREVA
13	EXHAUST FANS/CEILING FANS	CGL/ CINNI/ KHAITAN/ POWERVENT/ VENTWELL/ BAJAJ/ USHA/ ORIENT/ HAVELLS
14	HOOTER/BUZZER/BELL	KHERAJ / EPCC(KAKKU)
15	POWER PACK FOR MAGNETS	ELECTROMAG/BCH/EPCC(KAKKU)
16	RESISTORS (CRANES)	BCH/ ELECTROMAG/ AMP CONTROL/ EPCC/ SIEMENS/ RESITECH
17	LT CAPACITORS	GE POWER/ ABB/ CGL/ MEHER CAPACITORS/ UNI STAR
18	FLAME PROOF LDB/FEEDER PILLAR	FCG/ Sudhir/ Prompt Engineering Works/Flame Proof equipments pvt. Ltd/ Baliga Lighting Equipments Pvt. Ltd. Flexpro Electricals Pvt. Ltd.

NOTE: The switch board manufacturer and other manufacturer shall follow the relevant IEC/IS & other standards.

14.07 INSTRUMENTATION

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
A.	**Field Instruments:**		
1.	Pressure Gauge, Differential Pressure gauge & its accessories	:	WIKA, Forbes Marshall, Gauges Bourdon, Thermal Instruments, Baumer, Walchandnagar (Tiwac Div.), Goa Thermostatic, Radix, Standard Instruments
2.	Pressure / Differential Pressure switch (Mech. Type).	:	WIKA, Switzer, Indfoss, Gauges Bourdon, Baumer
3.	Pressure / Differential Pressure switch (Electronic Type).	:	Ifm, WIKA, Turck, Kaustubha Udyog
4.	Pressure / Differential Pressure/ Flow (DP type)/ Level (DP type)/ Temperature Transmitter	:	Emerson, Fuji (except TT), Honeywell, Yokogawa, Siemens, Nivo Controls (except TT)
5.	Temperature gauge & thermowell	:	WIKA, Gauges Bourdon, Thermal Instruments, Baumer, Walchandnagar (Tiwac div.), Forbes Marshall, Goa Instruments, Goa Thermostatic, Radix, Standard Instruments
6.	Thermocouple, RTD & thermowell	:	Gauges Bourdon, Thermal Instruments, Toshniwal Industries, Tempsens, Pyro-electric Instruments, Baumer, Temcon, Goa Instruments, Standard Instruments, Radix, Altop
7.	Temperature Switch	:	Ifm, WIKA, Switzer, Goa Instruments
8.	Rotameter	:	Forbes-Marshall, Instrumentation Engineers, Eureka instruments, Scientific Devices.

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
9.	Orifice Plate & flanges Assembly, Venturi, Flow nozzle, Wedge flow element	:	Engineering Specialities, Hydro-pneumatics, Micro-precision, Chemtrols-Samil, Minco Flow Element, Minco India, Unicontrols, ABB (Wedge flow only), DynaFluid, Eureka Industrial (Orifice assembly only)
10.	Averaging Pitot Tube, Annubar	:	Emerson, Engineering Specialities, Hydro-pneumatics, Minco India, Unicontrols, DynaFluid
11.	Flow Switch (Mech. Type).	:	Forbes-Marshall, Magnetrol, D.K. Instruments, Switzer, Levcon
12.	Flow switch (Electronic Type).	:	Ifm, Magnetrol, D.K. Instruments, Nivo Controls,Turck India, E&H
13.	Electromagnetic flow meter	:	Yokogawa, Emerson, Siemens, Endress & Hauser, Forbes-Marshall, Nivo Controls
14.	Vortex Flow meter	:	Yokogawa, Forbes–Marshall, Endress & Hauser, Siemens, ABB
15.	Mass (coriolis) flow meter	:	Emerson, Yokogawa, Forbes–Marshall, Endress & Hauser, Rockwin
16.	Ultrasonic Flow meter	:	Yokogawa, Forbes–Marshall, Endress & Hauser, Siemens, Eureka Industrial
17.	PD/Turbine Flow meters	:	Daniel (Emerson), Bopp & Reuther (Toshniwal), Liquid Controls, Rockwin
18.	Level gauge (tubular, magnetic, reflex type)	:	Gauges Bourdon, Chemtrol, Magnetrol, Baumer, Techtrol, Sigma Instruments, V Automat, DK Instrument, Nivo Controls
19.	Level Switch (Conductivity type)	:	SB Electro-mechanical, Techtrol, Nivo Controls, EIP, Sapcon, V AUTOMAT

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
20.	Level Switch (Capacitance/RF type)	:	Endress & Hauser, SB Electro-mechanical, Techtrol, Nivo Controls, Sapcon, V AUTOMAT, EIP Enviro, Protocontrol
21.	Level Switch (Tuning fork/ Rod type)	:	Vega, Endress & Hauser, Nivo Controls, S.B. Electro-mechanical, Sapcon
22.	Level Switch (Float type)	:	D K Instruments, Chemtrols, V AUTOMAT, Gauges Bourdon, Sigma Instruments, Baumer, Scientific Devices, SB Electromechanical
23.	Level Switch/ Transmitter (Displacer type)	:	Emerson, D K Instruments, Levcon Instruments, Trac
24.	Level Switch/ Transmitter (Ultrasonic type)	:	Vega, Endress & Hauser, Siemens, Forbes- Marshall, Magnetrol, SB Electromechanical
25.	Level Switch/ Transmitter (Radar type)	:	Vega, Endress & Hauser, Emerson (Rosemount), Siemens, Forbes- Marshall
26.	Level Switch/ Transmitter (Nucleonic type)	:	Dr. Berthold, VEGA, E+H
27.	Level switch (Electro-mech type)	:	D.K.Instruments, TRAC, LEVCON, VAUTOMAT, Forbes Marshall
28.	Control valve (Globe/Ball/V-Notch/Angle) along with Pneumatic Actuator & Pneumatic Positioner (non-smart)	:	Fisher, Instrumentation Ltd, Masoneilan (Dresser Industries), Flowserve (Valtek), Samson Controls, Arca (Forbes Marshall), MIL Controls, Introl (RK Controls), Metso, Virgo (only ball type), Elomatic, Uniflow Control Instruments Pvt. Ltd., Dembla, Severn Glucon
29.	Control valve (Butterfly) along with Pneumatic Actuator & Pneumatic Positioner (non-smart)	:	Fisher (Emerson), Instrumentation Ltd, Dembla (Except for power cyllinder actuators), Fouress, Metso, Severn Glucon (India), Elomatic, Uniflow Control Instruments Pvt. Ltd. (wafer type only & upto 900mm size)

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
30.	Electrical Actuator	:	Limitorque, Rotork, Bernard (Instrumentation Ltd), Marsh, Auma, Metso
31.	Electro-hydraulic actuator	:	Reineke, Rexa
32.	I/P converters	:	Fisher, Shreyas-Barton, Masoneilan (Dresser Industries), Forbes Marshall, Marsh-Bellofram, MIL controls, Watson Smith, YOKOGAWA
33.	Smart positioner	:	Fisher, Masoneilan (Dresser Industries), Siemens, Samson Controls, Metso, Flowserve (Valtek), Yokogawa
34.	Solenoid Valve	:	Herion, Burkert, Rotex, Asco, Avcon, Festo, Precision Instruments, IMI Norgren
35.	Air filter regulator	:	IMI Norgren, Placka, Schrader-Schovill, Asco, Fisher
36.	Fittings (compression & pipe) & valves	:	Swagelok, Parker, Excel-Hydro-pneumatics, Hylok, Fluid Control, DynaFluid, Flowtech
37.	SS Impulse Tubes & CS Impulse pipes	:	Sandvik, MJ Patel, Noble Tubes, Allied Steel, SAIL Maharastra Seamless (P) Ltd, Reliable Steel (Reliable Pipes & Tubes ltd).
38.	Junction box (other than FF/Profibus)	:	Rittal, FCG, Baliga, Ex-Protecta, P&F, Protocontrol
39.	Junction box (FF/Profibus)	:	P&F, Turck, Phoenixcontact, Siemens
40.	Instrumentation Cable (Screened, paired, triad-signal, control, power etc.) (other than FF/Profibus/ Modbus)	:	Delton, Thermopads, KEI industries, Lapp cables, Cords cables, Elkay Telelinks, TCL Cables, BELDEN, KEC, Insucon, Thermocables, Ocean cables, Pagoda cables, Special Cables Pvt. Ltd.

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
41.	Thermocouple Compensating Cable	:	Toshniwal Cables, Delton, Cords cables, Lapp cables, TCL Cables, Thermopads, BELDEN, Temcon, Thermopads, Tempsens, Associated cables
42.	FF/Profibus/ Modbus cables	:	BELDEN, LEONI, LAPP Cables
B.	**Control room Instrumentation**	:	
1.	Distributed Control System (DCS)	:	Yokogawa (Centum VP), Honeywell (Experion PKS +C 300), Emerson (Delta V/Ovation), ABB (800 XA), Siemens (PCS 7+ S7400H), Toshiba (nv series) (Masibus), Rockwell (Plant PAx), Foxboro- IA series, BHEL (METSO),
2.	Programmable Logic Controllers		ABB 880XA, SIEMENS S7-400H, GE FANUC 9PAC Rx/3i, Rockwell Automation L-73, Schneider (Quntum)
3.	Digital Indicator	:	Pyrotech Electronics, Masibus Instruments, Honeywell, TIPL, Yokogawa, Forbes Marshall, Ashe Control
4.	Bargraph Indicator/ Totaliser	:	Masibus Instruments, Pyrotech Electronics, Yokogawa, Honeywell, Ashe Control
5.	Recorders (Chart Less)	:	Yokogawa, Chino, Honeywell, Siemens, ABB.
6.	Microprocessor based controller	:	Yokogawa, Honeywell, Fuji, Toshiba, Foxboro
7.	Digital scanners	:	Micro systems, Masibus Instruments, Procon, TIPL
8.	DC Power Supply Unit	:	Aplab, Phoenix, Elnova, Siemens, Schneider, Pepperl & Fuchs, MTL, Cosel
9.	IS Interface/Zenner Barrier	:	Pepperl & Fuchs, MTL, Stahl, DEHN

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
10.	Signal isolators	:	Pepperl & Fuchs, MTL, Yokogawa, Phoenix, Radix
11.	Annunciation system	:	Procon, Micro Systems & Controls, Minilec, Pyroelectric, MB controls & Systems, DIGICONT
12.	Instrument Panels/ Cabinets/ Control Desk	:	Rittal, Pyrotech, Hoffmann
13.	Control room / Modular Control desk Desk/Furniture		Cosmos Media products Pvt.Ltd, Harmony systems, Pyrotech work space solution Pvt.Ltd, Godrej & Boyce Manufacturing, OTS Office tech system Pvt. Ltd,Chemi control & Instrumentation Pvt.Ltd.
14.	Control room Interior		Evan Console, Home Decore, PyroTech work space Solution Pvt.Ltd., Temflow, Winsted
C.	**<u>Analytical / Special Instruments</u>**	:	
1.	Gas analysis Instruments (including CEMS)	:	ABB, Emerson, Siemens (Adage), Sick, Fuji, Yokogawa, Servomex, Fuji (AICPL), Forbes Marshall
2.	Gas analysis components	:	Besides the following make, components of OEM supplier of analyser, can also be considered ➢ Solenoid valve: Herion (Germany), Burket (Germany), GEMU ➢ Sample gas Pump & Peristaltic Pump: KNF (Germany), ASF Thomas (Germany), Buhler, Charles Austin ➢ Rotameter/Purge Rotameter: Krohne (Germany), FPR (Austria), ABB (Germany) ➢ Probe Filter: SS Thyssen (Germany), Schumacel (Germany), ABB (Germany) ➢ Heated sample tube- prefabricated: Thermon (USA), Thermopads ➢ Condensate monitor: Buhler ➢ PTFE tube & PVDF fittings: Emtechnik (Germany)

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
			➢ SS tubes: Sandvik ➢ SS tubes fittings & valves : Swagelok, Parker ➢ Pressure gauge: WIKA ➢ PLC/Microprocessor based control system: Rockwell, ABB, Siemens, Yokogawa
3.	Stack Flow meter (Ultrasonic/ IR type)	:	Siemens (Adage), Sick, Forbes Marshall (Codel), Fuji, Teledyne, Thermo-scientific
4.	Gas Detectors including portable detector	:	Beiler & Lang (CO-Monitor), Draeger, MSA, Oldham (Industrial Scientific Corporation), Detronics,
5.	Dust Monitor/ SPM analyser	:	Durag, Codel (Forbes Marshall). Sick, Siemens (Adage)
6.	Calorific Value analyzers/ Woobe Index meter	:	Reineke, Union, Yokogawa, Siemens (Adage)
7.	Moisture Analysers (on line air/ gas)	:	Foxboro, Bartec, GE-Panametrics
8.	ORP/PH/ Conductivity meter / Transmitter	:	Emerson, Forbes Marshall, Yokogawa, ABB, HACH
9.	BOD/COD/TSS analyzer	:	Emerson, Forbes Marshall, HACH, Yokogawa, ABB, Honeywell, Teledyne
10.	Dissolved Oxygen analyzer	:	Forbes Marshall, Yokogawa, HACH, Emerson
11.	Turbidity meter	:	Forbes Marshall, Yokogawa, ABB
12.	Electronic Boiler drum level indicator	:	Hitech, Hydrastep (Solatron), BHEL, Yarway
13.	Vibration sensors/ transmitters	:	GE Bentley Nevada, IRD (Mechanalysis India), Bruel & Kjaer, Schenck-Avery, SPM Instruments, SKF, Shinkawa, Forbes-Marshall, Rockwell Automation, Masibus

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
14.	Vibration monitoring system (Turbo-supervisory system)	:	GE Bentley Nevada, IRD (Mechanalysis India), Bruel & Kjaer, Shinkawa (Forbes-Marshall), Rockwell Automation
15.	Infrared radiation pyrometer	:	Land, Raytek, Ircon, Keller HCW, Williamson, Chino, FLUKE
16.	Lightning / Surge protection device	:	P&F, MTL, DEHN
D.	**Erection Contractor**	:	Elmatics Engineers Pvt. Ltd., Paradigm Engineers and Consultants Pvt. Ltd., Konstelec Engineers Pvt. Ltd., Jasubhai Engineering Pvt. Ltd.
E.	**Testing & Calibration instruments**	:	
1.	4-1/2 Digit Digital Portable Multimeter	:	Fluke, Yokogawa, Philips
2.	Milli volt/ Milliamp Feed & Measure	:	Fluke, Yokogawa, Philips, Beamex, Druck, Scandura
3.	Portable Temperature Calibrator	:	Druck, Scandura, Beamex, Tempsens, Masibus, Nagman
4.	Portable Pressure Calibrator with pumps	:	Druck, Scandura, Beamex, Masibus, Nagman
5.	HART/ Fieldbus configurator	:	Emerson, Fuji, Honeywell, Yokogawa, Siemens
6.	Universal Calibrator	:	Druck, Scandura, Beamex
7.	Insulation Tester	:	Motwane, Fluke, Extech, Megger
8.	Digital Storage oscilloscope	:	Phillips, Hewlett Packard, Yokogawa, Tektronix, Aplab

Sl. No	ITEM DESCRIPTION		LIST OF MAKES
9.	Soldering & Desoldering Station	:	Q Max, Weller
10.	Vacuum Cleaner	:	Eureka Forbes, BPL,Philips
11.	Tools & tackles	:	Taparia, Everest
12.	Radiation Survey Meter/ Dosimeter	:	Fluke, RAE Systems, Thermo Fisher Scientific, Thermo Electron Corporation, LudLum
13.	Test bench (Pneumatic/ Electronic)	:	Masibus, Nagman, GE, Yokogawa

14.08 INFORMATION SYSTEM

Server Computers : IBM/HP/SUN/DELL

Client Computers (PC) : IBM/Lenovo/HP-Compaq/DELL

Network Equipment

- Active components : CISCO
- Passive components : LUCENT/AMP

Application software including Process control models : Technology Supplier

14.09 HANDLING & HOISTING:

Sl. No.	Equipment	List of makes
01.	EOT crane (upto 25T capacity)	Unique, Fafeco, Kone, Mukund, Electromech, Tuobrofurguson, Cranex, Brady Morris, Shivpra, Hebenkraft, Eddycranes
02.	Underslung crane	Electromech, Tuobrofurguson, Cranex, Brady Morris, Eddycranes, Rewa, electrotherapy

03.	Electric hoist	Cranex, Brady Morris, Eddycranes, Rewa, Indef, electrotherapy
04.	Elevator / lift	OTIS, OMEGA, Kone, ECE, ThyssenKrupp

14.10 MACHINE TOOLS:

Sl. No.	**Equipment**	List of makes
1	Centre lathe	HMT, Herbert smith, HEC, MCM
2	Hydraulic press m/c	Bemco, electro-pneumatic, ISGEC, KAWA, HMT
3	Shaping machine	Sagar, Jeet, Shimato
4	Bench Drill	Accuax, EIFCO, P&B, Thakoor
5	Radial Drill	HMT, Batliboi, HEC, Novisa, Luga
6	DE Pedestal Grinder	Grind Tools, GECO, Elmeco, epcogrinder
7	Power Hacksaw	ITL, Kasto, EIFCO
8	Portable Welding m/c	Ador welding, ESAB (welding equipment)
9	Marking Plate	Jash, Madras Gauge room (GRE), GMT

14.11 FIRE FIGHTING: Refer chapter 04.09

14.12 AIR CONDITIONING AND VENTILATION SYSTEMS:

Sl. No.	Item Description	Manufacturer
1	Tube axial fans /Propeller Fans	CBDOCTOR, EFE, FLOW LINK, ALMONARD, ACCEL, KHAITAN, AEROVENT, ISEL, FLAKTWOOD, MARATHON, LM ENGG, F. HARLEY, SUBURBAN INDUSTRIAL WORKS, PATEL AIRFLOW, PASKO ENGG. PVT. LTD., SCINTILLANT PROJECTS, TURBOFLOW, INDVENT FANS, FMI, AEROCON CORP,

		LAXMI ENGG., AIR TECHNIKO, KRUGER, GREENHECK, VOLTER
2	Roof exhausters	CBDOCTOR, EFE, ACCEL, ALMONARD, FLOWLINK, INDFAN, AEROVENT, LM ENGG., F. HARLEY, PASKO ENGG., INDUSTRIAL FANS, AEROCON CORPORATION, LAXMI ENGG. WORKS, GANESH ENGG (VADODARA)
3	Panel filter for air	FMI, CADILLAC, CBDOCTOR, FILTECH (INDIA), SPECTRUM FILTRATION, ANFILCO, AAF
4	Split AC	VOLTAS, BLUE STAR, CARRIER AIRCON, LG, SAMSUNG, HITACHI,
5	Duct Insulation	U.P.TWIGA, LLOYDS, BAKELITE HYLAM, MALANPUR ENTECH, OWENS CORNING, PARAMOUNT
6	Pipe Insulation	BEARDSELL, LLOYDS, THERMOWELL, PARAMOUNT
7	Vibration isolators	DUNLOP, EMERALD, GERB, GETZNER
8	Grills / Diffusers /Fire Dampers	RAVISTAR, DYNACRAFT, COSMOS, AIRFLOW, CARYAIRE, AIRMASTER
9	3 / 2 way Control Valve	HONEYWELL, JOHNSON CONTROLS, SIEMENS
10	Fabricated Duct	ZECO, RADIANT, NUTECH, SPIRO
11	Strip Heater / Pan Humidifier	ALCO HEATING, DAS PASS, RAPID CONTROL
12	VRF system	DAIKIN, MITSUBISHI, TOSHIBA, LG, VOLTAS, BLUE STAR, CARRIER, SAMSUNG, HITACHI
13	Air handling units	VOLTAS, BLUE STAR, SUVIDHA, CARRIER, CARYAIRE, ZECO, AIRFLOW, EDGETECH, ETA ENGINEERING PVT. LTD. , ZAMIL, ETHOS

15.00 TECHNICAL PARTICULARS TO BE FURNISHED BY THE TENDERER

Sl. No.	Description		Parameters
A.	**Gas Compressor**		
1.	Make	:	
2.	Model	:	
3.	Type	:	
4.	No. of Stage	:	
5.	Driver Type	:	
6.	Drive	:	
7.	Direction of Rotation (Facing Driven End):	:	
8.	Type of Inter/After Coolers	:	
9.	Type of Cooling media		
10.	Installation	:	
11.	Capacity (flow rate),	:	
12.	Suction Pressure, kg/cm² (g)	:	
13.	Suction Temperature, ºC	:	
14.	Discharge Pressure, kg/cm² (g)	:	
15.	Discharge Temperature, ºC	:	
16.	Compression Ratio	:	
17.	Gas Temperature after aftercooler, ºC	:	
18.	Type of Capacity Control	:	
19.	Mode of Start & Stop	:	
20.	Density (Dry Basis), kg/m³	:	
21.	Compressibility Factor	:	
22.	Ratio of specific heats (Cp/Cy)	:	
23.	Corrosive/Erosive Elements	:	
24.	Particle size of Erosive (if any)	:	
25.	Compressor Noise Level	:	
B.	**Gas Compressor Driver Details**		
1.	Make	:	
2.	Model	:	
3.	Type	:	
4.	Type of Cooling media	:	
5.	Installation	:	
6.	Rating	:	
7.	Voltage Level	:	
8.	Phase	:	
9.	Speed	:	
10.	Driver Noise Level	:	

C.	Constructional/ Design Features of Gas Compressor		
C.1	**Cylinder**		
1.	No of Cylinders	:	
2.	Single Acting (SA)/Double Acting (DA)	:	
3.	Cylinder Bore/Stroke	:	
4.	Rotational Speed	:	
5.	Linear Average Piston Speed	:	
6.	Piston Displacement	:	
7.	Volumetric Efficiency	:	
8.	Cylinder Liner (Yes/No)	:	
9.	Type of Cylinder Liner: Dry/Wet	:	
10.	Clearance Pockets Yes/No	:	
11.	Max. Allow. Working Pressure, Cylinder	:	
12.	Max./Min Allow. Working Temp., Cylinder	:	
13.	M.A.W.P, Cylinder @ Amb. Temp.	:	
14.	Safety Valve Set Pressure, Cylinder	:	
15.	Helium Test Pressure, Cylinder	:	
16.	Hydrostatic Test Pressure, Cylinder	:	
17.	Cylinder Jacket Cooling Type	:	
18.	Cooling Media, Cylinder Jackets	:	
19.	Max. Allow. Working Pressure, Cyl Jacket	:	
20.	Hydrostatic Test Pressure, Cyl Jacket	:	
21.	Suction Nozzle Size/Rating/Position	:	
22.	Discharge Nozzle Size/Rating/Position	:	
23.	Suction Valve Number	:	
24.	Valve Lift/Area Per Valve	:	
25.	Average gas Velocity	:	
26.	Discharge Valve Number	:	
27.	Valve Lift/Area Per valve	:	
28.	Average gas Velocity	:	
29.	Type of Suction valve	:	
30.	Type of Discharge valve	:	
31.	Suction Valve Unloaders Yes/No	:	
32.	Clearance Pockets Unloaders Type	:	
33.	Piston Rod Diameter	:	
34.	Rod Reversal at Crosshead Pin (Min.)	:	
35.	Piston Rod Runout	:	
36.	Max. Allow. Rod Load	:	
37.	Tension	:	

C.2	**Frame**		
1.	Frame Exposion proof Relief Device	:	
2.	Flame Arrestor Yes/No	:	
3.	Replaceable Crosshead Shoes Yes/No	:	
4.	Crosshead Guide Integral/	:	
5.	Maximum Frame Rating	:	
6.	Speed- Maximum/Minimum	:	
C.3	**Cylinder Material**		
1.	Stage	:	
2.	Cylinder		
3.	Liner		
4.	Piston		
5.	Piston Rings		
6.	Rider Rings		
7.	Piston Rod		
8.	Packing Rings		
9.	Valve Seats		
10.	Valve Stops		
11.	Valve Rings/Plates		
12.	Valve springs		
13.	Cylinder Head	:	
D.	**Utility Consumption**		
1.	Cooling Water, Flow (m^3/hr) & Pressure kg/cm^2g	:	
2.	Instrument Air, Flow (Nm^3/hr) & Pressure kg/cm^2g	:	
3.	Nitrogen, Flow (Nm^3/hr) & Pressure kg/cm^2g	:	
4.	Power (Auxiliaries), (kW)	:	
5.	Power (Heaters), (kW)	:	
6.	Purge (Air or N2), Flow (Nm^3/hr) & Pressure kg/cm^2g	:	
E.	**Lubrication Data**		
1.	Make		
2.	Type		
3.	Grade		
F.	**Meteorological Data**		
1.	Ambient Temperature (Max/ Min/ Design), ºC	:	
2.	Relative Humidity (Max/ Min/ Design), %	:	

3.	Rain Fall (Max/ Min/ Design), mm	:	
4.	Altitude	:	
5.	Seismic Zone	:	
G.	**Applicable Codes and Standards**		
1.	Gas Compressor	:	
2.	Gear Box, if any	:	
3.	Drive	:	
4.	Pressure Vessels	:	
5.	Oil Cooler	:	
6.	Piping	:	
H.	**Instrument Air Compressor**		
1.	Make	:	
2.	Model	:	
3.	Type	:	
4.	No. of Stage	:	
5.	Driver Type	:	
6.	Drive	:	
7.	Direction of Rotation (Facing Driven End):	:	
8.	Type of Inter/After Coolers	:	
9.	Type of Cooling media		
10.	Installation	:	
11.	Capacity (flow rate),	:	
12.	Suction Pressure, kg/cm² (g)	:	
13.	Suction Temperature, ºC	:	
14.	Discharge Pressure, kg/cm² (g)	:	
15.	Discharge Temperature, ºC	:	
16.	Compression Ratio	:	
17.	Compressor Noise Level	:	
I.	**Air Drying Unit**		
	Make	:	
	Model	:	
	Type	:	
	Capacity (flow rate),	:	
	Suction Pressure, kg/cm² (g)	:	
	Suction Temperature, ºC	:	
	Discharge Pressure, kg/cm² (g)	:	
	Discharge Temperature, ºC	:	
	Dew Point Temperature, ºC	:	
J.	**Air Compressor Driver (Motor) Details**		
1.	Make	:	

2.	Model	:	
3.	Type	:	
4.	Type of Cooling media	:	
5.	Installation	:	
6.	Rating	:	
7.	Voltage Level	:	
8.	Phase	:	
9.	Speed	:	
10.	Driver Noise Level	:	
K.	**Diesel Generating Units**		
	Make	:	
	Model	:	
	Type	:	
	Type of Cooling media	:	
	Installation	:	
	Rating	:	
	Voltage Level	:	
	Phase	:	
	Speed	:	
	Noise Level	:	
	Fuel	:	
	Fuel Oil Consumption	:	
	Lube Oil Consumption		

16.00 COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT

16.01 Period of Maintenance

The Tenderer shall be responsible for maintenance of Four (04) Nos. Natural Gas Compressors and their auxiliaries in the Natural Gas Compressor Station. This agreement shall take effect from the date of handing over of Natural Gas Compressor Station and shall remain in force for a period of five (05) years. The maintenance personnel are required to be continuously deputed by the Tenderer in the Natural Gas Compressor Station for Five (05) years and shall carry out the necessary activities as advised by the Purchaser's personnel.

16.02 Scope of Work

The Tenderer shall be responsible for the Maintenance of Four (04) Nos. Natural Gas Compressors and their auxiliaries from the date of handing over of Natural Gas Compressor Station to Purchaser and shall perform all necessary services in a prudent & efficient manner as listed below:-

The scope covers maintenance of all four Four (04) Nos. Natural Gas Compressors and their auxiliaries which includes all static and rotary equipment. The type of maintenance shall be as follows:

Spares and consumables as required for maintenance shall also be provided by the Tenderer.

16.02.01 Routine Maintenance:

Change of lube oil, filter, other consumables and accessories etc. as required for uninterrupted and trouble free operation of the plant & equipment installed by the Tenderer.

16.02.01 Periodical Maintenance:

Health check for four (4) Nos. Natural Gas Compressors and their auxiliaries complete in all respect shall be carried out by the Tenderer at regular intervals as and when required to ensure uninterrupted and trouble free operation of the plant & equipment.

16.02.02 Preventive Maintenance:

Preventive maintenance as required for uninterrupted and trouble free operation of the

(4) Nos. Natural Gas Compressors and their auxiliaries to ensure availability of the plant & equipment at its rated capacity.

16.02.03 Breakdown Maintenance:

Maintenance required for attending failures of four (4) Nos. Natural Gas Compressors and their auxiliaries to perform satisfactorily at rated parameters due to reasons what so ever.

The Tenderer shall depute experienced, qualified and skilled (certified by the manufacturer) manpower for periodical, routine, preventive and breakdown maintenance work and as required by the purchaser.

16.02.04 The preventive maintenance including capital repair shall be done by the Tenderer for the entire contract period. Subsequently, the yearly schedules, monthly schedules shall be prepared. Maintenance shall be combination of predictive, preventive and condition based.

16.02.05 Routine maintenance activities like checking of lubrication oil, cooling water system etc.

16.02.06 Lubrication schedules indicating quantity of lubrication shall be prepared by the Tenderer in consultation with Purchaser and fulfillment records shall be kept for further reference.

16.02.07 Periodical inspection of four (04) Nos. Natural Gas Compressors and their auxiliaries shall have to be carried out as per the inspection plan, detailed equipment wise inspection check lists. The inspection reports are to be submitted every month to Purchaser. All defects noticed during inspection are to be rectified by the Tenderer immediately to prevent major outages. The check list shall be reviewed jointly by the Tenderer and Purchaser and modified as per requirement to ensure the healthiness of the equipment.

16.02.08 Maintenance work for all electrical equipment & system, instrumentation & automation system shall be the responsibility of Tenderer. The complete maintenance activities include planning, co-ordination and execution of scheduled routine inspection, preventive, corrective and breakdown maintenance of all electrical equipment and systems including overhauling of HT & LT motors, instrumentation & control system, automation equipments and systems (routine / condition based) are included under the scope of work .

16.02.09 History records for all equipment to be maintained and handed over to Purchaser.

16.02.10 Log record is to be maintained for the activities carried out and recording the defects noticed / complaints received from the Purchaser. The Tenderer shall attend these complaints immediately and record the rectifications carried out in the same log book. On rectification of defects, the same shall be inspected and certified by Site-In-charge on a regular basis. All the records/documents are to be submitted to Purchaser on monthly basis for scrutiny and safe custody.

16.03 Before the expiry of term and extension of term as the case may be, the Tenderer shall organize a joint inspection with Purchaser and a joint inspection report/ defect list of the equipment shall be prepared in accordance to the norms of manufacturer. The Tenderer shall eliminate all the defects (if any) before expiry of the contract. Tenderer shall hand over all technical documents, literature, instruction manual, tools & tackles and all the relevant records and documents before the expiry of the term.

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PIPELINE PROJECT (PHASE - I)

TECHNICAL SPECIFICATION FOR NATURAL GAS COMPRESSOR STATION

VOLUME-II

PART-II (DRAWINGS)

MECON LIMITED

TS NO.: MEC/S/23UU/05/28/0001 (Rev. 00) **MAY, 2022**

CONTENTS

VOLUME II, PART-I

VOLUME II, PART-II

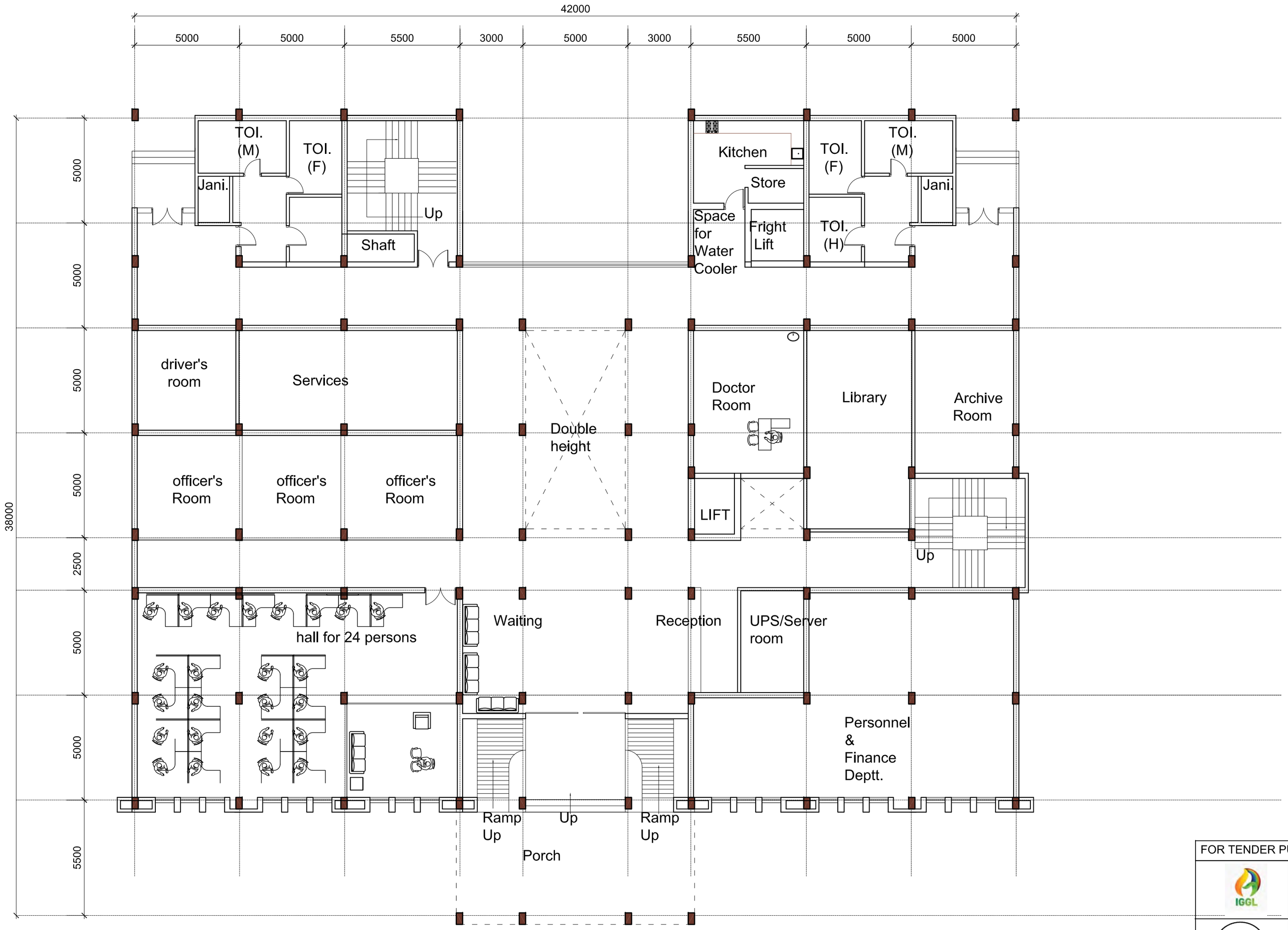
LIST OF DRAWINGS ATTACHED:

Sl. No.	Title	Drawing No.
1.	Administrative building - ground floor plan	MEC/05/28/23UU/NGCS/TD/001, Sheet 1 of 1, Rev. 0
2.	Administrative building - first floor plan and elevation	MEC/05/28/23UU/NGCS/TD/002, Sheet 1 of 1, Rev. 0
3.	Canteen building – ground floor plan	MEC/05/28/23UU/NGCS/TD/003, Sheet 1 of 1, Rev. 0
4.	Canteen building - first floor plan	MEC/05/28/23UU/NGCS/TD/004, Sheet 1 of 1, Rev. 0
5.	Control room building – ground floor plan	MEC/05/28/23UU/NGCS/TD/005, Sheet 1 of 1, Rev. 0

Sl. No.	Title	Drawing No.
6.	Control room building – first floor plan	MEC/05/28/23UU/NGCS/TD/006, Sheet 1 of 1, Rev. 0
7.	Control room building – second floor plan	MEC/05/28/23UU/NGCS/TD/007, Sheet 1 of 1, Rev. 0
8.	Fire tender house – ground floor plan	MEC/05/28/23UU/NGCS/TD/008, Sheet 1 of 1, Rev. 0
9.	Fire tender house – elevation and section	MEC/05/28/23UU/NGCS/TD/009, Sheet 1 of 1, Rev. 0
10.	Worker's Rest room building -plans	MEC/05/28/23UU/NGCS/TD/010, Sheet 1 of 1, Rev. 0
11.	Car parking	MEC/05/28/23UU/NGCS/TD/011, Sheet 1 of 1, Rev. 0
12.	Scooter and cycle parking	MEC/05/28/23UU/NGCS/TD/012, Sheet 1 of 1, Rev. 0
13.	Biometric security block - plans, elevation, schedules of openings	MEC/05/28/23UU/NGCS/TD/013, Sheet 1 of 1, Rev. 0
14.	Guard room – plans, elevation and schedules	MEC/05/28/23UU/NGCS/TD/014, Sheet 1 of 1, Rev. 0
15.	Gate complex – plans and elevation	MEC/05/28/23UU/NGCS/TD/015, Sheet 1 of 1, Rev. 0
16.	Guard room cum watch tower – plans and elevations	MEC/05/28/23UU/NGCS/TD/016, Sheet 1 of 1, Rev. 0
17.	Natural gas compressor station P&ID (typical for each compressor)	MEC/05/28/23UU/NGCS/TD/017, Sheet 1 of 1, Rev. 0
18.	Natural gas compressor station P&ID (typical for each compressor)	MEC/05/28/23UU/NGCS/TD/018, Sheet 1 of 1, Rev. 0
19.	Natural gas compressor station Process flow diagram (typical for each compressor)	MEC/05/28/23UU/NGCS/TD/019, Sheet 1 of 1, Rev. 0
20.	33kV & 6.6kV Basic Power Distribution Single Line Diagram	MEC/05/28/23UU/NGCS/TD/020, Sheet 1 of 1, Rev. 0
21.	Typical substation automation system architecture	MEC/05/28/23UU/NGCS/TD/021, Sheet 1 of 1, Rev. 0
22.	Typical LTPCCs (LTPCC-1&2) Single line diagram	MEC/05/28/23UU/NGCS/TD/022, Sheet 1 of 1, Rev. 0
23.	PLC Configuration Diagram	MEC/05/28/23UU/NGCS/TD/023, Sheet 1 of 1, Rev. 0
24.	Water based fire fighting system	MEC/05/28/23UU/NGCS/TD/024, Sheet 1 of 1, Rev. 0
25.	Drinking water scheme	MEC/05/28/23UU/NGCS/TD/025, Sheet 1 of 1,

Sl. No.	Title	Drawing No.
		Rev. 0
26.	Clearance drawing for Underslung crane	MEC/05/28/23UU/NGCS/TD/026, Sheet 1 of 1, Rev. 0
27.	Clearance drawing for DG-EOT crane	MEC/05/28/23UU/NGCS/TD/027, Sheet 1 of 1, Rev. 0
28.	Clearance drawing for elevator	MEC/05/28/23UU/NGCS/TD/028, Sheet 1 of 1, Rev. 0
29.	Central Store	MEC/05/28/23UU/NGCS/TD/029, Sheet 1 of 1, Rev. 0
30.	Mechanical workshop	MEC/05/28/23UU/NGCS/TD/030, Sheet 1 of 1, Rev. 0
31.	Fire layout at compressor station	MEC/05/28/23UU/NGCS/TD/031, Sheet 1 of 1, Rev. 0
32.	General Layout for compressor station at Guwahati	MEC/05/28/23UU/NGCS/TD/032, Sheet 1 of 1, Rev. 0

DRG.NO.:-MEC/05/28/23UU/NGCS/TD/001



GROUND FLOOR PLAN

AREA - 1483.1 Sq M.

SCHEDULE OF FINISHES(OUTSIDE) - Granite & zinc cladding

FOR TENDER PURPOSE ONLY

INDRADHANUSH GAS GRID LTD.

मेकॉन लिमिटेड

MECON LIMITED

NOTES:
1. 250MM WIDE BRICKS TO BE USED FOR WALLS.
2. ALL PAINTS TO BE ECO-FRIENDLY WITH LOW V.O.C.
3. CERAMIC TILES WITH RECYCLED CONTENTS TO BE USED.
4. LOW FLOW TOILET FIXTURES TO BE USED.
5. ±0.00 CORRESPONDS TO FINISHED ROAD TOP LEVEL
6. 12 MM DROP IN FINISH/SLAB TO BE MAINTAINED FROM INSIDE THE ROOM TO THE VERANDAH/BALCONY/TERRACE ETC.
7.1:80 MM SLOPE APPROXIMATELY TO BE MAINTAINED FOR DRAINAGE AT ROOF LVL.
8.ALL FINISH FLOOR LEVELS (EXTERNAL/INTERNAL) MUST BE LAID IN PROPER SLOPE & DIRECTION AS MAY BE REQUIRED AS/NORMAL ENGINEERING PRACTISE.

REV	DATE	ZONE	DESCRIPTION	BY	VERIFIED
			REVISION		

REFERENCES | DRG.NO.

REV / SEC

CONCURRED BY

SECTION	ARCHITECTURE
LOCATION	DELHI
DESIGNED	VIBHA
DRAWN	
CHECKED AND VERIFIED	S.BASU
APPROVED	SIG DR.R.K.DUTTA
	DATE : 01.02.2022

NORTH - EAST GAS GRID PIPELINE PROJECT

ADMINISTRATIVE BUILDING FOR COMPRESSOR STATION AT GUWAHATI

GROUND FLOOR PLAN

SCALE :- 1:100

DRG.NO.:-MEC/05/28/23UU/NGCS/TD/001

SHEET 1 OF 1

REV 0