

SPECIFICATION NO. G-0
LEAD SPECIFICATION

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SPECIFICATION NO. G-0

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1.00.00 PREAMBLE

The scope under this contract shall broadly include the following works by the EPC Contractor.

- (a) Main LSTK-EPC work for the 3 x 10 MW GEG Power Plant
- (b) 3 Months initial Operation and 1 Year Maintenance Service of the GEG Plant during warranty period
- (c) Comprehensive Long Term Maintenance Service (LTMS) of the GEG Plant for two (2) years with provision of extension by 1(one) year after completion of Warranty

The details of individual duration of works, mobilisations and other commercial details are given in GCC.

2.00.00 INTENT OF SPECIFICATION

2.01.00 The scope of LSTK-EPC work under this bid document is intended to cover on LSTK (Lump Sum Turn Key) Engineering Procurement and Construction (EPC) basis, the detail design, engineering, manufacture, procurements, assembly/reassembly, tests at Manufacturer's works, delivery covering packing, ocean shipment, marine insurance and clearance through Indian Port in case of imported plant/equipment, inland transportation, transit insurance, delivery to the site, unloading, storage, in plant transportation at site, Civil, Structural & Construction, Architectural work, dismantling and demolishing work, complete services of erection, testing, successful commissioning, integration with existing 2X14.45 MW Gas turbine generating sets and 1 x 20 .28 MW Gas turbine generating set, Reliability Run, handing over of Gas Engine Generator (GEG) based power plant consisting of three Gas Engine Generators each having minimum net exportable power output of 8.2 MW (to meet OIL's projected Electrical load of 24.4 MW) and other Balance of Plant (BOP) equipment at Duliajan, Assam, India as defined subsequently in different sections & sub-sections of this Bid Document and as required for safe and trouble free operation.

Each GEG power rating (gross) shall not be more than 10.5 MW at site condition.

2.02.00 This bid document includes carrying out of performance and guarantee tests at site after successful commissioning including supply of all necessary equipment, instruments, services, skilled & unskilled worker as required for this purpose.

2.03.00 This bid document also includes training of Company (OIL)'s personnel at Manufacturer's works and at site.

2.04.00 Under this Contract, the Contractor shall execute the whole and every part of the work in the best workman-ship manner and will hand over the equipment to the Company (OIL) in full satisfactory, working condition after commissioning and testing. In course of discharge of this obligation under the terms of this contract,

the Contractor shall provide/perform all services without any additional cost to the Company (OIL).

2.05.00 Any additional plant, equipment, material, services which are not specifically mentioned in this specification, but are required to make the plants/systems in this work-scope complete in every respect in accordance with the technical specification and for safe operation, guaranteed performance shall be covered under the scope of specification.

2.06.00 The GEG power station shall come under purview of CEA. All safety norms as specified by the latest amendments of CEA Regulations should be strictly followed. OIL shall file for necessary approval from Regional Inspectorial Organisation, CEA, Shillong. OIL shall also file for Consent to Establish and Consent to Operate, at appropriate time, with Assam State Pollution Control Board. The EPC Contractor shall provide all necessary assistance including all drawings, Test reports, Data etc. as may be required by the concerned Statutory Authority for granting the above approvals/clearances. All repair/modifications as directed by Statutory Authority for complying with Statutory guidelines shall have to be carried out by EPC contractor without any addition cost.

2.07.00 The EPC Contractor shall prepare the Zone Classification of the entire GEG Power Plant and shall ensure that all equipment to be used in the specified hazardous zones shall be suitable for use in such zones and shall have necessary approval of CMRI/CCoE.

3.00.00 **OPERATION & MAINTENANCE SERVICE (O&M)**

After works under the LSTK – EPC basis is completed and Plant declared as commissioned, the company (OIL) may seek the following services from the EPC Contractor:

The broad works under this O&M Contract(s) shall be as follows

- (a) 3 Months of Initial Plant Operation and 1 Year Maintenance Service during Warranty, including all materials and consumables for GEG plant (except fuel), after Plant Commissioning
- (b) Comprehensive Long Term Maintenance Service (LTMS) of Gas Engine Generator Plant for two (2) years with provision of extension by 1(one) year, including all spares and consumables for GEG plant (except fuel), after completion of 1 (one) Year Warranty

The detailed scope of work, Terms and Conditions, Payment terms and guarantees to be complied by the EPC Contractor under the above O&M Service is as specified elsewhere in this bid document.

4.00.00 **GAS ENGINE SPARES**

Post LTMS Contract, the Company (OIL) shall need Gas Engine spares for running the GEG sets. The bidder shall provide the details of Gas Engine spares that will be required for running each GEG for 1,00,000 Running Hrs. The details of the Scope, Terms and Conditions are as specified elsewhere in this bid document

5.00.00 PROJECT SYNOPSIS

5.01.00 Introduction

5.01.01 Duliajan is the field headquarters of Oil India Limited. It is located in the upper northeast part of Assam. It is a thriving industrial township set amidst lush green foliage round the year surrounded by rich sprawling tea gardens.

5.02.00 Approach to Site

5.02.01 Duliajan is well connected to the rest of India by air, rail as well as roads.

5.02.02 The nearest airport is 48 km away at Dibrugarh. Dibrugarh airport is connected by regular flights from Kolkata, the nearest international airport, and New Delhi. Besides there is also an air route to Dibrugarh from Guwahati the capital city of Assam.

5.02.03 Nearest railway station is Duliajan. Four major inter-state express trains operate on the rail link close to Duliajan. Three of these trains originate from New Delhi and one from Kolkata. The nearest stoppages are at Tinsukia (30 km) and Dibrugarh town (50 km). An inter-city shuttle plies daily between Dibrugarh and Guwahati (495 km).

5.02.04 Easily accessible by road by a branch-off (40 km) from the nearest national highway (NH-37), Duliajan is also well connected to the nearest district headquarters of Tinsukia (30 km) and Dibrugarh (50 km). The NH-37 traverses across the state of Assam connecting all major towns and cities.

5.03.00 Meteorological Data

5.03.01 Northeast Assam with its unique physiographic elements, experiences subtropical monsoon climate with mild winter, warm and humid summer.

5.03.02 The climatic condition of Duliajan is also congenial with monsoon remaining almost half of the year.

5.03.03 The site is situated at an elevation of around 118.8 meter above MSL

5.03.04 The available site meteorological data is presented in Attachment- 1.

5.04.00 Source of Water

5.04.01 Plant water of clarified quality shall be made available from the existing distribution piping network at one point adjacent to GEG plant. Quality of water available is enclosed in Attachment-2.

DM water, if required, shall be produced by bidder through standard RO based DM plant

5.05.00 Fuel

5.05.01 The Fuel Gas will be supplied from the existing OIL facility for use at a pressure ranging from 10.2 – 12.8 kg/cm²g. Fuel gas analysis is enclosed as Attachment-3 (Table – 1, 2 & 3).

5.06.00 Project Description

5.06.01 OIL intends to set up three Gas Engine Generators each having minimum net exportable power output of 8.2 MW each to meet the increasing industrial and domestic demand of OIL set up at Duliajan which is projected at 24.4 MW.

With the gradual phasing out of the 2x 14.45 MW GTG units, either existing 20.28 MW GTG unit with one GEG unit or three GEG units will operate to meet the maximum load demand in future.

5.07.00 Description of Existing Power Plant

The existing Duliajan Power Station presently comprises the following power generating units

5.07.01 Two units of 14.45 MW Gas Turbine generating sets installed in the year 1977. The gas turbine-generators generating power at 11kV are of Westinghouse Canada make, (model W191G).

5.07.02 One Frame #5 GTG unit of BHEL make generating 20.28 MW at 11 kV installed in the year 2014.

6.00.00 SCOPE OF CONTRACT

6.01.00 The complete work will be on LSTK - EPC basis for the entire plant and the scope of work as hereinafter outlined shall include, but not be limited to the complete engineering and design, supply of material & equipment, delivery, ocean/road transportation, custom clearance, inland transportation, storing & handling at site, insurance from transit to handover, installation, testing, trial run, performance guarantee test, handing over of all equipment including all necessary civil, structural, architectural, electrical, instrumentation & control and services as necessary for three Gas Engine Generator based power plant complete with all auxiliaries and ancillaries required for safe & trouble free operation.

The scope of work under this contract shall include equipment and services complete in all respect for the GEG power plant. For minimum technical requirement and other details of the respective equipment / plant / system, refer subsection and tender drawings as attached under Mechanical, Electrical, instrumentation and Control and Civil, Structural and Architectural work.

6.02.00 Mechanical

6.02.01 Gas Engine Generator Package as per Specification No. M-1 which essentially include

A. Each Gas Engine Generator Set consisting of

- i) Gas Engine with integral auxiliaries,
- ii) Coupling connecting the output shaft with the generator.
- iii) Open cycle air cooled brushless Synchronous Generator.
- iv) Engine Compressed Air based Starting system installed inside engine hall common for three units / Electric motor starting system.
- v) Gas Fuel System
- vi) Lubricating oil System
- vii) Engine Cooling Water System including modular packaged RO based DM plant if required to supply DM water make up.
- viii) Base Frame for the entire system.
- ix) Sound attenuated enclosure common for three GEG units suitably designed for a residual sound pressure level of 75 dB (A) at 1 m under near field condition.

- x) Inlet and Exhaust System including minimum 30 meter steel stack per engine enclosed in a single steel structure.
- xi) GEG building Ventilation System/Cooling System (As per Engine OEM/Packager's recommendation)
- xii) Gas Detection System covering also the new Gas Filtration Skid
- xiii) Control System comprising
 - Engine Control System
 - Generator Control, Synchronizing & Auxiliary System
 - Control System Interface
 - Facility for user to modify the preset Methane number in the Engine Control module, at Site, to enable GEG running under Rich Gas condition, without Vendor/OEM intervention.
- xiv) Fire detection and extinguishing system
- xv) Online measurement of flue gas at stack for NO_x and SO_x analysis through a set of in-situ analysers as per the statutory regulations, with continuous display and recording of values at control room HMI
- xvi) All integral cooling, sealing, lube oil, water piping with necessary Control & Instrumentation

6.02.02 Gas Conditioning cum Filtration System mounted on Skid (GFS) as per Specification No M-2 and essentially consisting of:

- A. 2 x 8 inch, 300 Class, gas pipeline from OIL supply point to GFS inlet
- B. Emergency Stop Valve at the inlet to the gas system
- C. 2 x 100% Knock Out Drum
- D. 2 x 100% Filter Separator Units
- E. 2 x 100% Fuel Gas Heaters, if required
- F. Gas flow metering devices
- G. Gas Venting System including cold vent stack / connection to existing gas vent header of 20.28 MW GTG
- H. Gas condensate collection and disposal system
- I. Nitrogen gas purging system
- J. Complete piping, valves, safety valves, filters & specialties in gas handling system as specified and as required for safe and reliable operation.

6.02.03 Plant Water System comprising:

- A. Service water interconnection piping from battery limit with valves and instruments for distribution and top up to primary cooling water system head tank as applicable.
- B. DM water interconnection piping from packaged DM plant with valves and instruments for top up to primary cooling water circuit head tank if applicable
- C. Distribution piping, valves and instruments

6.02.04 Plant Compressed air system as per Specification No M- 3 consisting of:

- A. Two (2) x 100% reciprocating type instrument air compressors (oil free type) with drives and accessories.
 - B. Two (2) x 100% air driers
 - C. One local compressor control panel with necessary instruments, switches, lamps, alarms etc.
 - D. One (1) instrument air receiver and one plant air receiver
 - E. Interconnecting piping, valves and instruments for instrument and plant air
- 6.02.05 Effluent System
- Effluent collection and discharge to underground oily waste water tank to be emptied periodically through mobile tanker by OIL.
- Sanitary sewage to be discharged to nearest sewer line after passing through septic tanks.
- 6.02.06 Fire Protection and Detection System (Extension) as per Specification No M-6 covering
- A. Review of the existing fire protection system for 1 x 20.28 MW GTG plant.
 - B. Furnish hydraulic calculation and proposed plan of utilizing existing pumping facility or its augmentation.
 - C. Extension / Augmentation of existing Fire hydrant system to cater the following requirements
 - i) Protection of GEG plant and facilities including existing 2 x 14.45 GTG building and new GFS skid through fire water outdoor hydrant system
 - ii) Standpipes and indoor hydrants including all accessories for auxiliary bay annex to GEG Building and extension of existing switchgear building
 - iii) Medium velocity water spray system for extended cable spreader room of existing Switchgear building of 1 x 20.28 MW GTG plant
 - iv) High velocity water spray system for three nos. new Generator Transformers.
 - v) Complete fire water distribution piping as necessary.
 - vi) Rerouting of existing cable spreader sprinkler system hydrant lines due to installation of elevator
 - vii) Passive fire protection system covering fire doors, fire sealing etc.
 - D. Installation/ Extension / Augmentation of Fire detection and alarm system in auxiliary bay annex to GEG building having electrical / PLC room, extended portion of existing switchgear and cable spreader room and newly occupied area of existing control room of 1 x 20.28 MW GTG plant to be utilized for GEG plant.
- 6.02.07 AC & Ventilation System as per Specification No M-4 and M-5 covering
- A. Review of the Air conditioning system of the existing control room of 1 x 20.28 MW GTG plant and accordingly provide if required additional wall mounted redundant air cooled Split-Type package air conditioners in existing Control Room of 1 x 20.28 MW GTG plant considering accommodation of DCS and other panels of GEG plant in the vacant space available in the control room

- B. Wall mounted redundant air cooled Split-Type package air conditioners shall be provided for the following areas:
 - i) Office, Record room, and PLC room in the first floor of Auxiliary bay annex to GEG building.
- C. Forced Ventilation system will be provided for the following buildings:
 - i) GEG Building
 - ii) Ground floor equipment of Auxiliary bay annex to GEG building including toilet.
 - iii) New Store building
 - iv) New Air Compressor Building
 - v) Extended portion of existing switch gear and cable spreader room of 1 x 20.28 MW GTG plant to be utilized for GEG plant
- 6.02.08 Pipes, Valves & Specialties as per Specification No M – 8 and M-9 covering
 - A. All interconnected piping with valves, hangers, supports and instruments as required for safe & trouble free operation of the plant. The pipe sleeper / racks and pipe trenches as applicable for the routing of piping shall be supplied under this contract.
 - B. Plumbing and drainage system covering all equipment vent & drains, pipe trenches etc. for all the buildings and facilities including supply & erection of sump/drainage pumps and drives.
 - C. Insulation for piping and equipment, as required.
- 6.02.09 Cranes & Hoisting as per Specification No M – 10 covering
 - A. One single girder EOT crane in the GEG building for maintenance purpose.
 - B. One single girder EOT crane in Store Building
 - C. Electric/Manual Hoists with monorails for new Air Compressor Building, etc.
 - D. One elevator of 400kg carrying capacity shall be provided in the extended part of existing Switchgear building of 20.28 MW GTG plant
 - E. The handling equipment as mentioned above are minimum requirement. Handling facility for all equipment/components shall be provided at appropriate locations.
- 6.02.10 All mechanical driven equipment e.g. pumps, compressors etc. shall be supplied along with electric drives and accessories, even if, specifically not mentioned.
- 6.02.11 Lube Oil Unloading, Storage and Handling System including development of storage area for storage of lube oil drums commensurate with annual lube consumptions.
- 6.02.12 Erection Testing and Commissioning
 - Erection, Testing and Commissioning of all Mechanical equipment as per specification no. M-12
- 6.03.00 **Electricals**
- 6.03.01 Synchronous Generator

- A. Generator along with suitable brushless excitation system with automatic voltage regulator and complete with all other associated equipment as per Specification No. E-1.
- B. The generator shall have but not limited to the following items:
 - i) One (1) set of brushless excitation system with automatic voltage regulator, field suppression/flushing equipment, interconnecting special cables complete with all equipment and accessories.
 - ii) All local and remote monitoring/supervisory instruments including sensing elements, connecting pipes/tubes/wirings.
 - iii) Air cooling system complete with all accessories.
 - iv) All equipment and accessories to facilitate erection, maintenance and removal of the equipment.
 - v) One (1) set of equipment required for generator drying out operation during commissioning.

6.03.02 Generator Phase & Neutral Side Cubicles

- A. Generator phase and neutral side cubicles as per Specification No. E-3.
- B. Generator phase side cubicles shall house the required no. of current transformers, voltage transformers, lightning arrestors and surge capacitors, busbar, shorting links and space heaters.
- C. Generator neutral side cubicles shall house the disconnect link, neutral grounding transformer, loading resistor, required no. of current transformers and space heaters.

6.03.03 Power Transformers

Three (3) nos. 11/11.5kV Transformers as per Specification No.E-4; one (1) no. for each GEG unit. The generator side winding shall be delta connected while the 11kV switchgear side winding shall be wye connected with the neutral grounded through a neutral grounding reactor.

6.03.04 HT Bus Duct

HT Bus ducts, as required, complete with fittings, accessories and auxiliary equipment as per Specification No. E-5.

6.03.05 11kV Switchgear

11kV Switchgears complete with circuit breakers and other associated equipment as per Specification No. E-8 including the following:

- A. The base channel frame of the switchgear with hardware.
- B. Set of accessories as detailed below:
 - i) Earthing equipment suitable for earthing of bus bar/ cable: One (1) no. each
 - ii) Device for slow opening and closing of breaker: One (1) no.
 - iii) Test cabinet with coupling cables: One (1) no.

6.03.06 Dry Type Plant Auxiliary Transformers

Two (2) no. L.T. Transformers (dry type 11 kV/433 V, 3 ph, 50 Hz), complete with fittings, accessories and auxiliary equipment as per Specification No. E-9.

- 6.03.07 L.T Busduct
- A. L.T Busducts of required length with associated equipment and accessories as per Specification No. E-10.
 - B. All supporting steel structures, fasteners and necessary hardware for complete busduct installation.
- 6.03.08 415 Volt Switchgear
- One (1) set of 415V Switchgear complete with circuit breakers and other associated equipment as required as per Specification No. E-11.
- 6.03.09 Motor Control Centre and Distribution Board
- 415 V Motor Control Centres, D.C. Starter Panels and A.C./ D.C. Distribution Boards as required for the auxiliaries of the entire plant complete with base channel frame with hardware & lifting angles and all other accessories as per Specification No. E-12.
- 6.03.10 Electric Motors
- All H.T. and L.T. A.C. motors and D.C. motors required for driving various equipment of the entire plant as per Specification No. E-13.
- 6.03.11 Electric Motor Actuators
- All electric motor actuators required for valves, dampers and gates of the entire plant along with all accessories as per Specification No. E-14.
- 6.03.12 Battery and Battery Charger
- 110V DC system for the 11kV & 415V power distribution system, protection and control systems and 24V DC system for the GEG units shall consist of Batteries and Battery Chargers with all accessories as required as per Specification No. E-15.
- 6.03.13 Uninterruptible Power Supply System (UPS)
- One (1) set of uninterruptible power supply system with battery back up as per Specification No. E-16.
- 6.03.14 Protective Relay Panel
- Protection panels as per Specification No. E-17 for the following:
- A. Three (3) sets Protective Relay Panel for the GEG Units, comprising of all protective relays for generator, generator transformer and other auxiliary devices.
 - B. Bus bar protection panel for the 11kV GEG Switchgear.
 - C. Synchronizing Panel.
 - D. Digital Fault Recorder.
 - E. Real Time Automatic Load shedding and generation management system.
 - F. The scope shall include one (1) set of relay test kits/ bench.
- 6.03.15 Diesel Generator
- One (1) Black Start Diesel Generator Set complete with all associated equipment including suitable starting system, automatic voltage regulator, DG control panel, protective relays and meters as per Specification No. E-18.
- 6.03.16 Plant Illumination System

LED based Indoor & outdoor illumination system for all the buildings/ structures/ areas/roads covered under the scope of this Specification and as per Specification No. E-19.

6.03.17 Plant Intercommunication System

- a) **Walkie-talkie handsets** for four stations having radius of 1 KM. Frequency shall be controlled and allocation will be decided & arranged by Company (OIL) during detail engineering stage. This shall include Chargers set, Holding Rack and other accessories as required.
- b). **Security system** with Closed Circuit TV as indicated in Specification No. I-1.

6.03.18 Plant Grounding and Lightning Protection System

Complete grounding and lightning protection system of the plant under scope of this package as specified in Specification No. E-21.

6.03.19 Cable Trays and Accessories

Complete cable trays and accessories as required for the entire plant as per Specification No. E-22.

6.03.20 Power and Control Cables

All H.T. and L.T. power and control cables and special cables as required for the entire plant as per Specification No. E-23.

6.03.21 Miscellaneous Panels

Miscellaneous Local Control Panels (for electrical integral with mechanical systems and subsystems), Local Control Stations, Junction Boxes as required for the entire plant, complete with all accessories as per Specification No. E-24.

6.03.22 Erection, Testing and Commissioning

Erection, Testing and Commissioning of all electrical equipment including cable tray, cabling & grounding as per specification no. E-26.

6.04.00 **Civil, Structural and Architectural Works**

Plant Civil, Structural and Architectural works as described under Subsection - C0 and A0 respectively.

6.05.00 **Instrumentation & Control**

Plant Instrumentation and Control systems as described under Subsection-I1

6.06.00 **General**

A. Dismantling / demolishing of Existing Facilities:

Contractor shall carry out dismantling of the existing facilities as described in Sub section C0 which shall among others, also include dismantling of existing gas filtration skid for 2 x 14.45 MW GTG plant to facilitate construction of the proposed GEG Building and existing Cooling Tower to facilitate construction of the proposed Gas Filtration Plant for the Power Plant. These dismantling works are critical and shall need meticulous planning to avoid Time over run and damage to existing running/live equipment and facilities in the vicinity.

- B. All actions necessary to comply with environmental requirements, including noise attenuation.

- C. Surface preparation and Painting of all equipment, piping, valves, structures, tanks, walls etc. as per Specification No M-11
- D. First fill & subsequent requirement of all consumables (except fuel) up to **Plant Commissioning**
- E. One set of Special tools & tackle supplied in separate containers with clear marking of the name of the equipment for which it is intended.
- F. One set of all calibration & testing instruments for maintenance, inspection & testing.

6.07.00

Accessories

All equipment/plant shall be complete in all respects with all applicable and necessary accessories such as:

- A. Anchor/foundation bolts
- B. Base plates/frames
- C. Supporting steel work
- D. Enclosure/weather canopies
- E. Integral galleries, walkways, ladders/stairs and platforms (including interconnecting platforms) required for access during erection, operation and maintenance for all equipment, piping, valves etc.
- F. Hand rails, kick plates, gratings
- G. Thermal insulation, lagging and cladding
- H. Acoustic insulation/treatment
- I. Hangers and supports for piping, cable trays etc.
- J. Integral piping and headers
- K. Isolating, check and regulating valves and their actuators
- L. Safety and relief valves with silencers
- M. Bearing, gearing, couplings, belt drives
- N. All fittings, hardware and fasteners
- O. Drive motors and integral electrical system
- P. Sampling probes and connectors
- Q. Integral control and instrumentation
- R. Lubricating and cooling system
- S. Expansion joints
- T. Inspection cover, manholes
- U. Gaskets, glands, sealing arrangements etc.
- V. Integral ducting and dampers
- W. Filling connections and cleaning lines
- X. Protective covers and guards
- Y. Danger boards and signs
- Z. Name plates, rating plates and labels.

AA. Any special maintenance tools & safety gadgets.

6.08.00 Other Services included in the Scope of this Specification

- 6.08.01 This is a Lump Sum Turnkey EPC Contract. The plant shall be engineered and designed strictly in accordance with the specification requirement. All engineering and services required to ensure a completely engineered plant shall be provided. The engineering documentation to be submitted shall include but not be limited to, Design basis report, covering system design, equipment sizing criteria including supporting calculations, write up and design philosophy including general arrangement drawings, and basic system diagrams of all mechanical, electrical, control and instrumentation system and Fire Protection System. Engineering services and documentation shall also include complete detailed engineering for the plant and equipment including preparation of detailed GA & layout drawings, flow diagrams, P&ID's, design calculations for pipes & insulation, AC and Ventilation system equipment, preparation of piping layouts, isometrics, equipment data sheets, single line diagrams, including block logic, control schematics, electrical schematics, technical literature, Civil, Structural and Architectural Engineering jobs including furnishing all construction and as built drawings and designs covering GEG and all other equipment foundation design. QA, erection and O&M manual etc. Drawing submission schedule and drawing list will be subject to approval of PMC/OIL during detailed engineering stage.
- 6.08.02 Engineering work shall be performed based on modern and proven concepts and internationally accepted good engineering practices but fully compatible with the site environments. Company (OIL) shall have the right to review and approve the engineering work by themselves and/or through Consultant and ask for any clarifications regarding the work performed by Contractor.
- 6.08.03 Bidder shall carry HAZOP study and Risk Analysis of the GEG power plant covering Qualitative/Quantitative risks and Risk Management Plan (RMP) & Disaster Management Plan (DMP) etc.
- 6.08.04 Bidder is to note that this project is an extension within an existing power generating station. Therefore, all work shall be carried out causing minimum hindrance to plant operation. Shutdown time for the existing Gas Turbine/s, when required, shall be limited to a minimum.
- 6.08.05 The Bidder is strongly recommended to visit the existing power station to familiarise himself with the conditions therein. Modifications of existing facilities, rerouting and dismantling of fuel gas piping etc. wherever required, dismantling of existing RCC foundation in the allotted plot and other demolishing / dismantling activities shall have to be carried out causing minimum down time. The work of dismantling of existing Gas Filtration Plant supplying fuel gas to the existing 14.45 MW Power Plant shall be carefully planned to ensure that the down time of the 14.45 MW Power Plant is restricted to the bare minimum.
- 6.08.06 Necessary interconnections and hook-up with the facilities of the existing plant, wherever required, shall be carried out.
- 6.08.07 Factory Acceptance Test all the three GEG units including Testing and inspection of all equipment, before shipment, at manufacturer's works. PMC/OIL may attend the performance testing which will be decided while approving the QC document.

- 6.08.08 Packing and transportation and insurance (Ocean & inland), port-handling and clearance.
- 6.08.09 Receiving at site, unloading and proper storage. Safety and security of all equipment shall be Contractor's responsibility. **All material/equipment shall be insured till taking over of the plant by OIL.**
- 6.08.10 Complete services of erection, subsequent cleaning/flushing, prestart checks, testing and commissioning of all equipment/plants. All manpower, equipment, instruments etc. as required for this shall be provided by the Bidder.
- 6.08.11 Training of OIL personnel as defined under this Section of the specification.
- 6.08.12 Trial run, initial operation, reliability run, performance testing and handing over to OIL after due approval by PMC/OIL.
- 6.08.13 All rectification, modifications and additions, as required in the plant to complete the Bidder's obligations.
- 6.08.14 All co-ordination with OIL, PMC and OIL's other Contractors, if any.
- 6.08.15 Assistance to PMC/OIL for obtaining all statutory clearances/approvals; licenses, permits, etc. from the concerned authorities as required for the plant and equipment. Attachment-4 of G-0 is enclosed for guide line purpose.
- 6.09.00 **Construction Facilities**
The following are the scope of work for the construction facilities for the project:
- 6.09.01 Roads
Existing roads, where necessary, shall have to be demolished, and new roads as required shall be constructed by the Contractor as per final and approved plant layout.
- 6.09.02 Construction Water
Construction water shall be arranged by the Contractor including storage and distribution as per his requirement.
- 6.09.03 Construction Power
OIL shall provide construction power of 10 KW to the Contractor at an available voltage level at one suitable location within the plant boundary on chargeable basis. The Contractor shall make necessary distribution for carrying out his work. Even though OIL will make all efforts to provide regular supply of construction power, the same is not guaranteed. The Contractor shall make his own necessary arrangements by way of diesel generator, etc. for having uninterrupted power supply. Contractor has to arrange for 3-phase ELCB/RCCB, MCB and Energy meter for getting power supply from OIL. Safe utilization of electrical power shall be Contractor's responsibility.
- 6.09.04 Other Facilities
- A. The Contractor shall make his own construction site office as required
 - B. The Contractor shall make his own construction store (open/ covered), fencing and construction workshop/fabrication yard and material/field testing laboratory as required. However, Electrical, Instrumentation and such mechanical equipment that are susceptible to damage by rain shall be stored only under covered storage area.
 - C. The Contractor shall provide necessary fire protection arrangement for his construction store, office and worksite.

- D. The Contractor shall arrange residential accommodation for all his personnel and arrange for their transportation to and from site.
- E. The Contractor shall arrange security arrangement for the plant and equipment.
- F. The Contractor shall clean up the site during and after erection to the satisfaction of PMC/OIL.
- G. The Contractor shall arrange the necessary facilities in the vacant land earmarked. Any additional land, if required, shall be arranged by the Contractor.
- H. The Contractor shall employ safety officer at site.

6.10.00 Terminal Points

The terminal points are listed below. It is the responsibility of the Contractor to define fully the details of the terminal points for safe, efficient construction and operation. The exact termination point location shall be finalized by the Contractor in consultation with PMC/OIL.

The contractor shall supply necessary termination equipment at all the terminal points.

The connections at terminal points shall be carried out with minimum disruption to existing plant operation. The means of termination and installation procedures shall be agreed and approved by PMC/OIL.

6.10.01 Mechanical

A. Fuel Gas Line

The terminal point shall be the flange of the isolating valve on two 8 inch fuel gas line (approx. 100 meter from engine room).

B. Plant Water

Clarified / Service water shall be sourced from the existing piping network at one point.

C. Fire Fighting Water

Fire-fighting water to be tapped from existing 150 NB hydrant main.

D. Nitrogen - To be supplied from the existing system at one point.

6.10.02 Electrical

A. 11kV Power Distribution System

- i) Outgoing feeders to various loads of OIL: power terminals at existing 11kV Switchgear of GT1-GT2 (14.45MW) units – Extension of Power cable from existing outgoing feeders of 11kV GT1-GT2 Reyrolle Burn Panel to the new 11kV GEG switchgear panels shall be under the scope of this package.
- ii) Tie feeders to existing 11kV GT3 switchgear – Power cable from outgoing feeder at 11kV GEG switchgear to terminals at 11kV GT3 switchgear shall be under scope of this package.

B. 415V System

- i) Tie feeder from 415V Emergency bus of GEG system to existing 415V Emergency bus of GT3 unit: power terminals at tie feeder of existing 415V

Emergency bus of GT3 – Power cable from outgoing feeder at 415V GEG
Emergency bus to terminals of tie feeder at 415V GT3 Emergency bus
shall be under scope of this package.

C. Digital Fault Recorder / Real-time Automatic Load and Generation Management System (ALS)

- i) Interface with relays/DCS of existing GTG 3 unit – Relevant port of relay/DCS in panels of existing GTG 3 unit in addition to covering all relays/DCS of GEG plant.
- ii) Real-time Automatic Load and Generation Management system (ALS) for the complete Power Plant shall continuously monitor the Power Generation, considering all existing GTGs and new GEGs, as well as the outgoing load on Real-Time basis. Based on user settable priority, high speed tripping of outgoing 11 KV loads shall be initiated in the event of an outage in one or more Generator. The design shall be such that system stability shall be maintained and total blackout prevented. The number of levels shall be finalized during detailed engineering.

7.00.00 **CODES AND STANDARDS**

7.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specification for the equipment/plant/system, all equipment, parts, systems & works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed including the following as a minimum:

- A. Central Electricity Authority (Safety and Electric Supply) Regulations, 2010
- B. Bureau of Indian Standards (BIS)
- C. Indian Electricity Act
- D. Indian Electricity Rules
- E. Indian Explosives Act
- F. Indian Factories Act and State Factories Act
- G. Emission Regulation of Central Water Pollution Control Board
- H. MINAS (Minimal National Standard)
- I. Pollution Control Regulations of Department of Environment, GOI
- J. Assam Pollution Control Board
- K. Regulations of the Tariff Advisory Committee for Fire Protection System
- L. DGMS Guidelines (as & where applicable)
- M. Oil Mines Regulations (OMR) & Mines Act
- N. Oil Industry Safety Directorate (OISD)
- O. Any other statutory codes/standards/regulations.

7.01.02 Unless covered otherwise by the Indian Codes & Standards and not specifically mentioned elsewhere in the Specifications, the latest editions of the Codes and standards as given below shall also apply:

- A. American National Standards Institute (ANSI)

- B. American Society of Testing and Materials (ASTM)
- C. American Society of Mechanical Engineers (ASME)
- D. American Petroleum Institute (API)
- E. Hydraulic Institute Standards for centrifugal pumps
- F. International Standard Organisation (ISO)
- G. Tubular Exchanger Manufacturer's Association (TEMA)
- H. ANSI code for Pressure Piping-B 31.1
- I. American Welding Society (AWS)
- J. National Electrical Manufacturer's Association (NEMA)
- K. National Fire Protection Association (NFPA)
- L. International Electro-Technical Commission Publication (IEC)
- M. Expansion Joint Manufacturers Association (EJMA)
- N. Heat Exchange Institute (HEI)

7.01.03 Other International/National standards such as DIN, BS etc. shall also be acceptable provided these are equivalent or superior to the standards mentioned. In all such cases, the Bidder shall furnish complete word to word English translation of the standards, which are normally not published in English.

7.01.04 In the event of any conflict between the codes and standards referred in above clauses and the requirement of this specification, the requirement of this specification shall govern.

7.01.05 All equipment covered by this specification shall comply with all applicable laws and regulations of the Republic of India.

8.00.00 **PLANT LAYOUT**

8.01.00 Layout should facilitate access for operation, maintenance and inspection of any equipment/component without disturbing the other plant and equipment.

Design of GEG enclosure will be given special emphasis in terms of sound absorption (possibility of sound absorbers at inner wall) and lower working temperature inside enclosure.

Minimum clearance of 1000 mm between two adjacent equipment skid shall be provided. Walkways shall be of minimum width of 750 mm. Similarly a clearance of minimum 1000 mm between equipment skid and the building wall shall be maintained.

The plot plan and GEG building layout are shown in drawing no18210-DWG-M-0101& 0102 respectively. The Bidder shall propose the optimum layout for his plant and equipment within the available space considering dismantling / demolishing work required for removing existing civil foundation and other underground facilities.

Piping /cable trench / sleeper shall not block the access to any equipment.

Requisite safety distance as per applicable standards shall be maintained from the existing plant equipment.

Necessary protection barriers shall be installed

All outdoor equipment shall have sheds for rain water protection

8.02.00 Lifting devices i.e. hoists & chain pulley blocks etc. shall be provided by the Bidder for handling of any equipment and/or part having weight in excess of 500Kgs during erection & maintenance activities.

Lifting devices like lifting tackles, slings, etc. as required shall be provided by the Bidder for lifting the equipment, accessories covered under the specification.

9.00.00 **IMPLEMENTATION SCHEDULE**

9.01.00 A master network schedule conforming to the overall schedule shall be prepared by the Bidder for submission with the bid. The Master Network will identify milestones of Key events in the areas of engineering, procurement, manufacture, transportation, erection and commissioning.

9.02.00 The master network shall also define the time and duration of shut-down if required for each existing Gas Turbine Unit in a phased manner.

It shall be noted that part of the proposed GEG building will be located in the space presently occupied by the Gas Filtration System of the existing 2x14.45MW Gas Turbines. The existing GFS can be dismantled only after the new GFS is ready and made operational. This needs to be suitably taken care of in the project schedule.

9.03.00 Based on the approved Master Network, the Contractor will prepare further detailed network and schedules indicating the schedule for data availability/drawing release/documentation.

The Contractor will also submit the site mobilization / infrastructure development plans, which will include plan for construction of site office, storage shed, deployment of tools and tackles etc. so as to commence the erection as per programme.

9.04.00 The Contractor shall submit monthly detailed progress report, indicating the progress achieved in design, manufacturing, supply, erection etc., actions proposed to be taken in delayed areas and areas needing attention of the Company (OIL).

9.05.00 Overall project progress review meetings will be conducted from time to time to ascertain the progress of engineering, manufacturing, dispatches, erection and commissioning activities. Representatives of all concerned groups from the PMC/Company (OIL) and the Contractor shall participate in these reviews to expeditiously resolve issues which may directly or indirectly affect the progress of the project.

10.00.00 **PACKING & TRANSPORTATION**

All equipment shall be suitably protected, coated, covered, boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the material, the limitations of weight, dimension etc. for transportation by railways and roadways, as applicable, should be taken into account. The Bidder shall thoroughly investigate and find out such limitations in the route of transportation planned by him for plant & materials to site. For easy identification, the equipment/part no. in the shipping list shall also be marked on the equipment/part.

11.00.00 **HEALTH, SAFETY, ENVIRONMENTAL REQUIREMENTS**

11.01.00 It is OIL's objective and policy to ensure that potential health and safety factors and environmental effects are assessed for all project activities. This is

implemented by staged audits of health, safety and environmental aspects from concept stage to completion in order to determine any shortcomings or noncompliance.

11.02.00 The detail guidelines, which the EPC Contractor has to follow, are provided under Attachment –B in this Tender Document.

12.00.00 **DESIGN CO-ORDINATION MEETING**

The Contractor will be called upon to attend design co-ordination meeting with the PMC/Company (OIL) during the period of the Contract. The Contractor shall attend such meetings at his own cost at mutually agreed venues as and when required.

13.00.00 **QUALITY ASSURANCE**

13.01.00 Quality Assurance Programme

To ensure that the equipment and services under the scope of this Contract, whether manufactured or performed within the Contractor's works or at his Sub-Contractor's premises or at the Company (OIL)'s site or at any other place of work, are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be submitted for PMC/Company (OIL)'s approval.

13.02.00 Inspection, Testing & Inspection Certificates

The PMC/Company (OIL), his duly authorised representative and/or an outside inspection agency acting on behalf of the Company (OIL) shall have, at all reasonable times access to the Contractor's premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection, and if part of the Works is being manufactured or assembled at other premises of works, the Contractor shall obtain from the PMC/Company (OIL). and for his duly authorised representative permission to inspect as if the Works were manufactured or assembled on the Contractor's own premises or works.

The Contractor shall give the PMC/Company (OIL) thirty (30) days written notice (in case of indigenous item) and ninety (90) days (in case of imported item) of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses for travel, board and lodging of PMC/Company (OIL).The Engineer of the PMC/Company (OIL), unless witnessing of the tests is waived, will attend such tests within the specified date on which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed with the test subject to waiver note of the PMC/Company (OIL) and he shall forthwith forward to the Inspector six copies of duly certified tests certificates.

The PMC/Company (OIL).shall within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the PMC/Company (OIL). giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Contractor's works, PMC/Company (OIL) shall issue a certificate to this effect within fifteen (15) days

after completion of tests but if the tests are not witnessed by PMC/Company (OIL), the certificates shall be issued within fifteen (15) days of the receipt of the Contractor's Test Certificate by PMC/Company (OIL). Failure of PMC/Company (OIL) to issue such a Certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificate shall not bind the Company (OIL) to accept the equipment should it, on further tests after erection, be found not to comply with the Contract.

In all cases where the Contract provides for tests whether at the premises or works of the Contractor or of any Sub-Contractor, the Contractor, shall provide free of charge such items as worker, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the authorised representatives of PMC/Company (OIL) to effectively carryout the inspection work.

The inspection by PMC/Company (OIL) and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

Quality Control Document shall be provided by the Bidder.

14.00.00 FACTORY ACCEPTANCE TEST FOR GEG UNITS

14.01.00 The Factory Acceptance Test (FAT), at OEM's works, for all the Gas Engine Generator units (String Test of the Gas Engine and Alternator together) shall be conducted in accordance with the ISO standard. Other standard(s), if offered, shall be subject to approval by PMC/OIL.

14.02.00 In the Factory Acceptance Test (FAT), at OEM's works, the performances of the engine(s) shall also be tested under the applicable ISO standard conditions for demonstration and witness by OIL Team. This is in addition to the String Test of the Gas Engine(s) coupled with the Alternator(s).

14.03.00 At least forty five (45) days prior to FAT, the detailed procedure for the tests shall have to be submitted in writing to PMC/OIL for necessary approval. FAT shall be carried out only after receipt of approval from PMC/OIL

14.04.00 FAT shall be performed with Gas fuel of Methane Number as declared by the Bidder in Form-A of the bid document. Guaranteed parameters shall be checked with respect to data declared in Form-A of the Bid document

14.05.00 During the FAT, Bidder's guarantee with respect to the following parameters, under ISO conditions, shall be verified at OEM's works

a) Gross Electrical Power Output at Generator terminal

b) Heat Rate at Gross Electrical Power Output

~~c) Specific Lube oil consumption at Gross Electrical Power Output~~

Post the measurement of above values, the OEM shall also provide the extrapolated value of these parameters under the designed site condition, using pre-submitted correction curves at the time of bid submission

14.06.00 In addition to the tests to be performed as per standards, the following shall also be tested / verified:

- a) No load running of the GEG for 30 min
 - b) Exhaust Emission
 - c) Noise level measurement
 - d) Voltage Regulation Test
 - e) Transient Voltage Dip and Transient Voltage Rise (TVD/TVR) Test
 - f) Temperature rise test at rated voltage and current, power factor and frequency
 - g) Response of Speed, Voltage and Frequency with sudden application of block load as per ISO 3046
 - h) Response of Speed, Voltage and Frequency with sudden load throw-off as per ISO 3046
 - i) The Governing System shall be tested during full load performance test to establish conformance
- 14.07.00 The Final Test report shall be submitted to OIL within 7 days of completion of the Test
- 14.08.00 The GEG unit shall be **Accepted only** if the results of the FAT are within acceptable values, and values of the following parameters fall within the range as specified below for both under ISO condition as well under site conditions (based on extrapolation) :
- a) Gross Electrical Power Output at Generator terminal under ISO condition is **not below 100%** of the guaranteed value.
 - b) Extrapolated value for Gross Electrical Power Output under site condition *minus* Declared Auxiliary Power Consumption, is **not below 100%** of the guaranteed Net Exportable Electrical Power Output at site condition.
 - c) Heat Rate at Gross Electrical Power Output is **not above 105%** of the guaranteed value.
 - ~~d) Specific Lube oil consumption at Gross Electrical Power Output is **not above 105%** of the guaranteed value.~~
- 15.00.00 **RELIABILITY RUN & PERFORMANCE GUARANTEE TESTS**
- 15.01.00 Fuel Gas used for the Reliability Run Test and Performance Gas Test at site shall be Average Gas, of composition as specified Table – 1 (Average). Fuel Gas for the Reliability Run Test and Performance guarantee Test at site shall be free-issue by OIL.
- The Reliability Run Test and Performance Gas Test at site shall be performed on full load or maximum available load
- 15.02.00 **Reliability Run Test**
- 15.02.01 At least forty five (45) days prior to Reliability Run Test, the detailed procedure for the tests shall have to be submitted in writing to PMC/OIL for necessary approval. Reliability Run Test shall be carried out only after receipt of approval from PMC/OIL
- 15.02.02 Reliability Run test shall be conducted individually for each GEG unit followed by a combined test involving all the three GEG units. During these tests, the

- performance of the GEG(s) with respect to Block loading/unloading capability, Synchronizing, Parallel Operation and load sharing among GEGs and available GTGs as defined in clause no 3.03.00 of Section E- 0 shall be assessed.
- 15.02.03 Individual GEG Unit: The duration of Reliability Run of each GEG unit, in the automatic position of control system under varying load, shall be for a period of fourteen (14) days. A maximum of 4 (four) outages, with a cumulative outage of not more than twenty (20) hours shall be allowed.
- 15.02.04 **Combined GEG Units:** After successful completion of reliability run of all individual GEG units, Reliability Run shall be performed under various combinations of GTG(s) and GEG units for a period of forty eight (48) hours. No outage shall be allowed during this test.
- 15.02.05 The Final Test report shall be submitted to OIL within 7 days of completion of the Test
- 15.02.06 GEG unit(s) will be put on reliability run when the PMC/OIL is fully satisfied that the offered GEG Plant has been proven with regard to its safety.
- 15.02.07 If the above limitation is not met, the Reliability Run Test shall be repeated. The test may also be terminated and rescheduled at the insistence of the PMC/OIL if in the PMC/OIL's opinion, the nature or cause of a shutdown does not warrant continued testing. Similarly, OIL may elect to accept a Test of shorter duration if, in the opinion of OIL, reliability has been adequately proven prior to a shutdown. If the Reliability Run is interrupted by shut down, the cause of which, in the opinion of the PMC/OIL, is not within the scope of the Contractor, the test shall be resumed at the earliest, and the delivery dates and penalties provided for in this Contract shall be adjusted to the components for the delay.
- If the Reliability Run is interrupted by shutdown, the cause of which, in the opinion of the PMC/OIL, is within the scope of the Contractor, the Contractor shall be allowed to resume the test under the same conditions and limitations specified above. However, no time extension shall be allowed in the completion dates and penalties provided for in this Contract.
- 15.02.08 In case of repeated failures in reliability run of the GEG unit(s), the Contractor shall modify the equipment as required at no extra cost to enable it to meet the reliability requirements. In case the GEG unit(s) fail the reliability run even after modifications, the PMC/OIL shall have the right to reject the unit(s).
- 15.03.00 **Performance Guarantee Tests**
- 15.03.01 After completion of satisfactory Reliability Run, the Contractor shall prepare the units for Performance Guarantee Tests at site. The tests shall be carried out as soon as possible on a mutually agreed date after successful completion of reliability run of all the three GEG units.
- 15.03.02 The performance test shall be conducted in two parts
- i) individually for each engine
 - ii) the GEG Power Plant
- At least forty five (45) days prior to Performance Guarantee Test, the detailed procedure for the tests shall have to be submitted in writing to PMC/OIL for necessary approval. Performance Guarantee Test shall be carried out only after receipt of approval from PMC/OIL
- 15.03.03 These tests shall be carried out by the Contractor to meet the stipulated requirements as indicated in the relevant clause(s) of specification G-0.

- 15.03.04 In case of delay in carrying out the performance guarantee test for reasons not attributable to the PMC/OIL, the Contractor shall be required to prove the specified performance guarantee without any derating /aging factor.
- 15.03.05 The performance guarantee tests will be conducted in accordance with the ISO / ASME PTC code or any other international standard offered by the Contractor and accepted by PMC/OIL.
- 15.03.06 All necessary test grade instruments (duly calibrated not before three months of the PG test with calibration certificate), system, equipment, tools, tackles, etc. required for the performance test shall be arranged and brought by the Contractor without any additional costs and would be deemed to be covered within the contract price.
- 15.03.07 Should the plant or any portion thereof fail under these tests to give the performance required, then any further tests which may be considered necessary by the PMC/OIL shall be conducted in a similar manner.
- 15.03.08 The guaranteed performance figures of the equipment shall be proved by the Contractor during these tests. The Contractor shall submit a detailed test report within Seven (7) days of completion of the test for PMC/ OIL's approval. Should the PMC/OIL's assessment of these tests show any shortfall from the guaranteed values, the Contractor shall modify the equipment as required at no extra cost to enable it to meet the guaranteed performances. In such case, Performance tests shall be repeated after the equipment is ready for retest. The whole cost of the repeated tests shall be borne by the Contractor. However, if the Contractor is not able to demonstrate the guarantee even after the modifications within ninety (90) days or a reasonable period allowed by PMC/OIL, PMC/OIL will have the right to reject the equipment/system/plant or accept the equipment/system/plant after levying liquidated damages as stipulated in specification G-0.
- 15.03.09 The method and the number and location of measurements and the provision of and duties of observers shall be mutually agreed upon before the tests. In relation to the electrical measurements the following procedure may be applied:
- a) The gross electrical power output may be measured at the terminals of the generator. The power consumed by electrically driven auxiliaries supplied as part of the Works shall be measured at pre-approved points. The Generator transformer losses, as obtained from routine test results, shall be deduced for the transformer load.
 - b) Suitable current and voltage transformers and all other measuring equipment shall be provided in the contract for the measurement of auxiliary power and for the efficiency and output test.
- In addition to the test measurements required by the agreed test standards, it may be necessary to log additional measurements to provide baseline operational data. These extra readings shall be defined by PMC/OIL and agreed with the Contractor as part of the testing programme.
- 15.03.10 Requisite no. of copies of the test reports as mutually agreed upon, are to be furnished by the Contractor to PMC/OIL backed up with jointly signed data sheets recorded during the test period.
- 15.03.11 Whenever it is not practicable to conduct the performance guarantee test at site, and an accurate test to prove the guaranteed parameters have already been

conducted in the shop test, such a test may not be repeated, if so agreed by PMC/OIL.

16.00.00 PERFORMANCE GUARANTEES & LIQUIDATED DAMAGES

16.01.00 Plant Performance

16.01.01 All the performance parameters guaranteed by the Bidder will be based on the following design conditions:

- A. Ambient Air Temperature of 40°C and Relative Humidity 50%
- B. Site Altitude 118.8 meter above MSL
- C. Voltage 11 KV, Power Factor of 0.8 (lagging) at Alternator Terminal.
- D. Site condition as per Attachment 1 of Section G0
- E. Fuel gas quality as per Attachment-3 (Table – 1).

16.02.00 Guarantees & Liquidated Damages

16.02.01 Performance of the plants/equipment supplied under this Contract shall be guaranteed by the Contractor. The guarantees shall be categorized as those, which attract "Liquidated Damages" and those, which are "Absolute guarantees".

The Contractor shall demonstrate all the performance guarantees during the Performance Guarantee (PG) tests to be carried out for each GEG.

The guaranteed parameters shall be without any tolerance values. All margins required for instrument inaccuracies and for all other reasons shall be deemed to be included in the guaranteed figures. No tolerance or allowance on the test results shall be permitted for any reason whatsoever, except for the adjustment for deviation from the design conditions, as per the certified correction curves.

In case the Gas Engine Generator unit cannot be loaded up to guaranteed power output during performance guarantee test due to limited power requirement of the Company (OIL), the PG test results shall be extrapolated with respect to guaranteed power output on the basis of certified correction curves.

A full set of certified correction curves with adequate resolution shall be provided with the bid to insure evaluation of the operation at the design point from the actual test conditions.

16.03.00 Guarantees attracting Liquidated Damages

16.03.01 Deviation in the following Performance Guarantee parameter, from their guaranteed values shall attract Liquidated Damages.

A. Net Unit Heat Rate

This will be calculated as follows:

Net GEG unit Heat Rate =

Engine Heat Rate at gross Power

$$\frac{\text{output}}{\text{output}} \times \frac{P_G}{(P_G - P_a)}$$

Where,

P_G = Gross output of each Engine at base Load

$$P_a = \text{Auxiliary power consumption}$$

B. Specific Lube Oil Consumption

This will be calculated as follows

Specific Lube Oil Consumption = Lube oil consumed / Energy in Kwhr
during test run period

- 16.03.02 If during the Performance & Guarantee (PG) test, the Contractor fails to demonstrate any of the above guarantees, he shall carry out all necessary modifications and/or replacements, at no extra cost to the Company (OIL), and repeat the PG test to demonstrate compliance with the guaranteed requirements. However, if the Contractor fails to demonstrate these guarantees within (90) days from the day of notification by the Company (OIL), the Contract price shall be reduced by way of Liquidated Damages. The Liquidated Damages shall be applied at the rates specified in the General Conditions of Contract.
- 16.03.03 There shall be no bonus payment if the actual performance (revealed by PG test) is better than the guaranteed parameters.
- 16.04.00 **Liquidated Damages on account of Non fulfillment of Guaranteed Performance Parameters**
For deviation from the guaranteed parameters, the following Liquidated Damages shall be applicable.
- 16.04.01 **Net Unit Heat Rate**
The liquidated damage for deficiency in the additional net heat rate for each GEG unit shall be **applicable up to 105%** of the guaranteed heat rate and shall be computed as given below. In case the tested heat rate is above 105% of the guaranteed heat rate, the Company (OIL) reserves the right to reject the plant.
Net Unit Heat rate: Deficiency in net unit Heat rate i.e. Difference in guaranteed Net Unit HEAT RATE and the actual Net unit HEAT RATE established during PG test (up to 105%). **LD for deficiency in Net unit heat rate will be imposed at the rate of ₹ 106.00/kcal/kwhr/kw or equivalent US\$ as Heat Rate Penalty.**
- 16.04.02 **Lube Oil Consumption**
The liquidated damage for deficiency in the additional lube oil consumption shall be **applicable up to 105%** of the guaranteed value and shall be computed as given below. In case the tested value for each GEG unit is above 105% of the guaranteed Specific Lube oil Consumption at Site, the Company (OIL) reserves the right to reject the plant

Lube Oil Consumption :Deficiency in Lube oil consumption i.e Difference in Guaranteed lube oil consumption and Actual lube oil consumption of each GEG established during PG test (up to 105%). **LD for deficiency in lube oil consumption will be imposed at the rate of ₹ 16 /milligram/KWh/Kw or equivalent US\$.**

16.04.03 The total amount of liquidated damages on account of non-fulfillment of guaranteed performance parameters shall not in any case exceed **7.5% of the Main LSTK-EPC work Contract Price**. The Company (OIL) shall deduct the amount of such liquidated damage from any money due or which may become due to the Contractor under this Contract, and/or recover such liquidated damages from the Performance Guarantee of the Contractor.

16.04.04 The total amount of liquidated damages on account of (a) Delay and (b) Non-fulfillment of guaranteed performance parameters of the GEG Plant shall **not in any case exceed Fifteen Percent (15 %) of the Main LSTK-EPC work Contract Price**. The Company (OIL) shall deduct the amount of such liquidated damage from any money due or which may become due to the Contractor under this Contract, and/or recover such liquidated damage from the Performance Guarantee of the Contractor.

16.05.00 **Absolute Guarantees**

16.05.01 These guarantees are precedent for Performance Guarantee Tests and Project Completion. The followings shall be offered as Absolute Guarantees.

- A. Net Exportable Electrical Power Output utilising Average Gas (Table-1), under designed site condition
- B. Gross Electrical Power Output utilising Rich Gas condition (Table-2), under designed site condition
- C. No load running of the GEG for a minimum of 30 minutes after reaching full speed utilising Gas fuel of composition as specified in Table – 1, 2 & 3, of the technical specifications, under designed site condition

The net electrical power output will be calculated based on the measurement at the Alternator terminal, covering the Alternator and excitation losses and subtracting the power consumptions of the continuously running GEG auxiliaries.

No derating of GEG unit will be considered for PG test.

The Bidder shall furnish a detailed list of all the auxiliaries considered by them in this guarantee for auxiliary power consumption for each GEG.

The guarantee will be based on the specified site conditions. Correction curves with adequate resolution as required for deviation of design conditions including fuel gas Methane number shall be furnished (with the bid). Those design conditions, for which no correction curve is furnished with the bid, will be deemed to have no effect on the guarantee parameter

D. GEG Exhaust gas emission level at Stack outlet. The SO_x and NO_x in the exhaust gas shall be within the stipulations of the Central Pollution Control Board and State Pollution Control Board.

E. Noise Level

Noise Level of all the major equipment shall not exceed 75 dB (A) at 1.0m distance (near field) and 60 dB(A) at 120m distance (far field) at a height of 1.5 m above ground during plant operation.

F. Liquid Effluent discharge quality from the plant – shall meet the stipulations of the Pollution Control Board.

16.05.02 If during the Performance and Guarantee Test, the Contractor fails to demonstrate any of the 'Absolute Guarantee', he shall carry out all necessary modifications and/or replacements, at no extra cost to the Company (OIL), and repeat the Performance and Guarantee Test to demonstrate compliance with the guaranteed requirements. However, if the Contractor fails to demonstrate any of these guarantees within ninety (90) days from the day of notification by the PMC/Company (OIL), the Company (OIL) reserves the right to reject the corresponding plant/equipment. In case of such rejection, the Contractor, without any extra cost to the Company (OIL), shall replace the plant/equipment with one which will meet the guaranteed parameters.

16.05.03 PG test procedure for GEG unit and other auxiliary plant and equipment shall be furnished by contractor during detailed engineering stage and is subject to approval of PMC/Company (OIL).

16.06.00 **Performance Demonstration**

Performance for the following items shall be demonstrated and shortfall in performance if any shall be rectified to the satisfaction of PMC/ OIL.

16.06.01 Auxiliary Power Consumption

This will include but not be limited to the following:

- i) All continuous running GEG auxiliaries
- ii) Transformer loss, bus duct loss, cable loss etc.

16.06.02 Gas Filtration Skid (GFS) Performance

16.06.03 Air Conditioning & Ventilation System performance

16.06.04 Plant Air Compressor performance

16.07.00 **Plant Availability & Unit availability**

The plant shall be designed to achieve a minimum individual GEG unit availability of 90% for the operating life. The plant availability, based on a scenario of 2R+1S should not be less than 99.9%. It should be noted that this availability includes planned maintenance losses, breakdown losses and derating losses. A plant availability assessment shall be provided by the EPC Contractor to demonstrate that the design being offered shall achieve the required availability.

17.00.00 **COMMISSIONING**

Plant Commissioning shall be declared on successful completion of Reliability Run Test and Performance Guarantee test, including completion of Automatic

Load and Generation Management System (ALS) and all mechanical, electrical and Instrumentation & Control systems of the balance of plant systems

18.00.00 WARRANTY AND MAINTENANCE DURING WARRANTY

The Warranty Period shall commence from the date of Plant Commissioning and shall be for a period of one year.

In addition to EPC contractor's Warranty obligations covered under the main LSTK-EPC works, OIL intends to seek the following additional services from the EPC contractor during the tenure of the Warranty Period.

18.01.00 Initial Plant Operation

Initial three (3) months Operation of the GEG plants (24x7) by deploying Contractor's experienced and skilled/trained manpower, including hand holding training of OIL's operational team and subsequent bump less transfer to OIL's operational team.

The date of commencement of initial plant operation shall be date of successful **Plant Commissioning or such other date as decided by Company (OIL).**

18.02.00 Maintenance Service during Warranty

Maintenance Service of the complete GEG Power Plant covering all routine, periodic, break down and scheduled maintenance, running repairs, troubleshooting etc. for a duration of **1 (One) Year** after successful **Plant Commissioning**

The Scope of service shall include supply of requisite manpower for carrying out these maintenances including all materials and consumables, including lube oil but excluding fuel. The scope of service and Terms & Conditions for this maintenance service shall be the same as defined under POST WARRANTY LONG TERM MAINTENANCE SERVICE (LTMS), elsewhere in this document.

19.00.00 SPARES

19.01.00 Recommended Spares

One (1) month prior to taking over the Plant by OIL, EPC Contractor shall furnish a comprehensive list of all the spare parts recommended by him for safe and satisfactory operation for three (3) years of all the plant and equipment (except the Gas Engines) covered under this specification. This list shall as a minimum include the following details:

- i) Equipment type and make
- ii) Description of spare item
- iii) OEM's part number
- iv) Quantity recommended and
- v) Rate
- vi) HSN code

Separate Purchase Order for these spares will be placed by OIL, as required. This item will not be used for evaluation of bids.

19.02.00 Startup/Commissioning Spares

The Bidder shall indicate and include in the scope of supply all the necessary start-up spares. Startup spares are those spares which may be required during the startup and commissioning of the equipment and/or system. All spares used until the plant is handed over to OIL shall come under this category. The prices for the start-up spares shall be included in the price for the respective equipment. The Contractor shall provide for an adequate stock of such start-up spares during plant erection and commissioning. The Contractor shall submit to OIL a complete list of all such start up spares which are proposed to be brought to site. They must be available at site before the equipment/system are energised and can be removed only after the receipt of Taking Over Certificate. All start-up spares which remain unused at that time shall remain the property of OIL.

19.03.00 All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended. The spares shall be treated and packed for long storage. In case any special protection for any spare parts is required, the Contractor shall clearly identify these spare parts and specify the type of protection required.

19.04.00 Each spare shall be clearly marked or labelled on the outside of the packing with its description. When more than one spare part is packed in a single case, the general description of the contents shall be shown on the outside of such case and detailed list enclosed.

All cases, containers and other packages must be suitably marked and numbered for proper identification.

20.00.00 SPECIAL TOOLS AND TACKLES

20.01.01 The Bidder shall quote for a complete and unused set of all special tools and tackle, including required number of the tool boxes, as required for erection, maintenance, overhaul or complete replacement of the equipment and components required for the plant. The Bidder shall enclose with his proposal the list of special tools and tackle as per the format given under Schedule-VII.

20.01.02 The tools shall be supplied in separate containers clearly marked with the name of the equipment for which they are intended.

20.01.03 The price of special tools and tackle shall be included in the lumpsum price quoted by the Bidder.

21.00.00 TRAINING OF PERSONNEL

21.01.00 The Contractor shall provide a comprehensive training program addressing the operation and maintenance aspects of the plant. This program shall be integrated with the commissioning/start-up of the plant and all documents and procedures referred to must be compatible to each other.

21.01.01 The program will be undertaken in two phases. The first phase will consist of the development of all necessary component and system operating procedures and maintenance (preventive and corrective) procedures and training outlines for all systems in the plant and it shall be issued to PMC/OIL for approval.

21.01.02 The second phase will consist of formal class room and on the job training to OIL's personnel. The Contractor shall issue to OIL a schedule for this phase of the training program at least thirty (30) days prior to the commencement of commissioning/ start-up activities which will show the time and duration of each training activity including vendor supplied training. The Contractor shall be

responsible for all costs related to training at Vendor's shop as needed for parts of the training which cannot be imparted at site.

21.01.03 The Contractor shall provide training at Engine OEM works for 2 batches, each batch comprising of three (3) engineers of OIL, for minimum period of seven (7) days for each batch. The training shall include engine technology and engine control system. All cost towards travel and accommodation will be borne by OIL.

21.01.04 All training necessary to ensure safe and efficient operation of the plant by OIL's personnel shall be provided.

21.02.00 **Training Documents**

OIL will require the following documents for all Systems:

21.02.01 System Operating Procedures comprising instructions which shall explain how each system shall be started up, normally operated and shutdown.

21.02.02 System Alarm Response Procedures comprising diagnostic routines for responses to alarms on each system.

21.02.03 Training Outlines to be used for training purposes for each system.

21.02.04 Preventive Maintenance Cards and Maintenance Procedures.

21.02.05 Spare Parts List.

22.00.00 **DOCUMENTS, DRAWINGS AND DATA TO BE SUBMITTED**

22.01.00 **Along with the proposal**

The Bidder shall fill-up all the **Schedules** containing **Proposal Exhibit Sheets** in Part 3 Section -II Book -5 of this specification completely in line with the instructions therein and sign each page. Failure to comply with this requirement may render the bid unacceptable. The response shall be clear and unambiguous. Ambiguous replies shall be ignored and it shall be construed that the specification requirement shall be met for the related item.

In addition to the above requirements, the Bidder shall also submit the following data/documents, along with his bid.

- i) Bidder to submit the names of proposed Civil Contractor(s) (Maximum 3) who will be executing the Civil work in case of an award on the Bidder.
- ii) Bidder's proposed sub vendor list (Minimum 3) for all major bought out items for approval by PMC / OIL.
- iii) Bidder's Quality Assurance/Quality Control document as relevant to his proposal.
- iv) Plot plan showing GEG building, Gas Filtration skid, reconstructed store building and plant air compressor room, other plant buildings, outdoor plants & equipment, lube oil storage & handling area, Compressed air system equipment, black start DG, transformer, pipe and cable rack, drainage & other pits, roads, etc.
- v) Plan and Section of GEG building including annex auxiliary bay
- vi) General Arrangement drawing of GEG assembly
- vii) General Arrangement Drawing of GFS

- viii) Schematic diagram of Gas Filtration system
- ix) Utility Tie in point Diagram
- x) Schematic Drawing for
 - i. Lube oil unloading, storage, handling and draining system
 - ii. Scheme of Engine cooling water system
 - iii. Scheme of engine starting system
 - iv. Instrument air system
 - v. Plant Fire Protection extension system
 - vi. Black Start DG fuel oil system
- xi) Single line diagram (SLD) of electrical power distribution system.
- xii) MV and LV system
- xiii) D.C. and A.C. emergency system
- xiv) Scheme of Air Conditioning and Ventilation and heat load calculation
- xv) A write-up on and a list of plant effluent/ environmental pollution monitoring equipment (with brief specification) including O&M philosophy to be provided by the Bidder.
- xvi) A write-up on the arrangements proposed to meet the specified limits on near field and far field noise level
- xvii) A write up on erection methodology of GEG unit
- xviii) A bar chart for the Bidder's proposed design, manufacturing, procurement and delivery activities
- xix) A bar chart for the Bidder's proposed site activities up to commercial operation of the units.
- xx) All correction curves needed to establish the guaranteed performance value
- xxi) GEG output curves at different methane numbers corresponding to entire range of site gas composition (Table 1, 2 & 3)
- xxii) Any other drawing and document indicated elsewhere in this specification

22.02.00 After Award of Contract

- 22.02.01 The Contractor shall submit a detailed Engineering document, data and Drawing submission schedule. The schedule shall indicate the comprehensive list of drawings and documents which will be submitted by the Contractor to the PMC/OIL clearly identifying the drawings which will be submitted for review and approval of the PMC/OIL. The schedule should allow adequate time for proper review and incorporation of changes/modifications, if any, to meet the contract requirement without affecting the overall project schedule.
- 22.02.02 Bidder shall submit the name of the proposed Civil Contractor who will be executing the Civil work.
- 22.02.03 Bidder's Final sub vendor list (Minimum 3) for all major bought out items for approval by PMC / OIL.

- 22.02.04 Prior to commencement of the engineering work as part of design submissions, detailed design basis report, covering all aspects of design, viz., criteria for selection and sizing of all equipment and systems, design margins etc. shall be submitted for PMC/Company (OIL)'s approval. This Design Basis Report shall form the basis for detailed engineering work.
- 22.02.05 The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the schedule for each set of equipment/plant. The review of these documents/data/drawings by the PMC/Company (OIL) will cover only general conformance of the data/ drawings/documents to the specifications and contract documents and external connections and the dimensions which might affect plant layout. The review and/or approval by the PMC/Company (OIL) shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.
- 22.02.06 Drawings must be checked by the Contractor prior to submission to the PMC/Company (OIL). In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission after proper review.
- 22.02.07 The PMC/Company (OIL) shall review the drawings and return one copy of drawing to the Contractor either to proceed with manufacture or fabrication, or marked to show changes if desired. When changes are required, drawings shall be resubmitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in contract schedule.
- 22.02.08 After final acceptance of individual equipment/system by the PMC/Company (OIL), the Contractor will update all original drawings and documents for the equipment/system to "as built" conditions. The Contract shall not be considered to be completed for the purpose of taking over until the "as built" drawings are submitted to the PMC/Company (OIL) & accepted.
- 22.02.09 It will be the responsibility of the Contractor to carry out design to suit his equipment, layout and site conditions and furnish to the PMC/Company (OIL) necessary construction drawings for all structures and foundations. All equipment foundation drawings shall have to be developed by the Contractor and submitted to the PMC/Company (OIL) for approval.
- 22.02.10 The Contractor shall prepare all the design drawings pertaining to his work for the above. The Contractor shall also prepare detail working drawings for construction based on these design drawings. These will include bar-bending for concrete reinforcements, structural fabrication drawings, details of inserts, embedment and fixtures, details of plumbing installations, water supply distribution and storm drainage in buildings, etc. The Contractor shall also prepare, where desired by the PMC/Company (OIL) drawings giving details of formwork and staging, excavation and dewatering system, etc. The Contractor shall be required to do all the necessary design related to his work and submit all calculations for PMC/Company (OIL). approval.
- 22.02.11 The following drawings and documents shall be submitted in required soft and hardcopies format in addition to those listed in the previous clauses:
- a) Tabular list of all Drawings and design data sheets showing therein the Drawing/document numbers, revision details, along with confirmation that the

- list incorporates the latest amendments/revisions.
- b) As built and updated drawings & Data sheets.
 - c) All application and operating system software, License keys (hardware key & Software keys)
 - d) Detailed Backup and restore procedure for all software.
 - e) Updated Data Sheet
 - f) Updated BOM
 - g) List of OEM Recommended spare parts for schedule and major maintenance along with parts catalogue. List to be segregated in terms of regular consumables and spares.
 - h) Updated Service, Operation & Maintenance Manual and shop manual of engine and its accessories.
 - i) Test Reports
 - j) Construction documents (civil/mechanical/electrical/instrumentation/control)
 - k) Detailed reports for HAZOP Study & Risk Analysis covering Qualitative/Quantitative risks and Risk Management Plan (RMP) & Disaster Management Plan (DMP) etc.
 - l) Lesson learnt: Problems faced during the project execution and mitigation measures taken for future reference.
 - m) Project Closeout Report incorporating following minimum:
 - Project brief
 - Layout diagram/detailed schemes/SLDs/ P&ID
 - List of all equipment with tag number and approximate value
 - Chronology of Approvals
 - Head Office & Site Office Organogram
 - Names of Personnel working for the project along with all contact details.
 - Any other details required for operation of the plant
 - Names of Standards referred and used in design and Engineering for various items, Construction, Inspection
 - WBS element wise "S" Curve and Overall physical progress curve
 - List of key milestones and date of actual achievement.
 - Experience gained during Project Execution and improvements for future projects.
 - Construction Photographs and videos.

22.02.12 The no. of copies of various drawings and document to be submitted shall be as follows:

| Type of Drg/Doc | For Approval | For Information | Released for Construction | As Built As As Built |
|--|-----------------------------------|-----------------------------------|---------------------------|--|
| Drawing | Soft copy + Hard copy if required | Soft copy + Hard copy if required | 6 hard copies + Soft copy | 6 hard copies + Soft copy in Pen Drive |
| Data Sheet | Do | Do | Do | Do |
| Quality Assurance/ Control Document | Do | Do | Do | Do |
| Erection, Testing & Commissioning procedures | Do | Do | Do | Do |
| Instruction Manual | | - | Do | Do |

| | | | | |
|--|--|--|----|----|
| Licensed software, Site specific Configuration data, System backup & System restore software, user & service Passwords | | | Do | Do |
|--|--|--|----|----|

All hardcopy documents as mentioned above shall be in a single bound volume with proper indexing.

- 22.03.00 The Contractor's Building and Foundation drawings shall include:
- 22.03.01 Plan, elevation and section drawings including dimensions and locations of all anchor bolts, sleeves, slots, inserts etc., in detail for the purpose of checking by the PMC/OIL.
- 22.03.02 Separate reinforcing placement drawings with plan, elevation and section views showing all required steel reinforcing bars clearly in their proper position and identified with mark numbers which tie into the bar details described below.
- 22.03.03 A schedule of bar bending details showing the mark number, type, size and dimensions of each reinforcing bar indicated on the placement drawings described above. Schedule of bar details, together with placement drawings, shall be in such detail as to enable cutting, bending and placing the bars within the formwork.
- 22.03.04 A schedule of anchor bolts, inserts and sleeves showing the number, size and dimension of bolt insert and sleeve with adequate details shall be supplied to the PMC/Company (OIL).
- 22.03.05 When submitting equipment foundation drawings to the PMC/Company (OIL) for approval, the Contractor must also submit the relevant equipment drawings at the same time in order that PMC/Company (OIL) may properly check the foundations and equipment. Any submission of foundation drawings without equipment drawings or submission of equipment drawings without foundation drawings will not be accepted by the PMC/Company (OIL). The foundation drawings for all major equipment must show horizontal, vertical and unbalanced loads imposed as well as moments about both axes.
- 22.03.06 The Contractor shall have to submit calculations justifying the equipment sizes, pipe sizes, HVAC equipment, transformer, switchgear, cable and all electrical equipment ratings. All calculations shall have to be approved by PMC/Company (OIL) prior to finalising the systems. All Civil and structural calculations shall have to be submitted to the PMC/Company (OIL) for approval.
- 22.03.07 During the execution of Contract, the relevant drawings shall be submitted for approval. These shall include, but not be limited to:
- A. Dismantling and Demolishing plan
 - B. Plot Plan
 - C. Plant Layout.
 - D. All P&I Diagrams.

- E. Design Criteria for all equipment/systems including Civil & Architectural Work.
 - F. Sizing Calculations
 - G. Equipment layout drawings of the various buildings.
 - H. Piping layout drawings inside buildings & outdoor piping layouts.
 - I. Equipment data sheets/Technical Particulars.
 - J. GEG Exhaust duct layout drawings with supports.
 - K. Instrument Index/DCS I/O Index and Console/Control Layout drawings.
 - L. Instrument loop diagrams, logic diagrams alongwith write-ups.
 - M. Ventilation and air-conditioning calculations.
 - N. Equipment interlock block diagrams
 - O. Electrical single line diagram showing the interconnection between different buses of different voltages and systems. The above drawing shall indicate ratings of all equipment such as transformer, switchgear, motors, feeders, cables, CT's, PT's and co-ordinated protection system of all electrical equipment.
 - P. Scheme of gas engine generator & electrical system protection.
 - Q. Cable routing drawings and cable schedule.
 - R. Cable sizing calculations.
 - S. Grounding layout drawings and calculations.
 - T. Lighting layout drawings and calculations.
 - U. All other drawings pertaining to each equipment as mentioned in individual specifications.
 - V. Drawings submitted for various equipment shall specifically include, but not be limited to the following:
 - W. General arrangement plan, side elevations and end elevation, complete with all dimensions and weights.
 - X. Loading diagram, minimum clearance drawings, and any other pertinent data.
 - Y. Reference and descriptive literature pertaining to above drawings or any equipment furnished.
 - Z. Schematic diagrams.
 - AA. Wiring diagrams.
 - BB. Logic diagrams.
- 22.03.08 All drawings shall have the Job Title, PMC/Company (OIL)'s name and Specification number indicated on the drawing title.
- 22.03.09 The PMC/Company(OIL).will review the various drawings/documents as submitted, make such changes as required to assist in overall job co-ordination and assure conformance to the Technical Specification, and return a copy to the Contractor as soon as possible marked with the PMC/Company (OIL). comments and/or approval.

- 22.03.10 Equipment and material shall not be fabricated prior to receipt of the PMC/Company (OIL). approval.
- 22.03.11 The purpose of having drawings checked and approved by the PMC/Company (OIL). is to assist the Contractor in interpreting the Technical Specification(s) so as to eliminate mistakes in the equipment or material actually shipped to the site of the work. The formal approval given to the Contractor is to be considered as in conformance with this purpose and in no manner shall relieve the Contractor from any liability or responsibility for proper design, fabrication or compliance with the Bidding Documents.
- 22.03.12 Successive issues of all drawings/documents shall be re-submitted by the Contractor until final approval is granted by the PMC/Company (OIL).
- 22.04.00 **Instruction Manuals**
- 22.04.01 The instruction manuals, complete in all respects, shall be submitted by the contractor at least 3 months prior to commencement of pre-commissioning activities of the respective equipment/system covered under this contract. The instruction manual shall contain full details and drawings of all the equipments under this contract, covering Parts Manual, Shop Manual, Operation & Maintenance Manuals of the Gas Engine, Compressor, Pumps etc. the storage procedures, operation and maintenance procedure of the equipment. The instruction manuals shall be submitted in 6copies.
- 22.04.02 If after the commissioning/initial operations/trial operations of the plant, the instruction manuals require any modifications/additions/ changes, the same shall be incorporated and then updated. 6 copies of all revision sheets of the manual shall be submitted to the Company (OIL).
- 22.04.03 The Instruction Manual shall present the following basic categories of information in a complete and comprehensive manner and prepared for use by the operating and/or maintenance personnel.
- A. Instructions for initial commissioning, short duration and long duration shutdown.
 - B. Normal and Abnormal Operation (load changes, start-up, shutdown) and conditions which could pose serious hazard to personnel or equipment.
 - C. Instructions for operation, routine inspection and maintenance including preventive maintenance and maintenance schedule.
 - D. Recommendation for inspection points, method of inspection and period of inspection.
 - E. Service manual, Information on detection, cause and rectification of troubles and faults.
 - F. Control of major components (sequencing, protective circuits etc.), process control (analog control loops etc.) and system monitoring and alarms.
 - G. Instructions on normal repairs and overhaul.
 - H. Complete parts list and ordering information for all replaceable parts. The identification details of equivalent and alternative makes for those spare parts, which are not manufacturer's own product shall also be listed.
 - I. Lubrication charts.

- J. List of all special tools & tackles and instructions for using those.
- K. Write up on the total plant including overall & individual Startup and shutdown sequences, interlocks, alarm and trip settings, details of consumables and their consumption pattern etc. specific to this plant.
- 22.05.00 If a standard manual covering more than one equipment and/or model is furnished, the information for the model and equipment supplied shall be clearly marked and identified.
- 22.06.00 The Instruction Manual will need approval of the PMC/Company (OIL). The contract shall not be considered to be completed for the purpose of taking over until the instruction manual is approved by the PMC/Company (OIL).
- 22.07.00 **Lubricants, Servo fluids and Chemicals**
Detailed specification for the lubricating oil, grease, chemicals etc. required for the complete plant shall be furnished. On completion of erection, a complete list of bearings/equipment giving their location, and identification marks etc. shall be furnished to the PMC/Company (OIL). Lubricant level indicators shall be marked to indicate proper level under both standstill and operating conditions. As far as possible lubricants and servo fluids as marketed by Indian Oil Companies shall be used. The variety of lubricants shall be kept to a minimum.
- 22.08.00 **Job Books**
Contractor shall maintain, throughout the duration of the work, complete records of the work, showing all data relevant to each and every item of a permanent nature. These records shall include all certifications, bill of lading, material receipt reports, inspection and testing reports, acceptance notes and similar documentation and shall be maintained on file on a continuing basis in a manner promoting ease of access and reference. Data shall be compiled and assembled into Work Job Books with hard bound covers as outlined below.
- 22.08.01 Contractor shall provide five (5) copies of the following types of Work Job Books after the completion of project to include but not be limited to the following requirements.
- A. Design Data Book: This book shall include design basis reports, major design data, calculations, setting charts for relays, instruments etc. P&I drawings, single line drawings and other construction drawings.
- B. Vendor Data Book: This book shall include specification, vendor data sheet, test reports, characteristics curves, spare parts list with OEM part number, outline drawings.
- C. Site Inspection Record Book: This book shall include construction inspection records, site testing and commissioning check lists, Performance and Guarantee tests records.
- Upon work completion, the Work Job Books shall be compiled and handed over to PMC/Company (OIL). Should any details be lacking, the Contractor shall be required to make up the deficiency.
- 22.09.00 **Rating Plates, Name Plates & Labels**
Each main and auxiliary item of plant shall have permanently attached to it in a conspicuous position, a name plate and/or rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings and service conditions.

22.10.00 Language

Official project communication language is English. All correspondence, drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall be in English. Any deviations are not acceptable.

All non-conforming documents must be translated properly and in a technically correct manner into English language. The Contractor is responsible for all consequential damages caused by improper translation of project document from any language to the Eng. language.

22.11.00 Units of Measurement

The SI system shall be applied on all documentation such as drawings, diagrams, schedules, flow sheets, reports, manuals, calculation, invoices and transportation papers which shall be prepared by the Contractor or his sub-contractors.

On drawings or printed pamphlets where other units have been used, the metric equivalent shall be marked in addition.

The SI system shall also be applied on instruments, gauges, tags, labels, name plates, packing or any equipment, buildings and structures provided for this project.

23.00.00 **COMPLETION DATE / TAKING OVER**

On successful **Plant Commissioning** and completion of all other balance works as per scope of work covered under these specifications, including fulfillment of requirements of Documentations, Drawings and Data, the Plant shall be ready for Handover to OIL. PMC/Company (OIL) shall issue to the Contractor a Taking Over Certificate, as stipulated in the General Conditions of Contract. The takeover by PMC/OIL as aforesaid shall be for the Plant complete in all respects. **The date of Taking over shall be the Completion date of the Main LSTK-EPC work**

ATTACHMENT - A

SPECIFICATION FOR LONG TERM MAINTENANCE SERVICE AND ENGINE SPARES FOR 1,00,000 RUNNING HRS

LONG TERM MAINTENANCE SERVICE (LTMS)

1.00.00 POST WARRANTY LONG TERM MAINTENANCE SERVICE (LTMS)

This LTMS shall be of duration **two (2) years with provision of extension by 1(one) year**. The effective start date of LTMS shall be the date of expiry of Warranty Period or such other date as decided by the Company (OIL). The jurisdiction of scope of work shall include the complete GEG power plant including all auxiliaries and sub-systems installed as part of this contract.

1.01.00 The scope of work shall include:

- (a) Undertaking all routine and periodic maintenance, break down maintenance & scheduled maintenance including running repairs, troubleshooting etc. that are required for safe, trouble-free & uninterrupted operation of the three GEG units and its associated auxiliaries as per sound industry practices
- (b) During the maintenance service period, the Contractor shall be responsible for arranging all resources, spares, consumables (including Lube oil but excluding fuel), including competent manpower as per requirements and upkeep of the premises including periodic repainting.
- (c) Compliance to all statutory laws of the land including among other The CEA, Indian mines Act, its bye-laws & other legislations in force. All statutory obligations including (but not limited to) payment of minimum wages, PF, ESI, paid holidays, employee benefits, employee insurance & benefits and public liability insurance for in relation to the maintenance service
- (d) Day-to-day routine inspection and maintenance including provision of consumables and lube oil shall be carried out by the Contractor during the tenure of maintenance service at their cost.
- (e) Periodic maintenance including supply of spares and /or consumables including lube oil shall be carried out by the Contractor during the tenure of maintenance service at their cost
- (f) Unscheduled / Break-down maintenance including supply of spares and/or consumables including lube oil shall be arranged by Contractor during the tenure of maintenance service at their cost.
- (g) Scheduled maintenance covering all inspections and associated maintenance including supply of spares and /or consumables including lube oil shall be carried out by Contractor at their cost. Programme for scheduled inspections / maintenance service and corresponding outage shall be planned in consultation with OIL operation group.
- (h) At the end of LTMS period, the Gas Engine shall be thoroughly inspected and replacement of parts shall be made as necessary for each engine to bring it to near new and clean condition before handing over to OIL.

1.02.00 Operational Philosophy

The Operational philosophy of GEG units during warranty period and **LTMS**

period shall be as follows:

- (a) Subject to providing the GEG Units in operable condition by the Contractor, OIL shall endeavor to run all 3 GEG units equally. The GEG Power plant shall be in operation for tentatively 80% of the time in a year. The total electrical load warrants that a max of 2 GEGs will be in operation to meet the electrical load (i.e 2R+1S combination for 80% of a year approx.).

1.03.00 **Guaranteed Availability**

The Contractor shall Guarantee the following availability figures, considering outages due to routine, scheduled and breakdown maintenance.

- | | | |
|------|----------------------------------|----------|
| (i) | Individual GEG unit availability | >= 90.0% |
| (ii) | Plant availability | >= 99.9% |

Note:

- (a) A GEG Unit shall be considered to be available when
- GEG Unit is started & Loaded
 - GEG is available for Startup (GEG on standby condition)
- (b) Plant availability shall mean when Electrical Power is available at Plant HT Switchgear Bus.
- (c) Availability figure for the plant and each GEG shall be calculated on Quarterly basis

1.04.00 **Price Reduction for Non Fulfilment of Guaranteed Availability**

1.04.01 Amount Payable against Maintenance Charge for the concerned GEG shall be reduced by 50% of the quoted price in case any of the following conditions are met.

- (a) The concerned GEG unit availability falls below 90% but is greater than or equal to 80%
- (b) Plant availability falls below 99.9% but is greater than equal to 99%

1.04.02 Amount payable against Maintenance Charge for the concerned GEG shall be **NIL** in case any of the following conditions are

- (a) The concerned GEG unit availability falls below 80%
- (b) Plant availability falls below 99%

1.05.00 The contractor for maintenance of the GEG may choose to make arrangements with OEM of GEG for supply of spares and their ready availability at site ensuring minimum downtime for break down maintenance. This arrangement may be endorsed to OIL on back-to-back basis but the primary responsibility for the maintenance service shall rest with the EPC contractor entirely.

1.06.00 The contractor before taking up maintenance work shall develop a Standard Operating Procedures (SOPs) & handover the procedure in line with the Company's requirements, reporting formats and such on-line and off-line records as may be generated by Plant Instrumentation & Control system as well

as checklists & schedule of routine and periodic activities for maintenance of the GEG units as per sound practices adopted in Gas based Power Plant. Such SOPs shall be duly approved by the Company and be strictly adhered to by the Contractor for operation & maintenance of the plant.

- 1.07.00 In addition to the reporting formats as framed up in the SOPs, the Company shall have the prerogative of demanding from the Contractor such data, information & records pertaining to the maintenance of the plant from time to time. The Company shall also reserve the right to inspect/review the Plant as well as its SOPs by itself or its representatives or audit/ statutory bodies and demand fulfillment of recommendations thereof in a particular timeframe.
- 1.08.00 Maintenance Services and supply of spares shall be supplied in accordance with the conditions and the specifications set out in this Contract, and the Contractor is responsible for satisfying itself to their suitability for the intended service.
- 1.09.00 The Maintenance Service shall include an advised requirement of spare parts for both 'off the shelf' usage and all relevant inspections and outages for the purpose of maintaining the plant efficiency and stability in operation of GEG units. To minimise downtime related to forced outages, adequate parts will be maintained at site and /or in the maintenance service set up located in India (preferably in north east part of India). The parts to be stored at site shall be managed by Contractor. Spare parts other than those maintained at site shall be made available upon requirement not later than 7 days. However the time frame can be mutually discussed and agreed with OIL at appropriate stage.
- 1.10.00 The Contractor shall manage and optimise all scheduled outages, the inspection schedule, and maintenance planning for each GEG unit in accordance with the OEM's recommendations.
- 1.11.00 The Contractor shall provide a detailed breakdown and description of the parts and work included under this Contract.
- 1.12.00 The Contractor will identify, procure, and manage parts for GEG components that will require inspections or replacement during the term of the Maintenance Service agreement. The parts will be identified in the Bidder's proposal form. Ownership shall pass from the Contractor to OIL upon installation of each of the same into the GEG units.
- 1.13.00 The Contractor's extended delay in achieving, or repeated failure to comply with, its obligations as set forth in this section shall constitute a material breach of this Contract.
- 1.14.00 The Contractor shall adhere to prevailing labour law, minimum wages law and other applicable Statutory laws / Acts.
- 1.15.00 After completion of the LTMS contract, OIL will undertake maintenance. OIL at its discretion may consider extension/renewal of the LTMS, thereafter, with the same party or otherwise, as deemed fit.

2.00.00 MAINTENANCE SPARES POST LTMS

2.01.00 Gas Engine Spares

Gas Engine spares (including turbocharger spares and all the consumables) that will be required post **4-years LTMS period** shall be declared by the Contractor and substantiated with OEM's Published Maintenance Catalogue for that particular Model, considering each engine running hours of 1,00,000 Hrs after

plant commissioning. Detailed list shall include rates and shall be duly validated/endorsed by the OEM. Separate Purchase Order for these will be placed by OIL as per requirement.

2.02.00

Considering the operation philosophy, Bidder shall include all spares and consumables duly validated/endorsed by engine OEM for maintenance of Gas Engine for the remaining operating period post LTMS up to cumulative running hours of 1,00,000 hrs for each engine.

- a) Bidder shall submit a comprehensive list of spares for the above period based on the maintenance schedule recommended by engine OEM
- b) This comprehensive list of spares will mandatorily include Turbocharger spares and all the consumables (e.g lube oil replacement, filters etc) recommended & vetted by Engine OEM for 1,00,000 RHRS.
- c) This spares list shall include **spares required for at least one major overhaul of each engine.**
- d) Spares required for major overhaul of each engine shall be specifically identified.
- e) Bidder shall furnish an undertaking from OEM that the list furnished is complete and exhaustive for the stipulated running hours of each engine and no additional spares and consumables will be required.

ATTACHMENT - B

HEALTH, SAFETY, ENVIRONMENTAL REQUIREMENTS

HEALTH, SAFETY, ENVIRONMENTAL REQUIREMENTS

It is OIL's objective and policy to ensure that potential health and safety factors and environmental effects are assessed for all products, project activities and acquisitions. For projects this is implemented by staged audits of health, safety and environmental aspects from concept stage to completion in order to determine any shortcomings or noncompliance. The EPC contractor shall provide statements and manuals / procedures for HSE requirements along with the tender document for compliance.

The specific requirement includes the following:

1.0 Project Safety Review

A formal project safety review shall be carried out by OIL/PMC. The review team shall require data, input from key personnel from other contractors and access to all locations being used by contractor, subcontractors and suppliers. The EPC contractor shall make all necessary arrangements for such reviews as required by OIL/PMC and shall ensure that contractors make available such data, personnel and locations as required. The EPC contractor shall ensure that all recommendations and findings from safety reviews are implemented by contractors in a timely manner.

2.0 Environment Pollution

The EPC contractor shall formulate a site scrap disposal management system in line with CPCB norms and ensure strict compliance by all contractor/sub-contractor. The purpose of this is to prevent accidents, incidents and/or degradation/deterioration of the environment.

3.0 Health, Site Safety and Security

The EPC contractor shall be responsible for ensuring a high standard of occupational health and site safety management and for ensuring the requirements for health, safety and security to be maintained by contractors, subcontractors and other personnel working at site. The EPC contractor shall ensure compliance of the safety requirement by the contractors.

The purpose of these safety requirements shall be to prevent any accidents, incidents or events that could result in injury or fatality to personnel and/or damage or destruction to property, equipment and material of contractors, subcontractors or OIL or third parties. The requirements shall be intended to supplement any Statutory Authority/State/Municipal/local or other regulations applicable to the site, which the EPC contractor shall be obliged to enforce. The EPC contractor shall agree with OIL's representative at site for any variation in these requirements. The EPC contractor shall monitor reports and ensure that the above requirements are fully adhered.

4.0 Site Safety Organization

The EPC contractor is to appoint a Safety Engineer, whose responsibility is to monitor all safety activities on the job and report the findings. The Safety Engineer shall make safety inspections of the job site. The inspections should be made jointly with the Safety officer / In-charge of the contractors responsible for ongoing work in the areas to be inspected. Any infractions or poor safety practices uncovered by these inspections shall be promptly corrected. Safety requirements shall be enforced on all the contractors and subcontractors.

5.0 Site Safety Planning

Prior to start of site work, the EPC contractor shall plan job safety requirement in conjunction with contractors giving due consideration to:

- (i) OIL's / PMC's Safety requirements
- (ii) Statutory requirements
- (iii) Risks/Hazards involved in working with high pressure live hydrocarbon pipelines
- (iv) Location of job site(s)
- (v) Type, background and quality of labour resources and anticipated training programs
- (vi) Nature of work, types of hazards anticipated and hazard prevention methods
- (vii) Inspection & testing activities, implementation and ensure compliance to work permit system.
- (viii) Equipment and material to be used.
- (ix) The number of personnel working concurrently in any area at the same time.
- (x) Personal protective equipment (PPE) requirements. The EPC contractor shall ensure that contractors ensure availability and usage of PPE during work execution.

6.0 Preparation of Emergency Action Plan

The EPC contractor shall prepare the Emergency Action Plan for Site by integrating with OIL's existing Disaster Management Plan in-line with the requirements of statutory authorities, CEA, and other safety norms. The same shall be handed over to OIL/PMC for approval and subsequent circulation.

7.0 Safety Activities

The EPC contractor shall ensure that contractors / subcontractors carry out their activities in accordance with the safety plan throughout the course of the construction of the project to inculcate and maintain safety awareness among their employees. Each employee, prior to beginning work, shall be given a safety orientation course. The EPC contractor shall be responsible for arranging and providing such trainings and ensuring consistency of knowledge and understanding across all work groups. All personnel must be fully aware of the potential hazards involved in the work they supervise and the safe practices to be followed while working on high pressure live hydrocarbon pipelines. The EPC contractor will be responsible for execution of works by following all safety measures and ensure no deviation is taken in adopting safety standards, at any cost during construction.

Additionally, following measures related to Fire shall also be ensured by The EPC contractor

- a) Availability of firefighting equipment during execution of project.
- b) Publication and distribution of Fire safety manual, Dos & Don'ts about Fire Safety to cover hazardous activities. The manual shall be published in English, Hindi and local language.
- c) Fire Safety precautions throughout the execution of the project.
- d) Proper Procedure is followed by EPC contractor during any Fire Emergency.

8.0 Accident Reporting and Investigation

Any accident or incident resulting in a lost time injury, death of person, or damage to property or equipment is to be investigated by the EPC contractor. Every incident shall be documented properly after the incident including the results of investigation and recommendations for preventive action. The EPC contractor shall also ensure that all necessary publicity is given, across all sites, to ensure that such incidents do not occur in future. This investigation and report shall not preclude any similar investigations and reports required by government regulation.

The EPC contractor shall maintain safety performance and accident statistics records for the whole site in conformance to the international standards. Updated safety performance and accident statistics shall be included in the EPC contractor's monthly report.

9.0 Safety Regulations

- a. Safety to Man & Machine is of paramount importance. Hence, utmost care has to be taken by the EPC Contractor for safety while carrying out any job. A Health, Safety & Environment (HSE) Policy is already in place with OIL which is followed in all activities of OIL. A copy of OIL's HSE policy will be handed over to the EPC Contractor for understanding and guidance during execution of the Contract. The Contractor shall ensure that all international & local safety regulations are complied with during construction & commissioning activities at site. All necessary preventive measures & adequate first aid facilities shall be provided by the Contractor.
- b. When going to or from the place of work in the plant, only the prescribed walkways, paths or cross-overs shall be used. Railroad crossing warnings shall be heeded.
- c. Crawling on, over or under movable equipment shall generally be prohibited.
- d. All persons are to stay clear of lifts being made by overhead cranes.
- e. For overhead work, proper signs shall be placed below and, when conditions justify, a watchman shall be stationed to warn employees in the vicinity.
- f. Work on or about crane runways shall not be undertaken without the equipment manufacturer/PMC/OIL's permission. Whenever it is necessary to do any work on or above the crane runways, the Contractor shall furnish a lookout man to ride each adjacent crane cab with the operator and an additional flag man stationed on the floor.
- g. Only scaffolds which meet the requirements of any governing laws shall be used in the project.
- h. All necessary protections shall be taken while working on electrical equipment.
- i. All burning and welding equipment shall conform to, and be used in accordance with, regulations governing such equipment. No burning or welding shall be done at any place on the site until the location where such work is to be done, is approved.
- j. Good housekeeping conditions shall be observed at all times.
- k. All excavations shall be guarded with guard rails or be securely covered to prevent anyone from falling into them.
- l. Adequate fire protection shall be available before work proceeds.
- m. All warning signs shall be observed.

- n. Use of explosives shall comply with all regulations.
- o. Proper care shall be taken in the use of compressed air.
- p. The Contractor shall require his employees to wear hard hats at all times within the construction area and when they are in an area where they are in danger from falling objects.
- q. Goggles shall be worn whenever there is a possibility of flying particles or splashing corrosive fluid.
- r. When working around caustic or acid solutions, workmen shall wear gloves, goggles and protective shoes.
- s. The use of barrels, boxes, stacked tile or any other unstable support for working platforms is prohibited.
- t. When ladders are the means of access to a platform, they shall be firmly secured at top and bottom and the ladder rails shall extend at least one meter above the top landing. When a ladder cannot be secured, a man shall be stationed at the base.
- u. The contractor shall provide all the above personal protective equipment (PPE) to his personnel at site & shall ensure that the same are used by them. Otherwise, PMC/OIL's engineer shall not allow the Contractor's personnel to work at site and the Contractor shall be considered to be responsible for stoppage of work due to his people not using PPE. The cost of the P.P.E.s shall be borne by the Contractor.
- v. Safety belts shall be used by men working in high places where no handrails or other guards are in place.
- w. Trenches shall be shored whenever sand or loose soil is encountered. Piled dirt shall be kept well away from the edges to reduce surcharge.
- x. All NEAR MISS incidents or accidents shall be dealt promptly as per the procedure given in **ANNEXURE-A, FORM-A, FORM-B** in this section.
- y. **Proper Treatment of the Injured**
 - i) All employees shall be instructed by the Contractor to report immediately for treatment in case of any injury, no matter how trivial.
 - ii) The Contractor shall ensure that proper treatment of injuries is immediately available either at work site or in the form of constantly available transportation to a source of such treatment.
 - iii) The Contractor shall ensure that stretchers are available near all areas where men are working and that the location of stretchers is well marked.
 - iv) The contractor shall do all arrangement towards medical treatment owing to any accident or illness of the employees of the contractor. Expense towards the same shall also be borne by the contractor.
- z. The Contractor shall be solely responsible for the dissemination of all safety regulations including those written here, those promulgated by OIL and those dictated by good practice, and shall ensure that all his employees and those of his sub-contractors are conversant with same.

- aa. Safety audits during construction stage shall be conducted by a team comprising of the Resident Engineer of the Contractor, Safety Officer of PMC/OIL. Any recommendations of the safety audit team have to be implemented immediately by the Contractor.
- bb. All lighting circuits (except office lighting) shall be fed from a transformer of appropriate rating having 230 volts AC (ph to ph) as per DGMS guidelines.
- cc. The Contractor shall accept that PMC/OIL shall not be liable or responsible in any manner for compensation or otherwise for injury to or death of any workman engaged/employed by the Contractor and liability and responsibility shall rest solely with the Contractor.

ANNEXURE-A

**Procedure for reporting near Miss Incident/Accident
for EPC Contractor (LSTK) Personnel:**

| PROCESS | ACTION | | |
|---|---|---|--|
| A) REPORT: NEAR MISS INCIDENT OR ACCIDENT | <p>LSTK Contractor shall be solely responsible for work safety of all of his deputed personnel. However, the LSTK Contractor along with his appointed Safety officer shall be assigned with the responsibility for co-ordination of reporting of Near Miss incident/accident and investigation thereof. Arrangements will be established to ensure compliance with statutory incident reporting and investigation requirements as per the following details:</p> <table border="1" data-bbox="408 741 1406 1507"> <tr> <td data-bbox="408 741 743 1507"> <p>1). Open reporting is to be encouraged for any of the following incidents :</p> <ul style="list-style-type: none"> • Injuries resulting from accidents (incidents resulting in man days loss, Medical and discharge, requiring first aid.); • Medical emergencies and evacuations; • Other loss events such as asset or environmental damage; • Incidents of near misses; • Potentially hazardous situation </td><td data-bbox="743 741 1406 1507"> <p>2). All reports will be made using the standard report forms as mentioned below (FORM-A for Report of Accident & FORM -B for Report of Near miss Incident). The information which needs to be reported and recorded, includes :</p> <ul style="list-style-type: none"> • Details of the event; • Description of the circumstances surrounding the event; • Details of any injuries or illness and, actual or potential occupational exposure; • Adverse effects on the environment; • Details of involved persons, any casualties or witnesses, and their statement of events; • Details of the outcomes and any recovery actions taken; • Potential consequences; • Any identified management system failures which contributed to the incident or the way it was damaged </td></tr> </table> <p>3). Each Near miss incident and potential hazardous situation will be categorized according to the severity of the actual outcome and the potential outcome in terms of damage to people, assets, the environment and company reputation in accordance with the Incident Reporting classification.</p> <p>Near Miss incidents will be reported forthwith through the management chain according to the actual or potential severity in accordance with the Incident Reporting guideline as mentioned in FORM-B.</p> <p>All near miss incidents and potentially hazardous situations will be recorded.</p> | <p>1). Open reporting is to be encouraged for any of the following incidents :</p> <ul style="list-style-type: none"> • Injuries resulting from accidents (incidents resulting in man days loss, Medical and discharge, requiring first aid.); • Medical emergencies and evacuations; • Other loss events such as asset or environmental damage; • Incidents of near misses; • Potentially hazardous situation | <p>2). All reports will be made using the standard report forms as mentioned below (FORM-A for Report of Accident & FORM -B for Report of Near miss Incident). The information which needs to be reported and recorded, includes :</p> <ul style="list-style-type: none"> • Details of the event; • Description of the circumstances surrounding the event; • Details of any injuries or illness and, actual or potential occupational exposure; • Adverse effects on the environment; • Details of involved persons, any casualties or witnesses, and their statement of events; • Details of the outcomes and any recovery actions taken; • Potential consequences; • Any identified management system failures which contributed to the incident or the way it was damaged |
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| B) INVESTIGATE | All near misses incidents and potential hazardous situations will be investigated to establish the immediate and underlying causes and to identify | | |

| PROCESS | ACTION |
|---|--|
| INCIDENT CAUSE | <p>actions to :</p> <ul style="list-style-type: none"> • Restore compliance/correct situation as quickly as possible • Prevent recurrence and improve performance. • Assessing and limiting adverse HSSE effects. • Ensuring planned actions integrate with other HSSE effects. <p>All investigations will be documented in detail with sketches and photographs. A copy of the investigation report shall be submitted to OIL</p> |
| C) IMPLEMENT CORRECTIVE/ PREVENTIVE ACTIONS | An action plan for the remedial measures identified in the investigation will be completed including responsibilities, completion dates and reporting requirements. |
| D) FOLLOW-UP | Progress against the action plans will be reported in the joint monthly safety meeting held between LSTK personnel & OIL. Critical recommendations to be highlighted in the safety meeting at the site level. |
| E) FEEDBACK | Incident reports should be analyzed for trends in incident occurrence and actions taken to make improvements. |

REPORT OF ACCIDENT (FORM-A)

(To be filled up forthwith)

| | | |
|-----|--|---|
| 1.a | Name of the Injured | : |
| 1.b | Code . No. of Injured | : |
| 2.a | Event Date | : |
| 2.b | Event Time | : |
| 3.1 | Accident Place (Work Area) | : |
| 3.2 | Exact Location | : |
| 4 | Mine | : |
| 5 | Nature and extent of injury | : |
| 6 | Brief Description of the accident | : |
| 7 | Cause of accident | : |

(Examples:

Lack of training/ Lack of Supervision/ Improper
attitude towards the job/ Lack of co-ordination/
Improper use of tools/ Unsafe working
condition/ Failure of equipment/
Environmental factor/ Negligence/ Non use of
safety gears, other reason)

| | | |
|----|--|---|
| 8 | Date of Birth | : |
| 9 | Work Experience | : |
| 10 | Who or What is Responsible for accident | : |
| 11 | Name of the witness of the accident | : |
| 12 | Person in direct charge at the time of accident | : |
| 13 | How can a similar accident be prevented | : |

Name & Signature of

LSTK Contractor
Date:

NEAR MISS REPORTING FORM (FORM- B)

Report No. _____ Time : _____ Date: _____

1a) Name of Installation _____

1 b) LSTK Contractor _____ (Name & signature)

2. Exact Place of Near Miss (Please tick ✓ whichever is applicable) :

Please specify :

3. Names & Registration number/Code No of other employees who saw the incident(if any):

4. (A) What could have happened (Please tick ✓ whichever is /are applicable):

Accident(*Minor/Serious/Fatal) / Fire(Major/Minor)/ Electrical shock/ Vehicle accident/Explosion/ Property loss(Equipment /machinery damage)/environmental pollution/others (describe) _____
due to reasons given at (B) below

(B). Reasons: Please tick ✓ whichever is /are applicable) :

| | |
|---|--|
| <input type="checkbox"/> Strike against moving objects, raised platform, etc | <input type="checkbox"/> Fall on same level |
| <input type="checkbox"/> Struck by tong , crow bar, flying particles, falling objects | <input type="checkbox"/> Fall below |
| <input type="checkbox"/> Caught in between Grinding wheels, Bench vice, | <input type="checkbox"/> Collapse of wall , ladder, overhead tank, etc... |
| <input type="checkbox"/> Caught on metallic strip, moving chain, | <input type="checkbox"/> Over exertion due to lifting heavy weight , pushing or pulling objects, |
| <input type="checkbox"/> Caught between moving parts | <input type="checkbox"/> Others(please specify) |
| <input type="checkbox"/> Slip on the ground, stair, ladder, etc | |

5. Probable Damage Information(Tick as applicable)

| | | |
|----------------|--|-----------------------------------|
| To Human | | Name : |
| To property | | Name : (Eg. Engine, , pump, etc.) |
| To Environment | | Name : (Eg. Water body, etc) |

6. Loss that can take place if not corrected : Major _____ Serious _____ Minor _____

7. Probability of occurrence : High _____ Moderate _____ Low _____

8. Brief description : _____

9. a) Name and Regn. No/Code No. of the person who has reported the near miss. (optional) _____

b) Signature (optional) : _____

Minor Reportable - Any injury other than a serious bodily injury which involves , or in all probability will involve, the enforced absence of the injured person from work for a period of 72 hours or more.

Serious - When an accident causes serious bodily injury like fracture of bone, amputation, permanent loss of body parts, etc.

Fatal - When death results from an injury in an accident

Definition of Near Miss

1. A "Near Miss" is any incident that could have resulted in serious injury or death but for good fortune did not develop into an accident causing serious injury or death.

2. A "Near Miss" is an unplanned event which, under different circumstances could have been an accident (i.e. hurt someone) , or incident (i.e. damaged property) but did not in this case.

Reporting near miss helps us to take corrective measures and prevent occurrence of accidents/incidents and thereby make the work place safe