TECHNICAL SPECIFICATION

FOR

EMERGENCY DG SET

PROJECT : 2 X 4 MLD SEWAGE TREATMENT PLANT

CUSTOMER : HPEP

C O N T E N T S

1.00.00 INTENT OF SPECIFICATION

1.01.0 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport of the DIESEL GENERATOR as specified herein under, complete with all accessories, fittings and auxiliary equipment as required for efficient and trouble-free operation.

1.02.0 POWER SUPPLY SYSTEM

System voltage /DG OUT PUT	: 415V, ±10% System
Frequency	: 50HZ, +5% to –5%
Phase	: 3ph,4 wire.
System fault level	: 50 kA R.M.S.for 1 sec.
System Grounding	: Solidly Grounded System.
DG SET Neutral Grounding	: Solidly grounded
AC Voltage	:3 PH 415 V & 1 PH , 240V AC
AC Control supply	:1Ph , 110 V AC / 1 Ph 240 V AC
DC Voltage for engine control & Instrumentation	:24 V DC.
AC Voltage for Space heater	:240 V

1.03.0 APPLICABLE STANDARDS

The equipment & accessories covered by this Specification shall be designed, manufactured and tested in accordance with the latest relevant Indian/international standards and codes of practice.

The Diesel Engine, Alternator & Electrical Panels & accessories shall also confirm to the latest Electricity Rules AS APPLICABLE & other related Statutory agencies as applicable.

Applicable Standards: -

BS : 5514, ISO : 3046 ,SAE J1349, IS - 10000	For Engine
IS- 1271, 2253, 4722, 4728, 4889, 6362, 7132, 7306, 7816, 12065, 12075, 12802, 13364, 13118, IEC- 600 34	For Alternator
IS-5, 1994	Color for ready mixed paints & enamels
IS-694, 1990	PVC Insulated cables for working voltage up to and including 1100 Volts.
IS-1248Part - 1 to 9, 1991	Direct acting indicating analogue electrical measuring instrument & their accessories.
IS-2026, Part-1, 1991	Power Transformers (General)
IS-2551, 1990	Danger Notice Plates.
IS-2705,Part-1, 2,3,4, 1992	Current Transformers
IS-3156,Part-1, 2,3,4, 1992	Voltage Transformers
IS-3231,Part-0, 1,2,3, 1992	Electrical Relays for Power System Protection.
IS-5082, 1991	Wrought Aluminum & Aluminum alloy bars, Rods, Tools & Sections for Electrical purpose.
IS-5578, 1991	Guide for marking of Insulated Conductors.
IS-7372, 1995	Lead Acid storage batteries for Motor vehicles.
IS-8623, Part-1, 1993	Low voltage Switchgear & Control Gear assemblies.
IS-8923, 1990	Warning Symbol for dangerous voltages.
IS-9224, Part-2, 1991	Low Voltage Fuses : Supplementary requirement for fuses for Industrial applications.
IS-12065, 1987	Classification of degree of protection provided by enclosures of electrical equipments.

This above list is not exhaustive. Standards not listed above but are applicable also to be followed to meet the requirement

2.00.00 DESIGN CRITERIA

2.01.00 Design Basis

a) Diesel generator set covered under this specification is meant for providing safe operation of sewage treatment plant.

DG set shall be 415V, 3-Phase, 4-Wire, 50Hz, 450KVA at 50 deg. C (amb), 0.8 pf (lag) and suitable for emergency operation at full load at 50deg. C (amb) with acoustic enclosure , canopy and a lightning protection rod.

b) The equipment will be installed outdoor in a clean but hot, humid and tropical atmosphere in an acoustic enclosure.

c) DG set shall be suitable for Prime continuous duty as per ISO.

3.00.00 SCOPE & SPECIFIC REQUIREMENTS

3.01.00 Diesel Engine

3.01.01 Ratings & Requirement

a) Type : Four stroke cycles, water cooled, Turbo charged.

b) Nominal Output : 450 KVA rating at 0.8 p.f

c) Fuel : High speed diesel oil as per IS-1460.

d) Governor : Electronic/Hydraulic type.

e) Lubrication : Positive displacement shaft driven system lube oil pump.

f) Location : Outdoor

g) Engine Speed : 1500 RPM.

h) Over speed Set: 110% engine speed.

i) Engine Type : Turbo-charged.

j) Cooling System : Radiator cooled heat exchanger

3.01.02 All equipment shall be of proven design using materials with well established physical and chemical properties adequately demonstrated in operation and appropriate to the service intended to.

3.01.03 ***Engine Cranking***: DC motor starter (inclusive of DC battery system) with starting switch and key facility.

3.01.04 ***Engine Starting Mode***: Auto and manual mode for cold and hot start applications. Quick starting aspect as required shall be provided.

3.01.05 ***Operating Conditions***: As per Prime Continuous Duty.

3.01.06 ***Coupling with generator***: As per OEM standard practice.

3.01.07 ***Sound Level (in dBA)***: 75 dB (A) at a distance of 1 metre for DG set (with acoustic enclosure).

3.01.08 ***Engine Derating to be provided for***: Naturally aspirated/Turbo charged engine.

3.01.09 **Performance test required**

Guarantees shall be given for the following for the DG set:

a) Rated continuous output (BHP) of engine at design and at site conditions.

b) Rated continuous output (KVA with rated p.f.) of generator at design and at site conditions.

c) Specific fuel consumption of engine (gms/KWH.) at rated BHP of engine, both at rated output of generator and at 75% rated output of generator.

d) Overall efficiency of DG set at rated output of engine, at rated output of generator and at 75% rated output of generator.

e) Speed regulation of DG set, over speed capability and trip speed (rpm).

f) Vibration and noise level (including noise due to exhaust) of the DG set at full load.

g) DG set starting time.

h) Voltage regulator response.

3.01.10 Diesel Engine mounted control panel shall have the following instruments and interlocks apart from what is indicated elsewhere in this specification.

a) Engine Speed with running hour meter and RPM indicator.

b) Engine lube oil pressure gauge, lube oil temperature indicator.

c) Engine exhaust gas temperature Indicator with switch.

d) Crank case pressure gauge.

e) Engine running indication.

f) Engine speed raise/lower switch.

g) Lube oil pressure gauge.

h) Lube oil filter differential pressure indication with switch.

i) Lube oil cooler oil side inlet/outlet temperature indications and oil outlet pressure indication with temperature of oil outlet high alarm.

j) One no, 12 channel, 2 stage temperature scanner along with RTDs & BTDs in the generator as sensors to monitor the temp of Windings & Bearings.

3.01.11 Starting Battery

a) Type : VRLA or Automatic type.

b) Nominal Voltage : 24V D.C ± 5%

c) No. of Cells : 12

d) ***Capacity***: Battery shall be suitable for six consecutive Starting/Cranking of Engine. To be decided by vendor considering engine starting, indication, protection, metering & control and annunciation of DG Plant auxiliaries.10% design margin and 1.25 aging factor shall be considered.

e) ***Mounting***: Preferably on engine base

3.01.12 Battery Charger

a) Type : Outdoor, sheet metal enclosed floor/wall mounted,

b) Charging System : Automatic Float and boost charging.

c) Voltage Control : Thyristor control.

d) Input Voltage : 240V ± 10%, 1 ph, 50 Hz. (To be taken from DG Control Panel)

3.01.13 Fuel Oil Service Tank

Fuel oil service tank (Day Tank) of 550litres capacity along with fuel pipes on tank, gauges, 3no.s level switches, heavy duty tubular level sensor/gauges with channel protection and required hard wares. Hand operated pumps with hose pipes of length 10 mtrs for transferring fuel from storage tankers to 550 Ltrs. Day tank. Inlet of the pump shall have 5m long armoured hose with suitable filter. Distance between DG and fuel oil day tank is approximately 20mts. Vendor shall consider the same.

3.01.14 Fittings and Accessories

a) Necessary fuel piping with hardwares, pipe support from engine to equipment fuel tank etc as required for one DG Set. Any water, air piping if required shall also be included.

b) Outlet exhaust pipe with silencer.

Complete Air & Exhaust gas system comprising of intake filters, intake manifold/ exhaust manifold, expansion bellows, exhaust piping, bends, fittings shall be in scope of vendor. Exhaust piping shall meet all the pollution control requirements as applicable. Exhaust piping shall be glass wool insulated with aluminium cladding.

DG is located outdoor nearby a switchgear building of 5 mtrs height Accordingly necessary exhaust piping and its supports shall be considered in Vendor scope.

System Consists of :

i. Dry type filter
ii. Air intake manifold with necessary connections.
iii. Turbocharger with after cooler
iv. Exhaust manifold.
v. Flexible piping.
vi. Residential silencer .

c) Closed circuit water cooling radiator heat exchanger. Suitable arrangement for discharging the hot air from radiator to outside the DG area shall be supplied.

d) Inlet air duct with filter and louver.

e) Exhaust duct/piping with flexible bellow connector at radiator end. The radiator fan shall be capable of handling exhaust upto the exit point.

f) Main lube oil pump gear driven from diesel engine.

g) Jacket Water Heater : Thermostatic controlled jacket water heater.

h) Engine Emission Data : The Engine shall meet all emission norms as applicable.

i) Other standard accessories.

3.01.15 **Safety**: All couplings, gears and exposed rotating parts shall be provided with adequate guards of non-sparking type. Drive belts, if use, shall be of antistatic type. Fuel Manifold & Silencer of engine shall be insulated to ensure the cladding skid temp. not exceeding 70°C.

3.01.16 **Base Frame**

a) All the equipment of the Diesel Generator and accessories shall be mounted on a common base frame. The base frame of sturdy design made of M.S. channel with necessary reinforcement to take the loads of engine and alternator, pre-drilled holes for permanent installation on pre-casted foundation. The foundation bolts shall be supplied by vendor.

b) In case the manufacturer recommends vibration isolators for the installation of the equipment, the same shall be provided.

c) Two (2) nos. grounding pad shall be provided on the base frame to terminate 50 mm x 6 mm G.S. flats for grounding.

3.01.17 **Sound Proofing System**: The sound proofing system shall be designed to achieve noise reduction as per relevant norms.

DG Acoustic Enclosure : Shall be suitably designed for outdoor installation. The acoustic enclosure shall be provided at 800 mm(suitable) distance from the DG Set. It shall be fabricated from 2.0 mm THICK CRCA Sheet with angle/channel frame of suitable size.

The construction shall be modular type to facilitate dismantling as required for maintenance. The ISMC shall be of sufficient stiffness and rigidity. It shall be suitably painted for outdoor installation.

The sound absorptive layer shall comprise of bonded type mineral wool / rock wool / glass wool of adequate thickness and density to comply the design requirements.
The exposed surface of lining shall be retained in place by a 1.6 mm thick CRCA / aluminum perforated sheet. Absorptive lining shall be provided between the perforated plate and absorbing material. Necessary acoustic sealing shall be done in the Panels/ modular unit joints.

All hardware of mild steel shall be electro – galvanized.

The acoustic enclosure shall be of modular construction to facilitate engine removal from front side. Necessary provisions shall be made in enclosure and associated ventilation.

If required, the exhaust air from radiator shall be discharged through modular duct duly insulated of adequate size/construction.

The door design shall be generally compatible to the enclosure design. The bonded mineral wool slab of adequate thickness shall be used. The door shall be provided with heavy duty hinges and handles. The sealing shall be done with neoprene / silicon rubber gasket to avoid leakage of noise.
Fans if required shall be provided in the acoustic enclosure.

3.02.00 Generator

3.02.01 Ratings & Requirement

a) Type : Salient pole, Synchronous.

b) KVA : To be decided by the Vendor.

c) Voltage : 415 Volts

d) Phase : 3 phase

e) Frequency : 50 Hz

f) Power Factor : 0.80 (lagging)

g) Maximum Transient Reactance (X'd) : To be decided by the Vendor

h) Short circuit ratio : Not less than 0.5

i) Excitation Type: Brushless exciter.

j) Excitation Response : 3.0

k) Insulation Class: Class H with Temperature rise limited to class F.

l) Cooling : Air cooled

m) Connection: Star with isolated neutral terminals.

n) Voltage regulator: Fast acting solid state.

o) Anti-condensation heater: Suitable for 240V ± 10%, 1 ph, 50 Hz and automatically cut-off when the set is started.

3.02.02 Unit Performance

a) Frequency regulation shall be within ± 5% from no load to full load.

b) Voltage regulation shall be within ± 2% of rated voltage from no load to full load.

c) The instantaneous voltage dip shall be less than 15% of rated voltage when full three phase load at rated power factor is applied to the generator. Recovery of stable operation shall occur within 4.0 second.

d) For steady state operation, frequency variation shall not exceed ±0.25% and voltage variation ± 1% of their mean value for constant load from no load to full load.

e) The Diesel Generator shall be capable of starting and taking the full load within 10 seconds.

3.02.03 Short Circuit Condition

The generator shall be capable of withstanding for three (3) seconds without injury for a three phase short circuit at its terminal when operating at rated KVA, power factor and a voltage 5% over the rated voltage with fixed excitation. The generators shall be capable of continuously operating without injury or damage on an unbalanced system such that the ratio of the negative sequence component of the system current to the rated current of the generator is 10% (max). The generator shall also be capable of withstanding without injury any asymmetrical short circuit at its terminal or asymmetrical loading on the system, such that the negative phase sequence current (I_2) expressed in terms of per unit stator current at rated KVA, and the duration of fault in seconds (t) are limited to values which gives an integrated product $(I_2)^2t$ equal to or less than 20 and also the maximum asymmetrical phase current shall not exceed the maximum phase current obtained from a three (3) phase short circuit at no load at rated voltage at machine terminals.

3.02.04 Short Time Overload

The generator shall be capable of withstanding on test without injury for not less than fifteen (15) seconds a current of 50% in excess of its rated current after having attained the thermal equilibrium corresponding to rated load. The terminal voltage being maintained as near the rated value as possible.

3.02.05 Over speed

The generator shall withstand without mechanical injury an over speed of twenty (20) percent for a period of two (2) minutes.

3.02.06 Temperature Detectors

Resistance element temperature detector shall be installed at the following locations for the generator:

i) Six (6) elements of platinum each having a D.C. resistance of 100 ohms at 0°C suitably distributed at locations where highest temperatures may be expected in stator winding and cases.

ii) One (1) element in each bearing.

3.02.07 Current Transformer

The C.T. ratio, accuracy class, VA burden. ALF/ISF (for protective and metering C.Ts.) shall meet the requirement of the relays metering and control.

3.02.08 Excitation System

The generator shall be provided with brushless excitation system capable of supplying the excitation current of the generator under all conditions of output from no load to full load and capable of maintaining voltage of the generator constant or within ±1% at any set value within ±5 % of the rated voltage. Shaft driven A.C. exciter shall be provided.

3.02.09 Voltage Regulator

a) An automatic high speed, non-dead band voltage regulator shall be furnished with the generator.

b) The voltage regulator system shall be provided with all necessary equipments for both automatic and manual control and shall be furnished for the following:

i) To prevent automatic rise of field voltage in case of failure of generator potential signal to AVR.

ii) To initiate transfer from automatic to manual control of excitation on fuse failure in the generator potential signal.

c) The regulator shall regulate from generator current and potential signals.

d) The system shall function without hunting and shall be capable of preventing any abnormal change or oscillation in the generator voltage.

e) The reference voltage set point shall be adjustable over a range of 90 to 110% of the nominal rated voltage.

f) The voltage regulator system shall have high initial and transient response to improve the steady state and dynamic characteristics of the generator.

g) The regulator excitation system shall be provided with necessary limiters if required for voltage and speed.

h) The regulation equipment shall function correctly between the frequencies 47 and 53 Hz and shall assure to maintain a constant voltage in steady operating condition between no load to full load.

i) The excitation and voltage regulation should be designed so as to cause necessary de-excitation in case of any short circuit.

3.03.00 Diesel Generator Control Panel

3.03.01 DG Control Panel consisting of all devices, equipment and accessories required for control, protections, monitoring and operation of the DG set, fully wired and complete protection, with annunciation system, AMF (Auto-Mains failure feature) including synchronization facility etc. The paint shade of AMF panel shall be RAL7032.

3.03.02 The Control Panel shall house all the relays, meters, controls, indications, annunciations etc. which are required for the safe and trouble free operation of the Diesel Generators. Indicating lamps shall be clustered type LED module pilot lights in thermoplastic enclosure with polycarbonate lens and diffuser. LED shall be protected by inbuilt fuse with surge suppressor and leakage voltage glow protection. Lamp and lens shall be replaceable from front.

The following items/features shall be included in the Control Panel:

a) Control of automatic engine start-up, test and shutdown sequence.

b) Manual Start and Shut down

c) Automatic and Manual control of voltage & frequency.

d) AC Voltmeter with selector switch.

e) AC Ammeter with selector switch.

f) Multi-functional meter

g) Battery Voltmeter

h) Battery Ammeter

i) RTD temperature indicator for generator winding & bearing (if applicable) with selector switch.

j) All protection relays, auxiliary relays, timers etc.

k) Indication, annunciation, control switches, push buttons etc.

l) Frequency relay.

m) Voltage relay.

n) Speedometer

o) Running hour meter

p) Lubricating oil pressure gauge.

q) There shall be separate Ammeters for Float and Boost charging currents for measurement.

r) For synchronization dual frequency/voltmeter, synchroscope, check synchronization relay etc. to be provided.

3.03.03 Annunciation

a) Indicating lamps shall be provided, complete with proper actuating devices and legends.

b) The arrangement shall be such that on occurrence of a fault, the corresponding indication lamp will light up and stays lighted until the fault is cleared and reset button is pressed. Test push button shall be provided to check the annunciation circuit. No hooter shall be provided.

c) The following indications/annunciations shall be provided in the DG control panel:

i) DG breaker tripped on fault.

ii) DG tripped on over-speed.

iii) DG Circuit breaker ready to close.

iv) Over current relay operated.

v) DG under voltage.

vi) Reverse power relay operated.

vii) DG tripped on over speed.

viii) Generator winding temperature high.

ix) Generator bearing temperature high.

x) Engine trouble

xi) DC control supply failure

xii) Lube oil pressure low

xiii) Lube oil temperature high

xiv) Fuel oil day tank level low

xv) Any other alarm/indication necessary for proper operation of the DG Set.

xvi) Normal supply `ON'

xvii)DG 'ON'.

xviii) DG 'TRIPPED'.

xix) Low battery voltage.

xx) DG failed to start

e) Contacts shall be suitably rated at operating voltage.

3.03.04 Protective Devices

The vendor shall provide all the protective devices required for the safe operation of the Diesel Generator. Actuation of any of the protective devices will cause the Diesel Generator stopped. Protective devices shall correspond to the annunciation lists given above. Over speed tripping actuator shall be of adjustable type.

All protective relays shall be multifunction type numerical relays.

Multifunction numerical relays shall be selected to provide an integrated protection, continuous measurement and monitoring functions. Features such as self-diagnosis and external testing, disturbance recording, sequence of event recording, time stampings shall be available with the relay. Relevant data shall be possible to be stored in non-volatile memory backed up by battery. The relay shall have multiple setting groups, optically isolated input / output, fixed function and programmable LEDs, keypad and password protection.

All functions including protection, automation, communication, LEDs, input/output shall be programmable and can be modified, if required, using the front panel user interface. Communication port for local and remote (with suitable protocol) communication shall be located in the front and rear part of the relay. The relay shall be housed in dust tight enclosure, suitable for IP 52 degree of protection.

3.03.05 Generator Protection

DG set shall be provided with the following minimum protection. Any other protection required for proper functioning of DG set shall also be considered:

a) Voltage Restrained Over-current Relay (51VG) :
Three-pole phase over current protection shall be provided for overload and fault of the generator. The same shall have voltage restrained IDMT current characteristics with adjustable 50-200% of current settings.

b) Under voltage Protection (27G) :
Under voltage protection in conjunction with a timer shall be provided to trip out the generator for persistent under voltage. The same shall have an adjustable range of 40 - 80 % of voltage setting.

c) Under Frequency Protection (81G) :
Under voltage protection in conjunction with a timer shall be provided to trip out the generator for persistent under voltage. The same shall have an adjustable range of 40 - 80 % of voltage setting.
An ON delay timer to receive signals from voltage and frequency relays shall be provided. The range of the timer shall be greater than total time between the instant of grid power failure and the instant the generator builds up rated voltage and frequency. The timer shall trip out the generator in case the generator does not build up rated voltage frequency in a pre-set time and give an alarm 'generator start incomplete'. The timer shall also give closing impulse for auto closing of the circuit breaker of 415 V station unit switchgear.

d) Reverse Power Protection (32G) :
Reverse power protection will be used to initiate tripping in case of motoring of the machine or turbine trip.
The power relay shall have a sensitivity of 0.5 - 2% of the machine rated power.
Time delay relays shall be furnished to ensure stability of the interlock during start-up and synchronizing.

e) Lockout Relay (86G) :
Lockout relay shall be fast operating, hand-reset type with multi contacts for a number of switching operations. The relay shall be designed for a high degree of mechanical stability and shall have heavy duty contacts.

f) Lockout Supervision Relay (74G) :
Each lockout relay circuit shall have a supervision relay which will initiate alarm in case of any trouble in the lockout circuit/ relay. This relay shall be properly co-ordinated with the characteristics of lockout relay to prevent any mal-operation.

g) Field failure relay (40)

h) Single element Over voltage Relay (59G) with timer

i) P.T fuse failure relay (98)

3.03.06 Start-Stop Operation

a) The Diesel Generator will be controlled from the Diesel Generator Control Panel(AMF) which will be located in switchgear/control room. Facility to be provided for remote operation from customer control panels.

b) The following switches shall be installed in the Diesel Generator Control Panel:

i) `Auto/Manual & L/R selector switch

ii) DG set Start & Stop push buttons / Switch (Spring return to normal)

c) The starting and stopping methods for the DG set are envisaged as indicated below. The control circuit shall be developed by the Vendor considering the same.

i) The DG set can be stopped from the DG Control Panel irrespective of the position of the 'Auto/Local/Remote' selector switch through Stop push button.

ii) `Auto/Local/Remote' selector switch at `Local' position:
The DG set can be started and stopped manually for testing purpose from the D.G. Control Panel (mounted on DG set) through Start & Stop push buttons. At this condition circuit breaker of 415V station switchgear cannot be closed.

iii) `Auto/Local/Remote' selector switch at `Remote' position:
The DG set can be started and stopped manually from the AMF panel. At this condition the DG set can be run in parallel with station auxiliary system by manual closing of circuit breaker of 415 V station switchgear after synchronization. This is required for testing the DG set under load.

iv) `Auto/Local/Remote' selector switch in D.G. Control Panel in 'Auto' position:
The DG set will start automatically on failure of normal power supply. The simulated auxiliary contact for this purpose will be derived from the system. This signal will be of stay-put type and fed to the D.G. control panel. A timer in the DG Control Panel will introduce an adjustable (1 thru' 10 seconds) time delay to ensure that the DG set is started only under sustained under voltage (power failure) condition.

Contacts for voltage & frequency check start permissive at rated condition, shall be provided through voltage relay & frequency relay located in the DG Control Panel for opening & closing of circuit breaker of 415 V station switchgear.
During operation of the DG set under the above condition, if any stop command is initiated (either thru' stop push button in DG Control Panel or actuation of any protective device) the DG set will stop and will not restart even though the above DG auto start command is available.

v) On restoration of normal power supply, the operator will manually (through stop push button in DG Control Panel) stop the DG set depending on the plant status.

vi) Under all the above operating conditions, the DG stop command from DG Control Panel will be able to stop the DG set irrespective of whether normal power supply is restored or not.

3.03.07 Tripping

Any one or more of the following reasons shall cause the running diesel generator to be tripped and re-start shall be prevented until the fault/faults are removed and manual resetting is done.

a) Failure to start-up

b) Overload

c) Lube oil pressure inadequate

d) High lube oil temperature

e) Over speed

f) Generator stator temperature high

g) Generator bearing temperature high

h) Electrical protective relays operated.

i) D.G. Set fails to build-up rated voltage and speed in preset time.

3.03.08 Construction

a) The generator shall confirm to the latest standard such as BS:5000/IS:4722/IEC 34.

b) The panel shall be indoor, air insulated, dust and vermin proof, metal-clad, floor mounting.

c) Panel enclosure shall conform to the degree of protection IP-52. Minimum thickness of sheet metal used shall be 14 SWG.

c) The panel design shall be of fully compartmentalized execution with metal/ insulating partitions. Working height shall be limited to 250 mm to 1800 mm from the floor level.

d) All switches, lamps, relays, indicating instruments, annunciations etc. shall be flush mounted on the panel.

e) Exhaust Emissions, Height of engine exhaust piping system, Engine sound etc should be within the limits as per CPCB (Central Pollution Control Board) guidelines/norms.

f) The Diesel generating set should be housed in acoustic enclosure for reduction of sound

g) Terminal box should be Dust tight, weather proof phase segregated doubled walled having degree of protection of IP54.

h) Terminal box shall be of sufficient size to accommodate termination of minimum 3 nos cable of size 3.5Cx300 sq mm(3cables per phase).

3.03.09 Current Transformer

a) Current Transformers shall be cast-resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connection will be made. The CT secondary shall be rated for 1A.

b) Accuracy class/burden of the current transformers shall be:-
   i) Class 5P20 for relaying.
   ii) Class 1.0, ISF < 5 for metering.
   iii) CT burden shall be 15VA minimum
   iv) CT ratio 650/1A for ph side.

c) Dedicated number of CTs shall be considered for metering & to cover all protections given in cl. **3.03.05**.

Other particulars of the CTs viz. ratio, knee point voltage, excitation current and secondary resistance shall be decided by the Vendor.
All CT links shall be extended to TB for Owner panel.

3.03.10 Voltage Transformer

a) Voltage transformers shall be cast-resin, fixed type and shall have an accuracy class of 1.0. Voltage transformer mounted on breaker carriage is not acceptable.

b) High voltage windings of voltage transformer shall be protected by current limiting fuses. The voltage transformer and fuses shall be completely disconnected and visibly grounded in fully draw out position.

c) Low voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the switchgear is energized.

d) PT shall be provided for Synchronizing and metering purposes.
All PT signals shall be extended to TB for Owner panel.

3.03.11 Relays

a) All protective relays shall be Numerical type & of draw-out design with built-in testing facilities. Small auxiliary relays may be in non-draw out execution and mounted within the cubicle. Make of Numerical relay shall be Siemens/ABB/Areva/L&T.
b) Relays shall be rated for operation on 1A C.T. secondary current and 110V secondary voltage. Number and rating of relay contacts shall suit the job requirements.
c) The Vendor shall furnish, install & co-ordinate all relays to suit the requirements of protection, and interlock scheme.

3.03.12 Meters and Meter Selector Switches

a) All Indicating meters (96 x 96 mm) shall be switchboard type, with 240 degree scale, anti-glare glass and accuracy class of ± 2%. Each meter shall have zero adjuster on the front.

b) Motor ammeter shall have extended suppressed end-scale range to indicate starting current (6-8 times full load).

c) Energy Meter shall be three phase multifunction, digital type with communication port for customer panel interface.

d) Selector switches shall be maintained contact, stay put type with knob handle. Ammeter & Voltmeter selector switches shall be four position type. Ammeter selector switches shall have make before break feature to prevent open circuiting of CT secondary.

3.03.13 Secondary Wiring

a) The panel shall be fully wired at the factory to ensure proper functioning of control, protection, transfer and interlocking schemes.

b) Fuse and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up to terminal blocks.

c) Wiring shall be done with flexible, 650V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 Sq.mm for control & current circuits and 1.5 Sq.mm for voltage circuits.

d) Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per approved wiring diagrams.

e) Wire termination shall be made with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

3.03.14 Terminal Blocks

a) Terminal blocks shall be 660 V grade box-clamp type with marking strips ELMEX 10 Sq.mm or equal. Terminals for C.T. Secondary leads shall have provision for shorting.

b) Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

c) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

3.03.15 Cables , Cable Termination, Glands & Lugs

a) Control Cables between vendor supplied equipment are in vendor scope. DG set shall be kept outdoor area. Distance between DG set and AMF panel located in switchgear/control room will be 50mts (approx.)

b) Vendor shall supply Control cables, shall be 1100V grade, multicore, 1.5/ 2.5 sq.mm stranded copper conductor, PVC insulated, inner PVC sheathed, galvanized steel wire armoured and outer sheath made of FRLS PVC compound. Glands & Lugs for control cables shall be in the scope of vendor. Glands shall be double compression nickel plated brass cable glands &Lugs shall be tinned copper heavy duty lugs .

b) The panel shall be designed for cable entry from the bottom. Sufficient space shall be provided for ease of termination and connection.

c) All provisions and accessories shall be furnished for termination and connection of cables, including removable gland plates, cables supports, crimp type tinned copper/aluminum lugs, brass compression glands with tapered washer (Power cables only) and terminal blocks.

d) Gland plates shall be minimum 3 mm thick. The gland plate and supporting arrangement for 1C power cables shall be of non-magnetic material to minimize flow of eddy current.

e) Sufficient space shall be provided between the power cable termination (end boxes) and gland plate.

f) Power Cable of 3RX3.5CX300sq.mm between LTSWGR and DG set shall be in BHEL scope of supply. However lugs and glands at DG end shall be in the scope of DG vendor.

3.03.16 Ground Bus

a) A ground bus of Al. rated to carry maximum fault current, shall extend full length of the panel.

b) The ground bus shall be provided with two-bolt drilling with GI bolts and nuts at each end to receive plant grounding connection.

c) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker and draw out V.T. unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

d) Wherever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus and connected thereto.

e) C.T. and V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing other.

f) All hinged doors shall be earthed through flexible copper braid.

3.03.17 Nameplates

a) Nameplates of approved design shall be furnished at each cubicle and at each instruments & device mounted on or inside the cubicle. Cubicle nameplates shall be provided both at the front and back of the cubicle.

b) The material shall be lamicoid or approved equal, 3 mm thick with white letter on black back ground.

c) The nameplate shall be held by self-tapping screws. Nameplate size shall be minimum 20 x 75 mm for instrument/device and 40 mm x 150 mm for panels.

d) Caution notice on suitable metal plate shall be affixed at the back of each vertical panel.

3.03.18 Illumination, Space Heaters and Plug Sockets

a) Each vertical section shall be provided with illumination lamp with door switch, thermostat controlled space heaters and 5A, 3 pin plug socket.

b) Lamp, cubicle heater and plug socket circuit shall have individual switch fuse units.

3.03.19 A.C Power Supply

a) For control panel, the Vendor shall make his own distribution arrangements for control, annunciation, space heater and other auxiliary purposes from the 1 No. 415V, 3φ, 4W, 50 Hz AC feeder using suitable control transformer.

b) Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles.

c) Isolating switch fuse units shall be provided in control panel for incoming A.C.

d) No DC supply(110V/220VDc) is available in the Plant. Hence control philosophy shall be maintained such that above mentioned supply is not required.

3.03.20 Provision for Earthing

All the equipment of the Diesel Generator and accessories shall be earthed to common base frame. Two (2) nos. grounding pad shall be provided on the base frame to connect 50 mm x 6 mm G.I strip for grounding. Nuts & bolts required for connecting earthing strip shall be in vendor scope. Separate provision for Neutral earthing shall be provided.

4.00.00 INSPECTION & TESTS

All equipment shall be completely assembled, wired, adjusted and tested at the factory as per the relevant IS/IEC standards. The following tests shall however be carried out as a minimum. All the tests being conducted shall clearly be brought out in the Quality Assurance Plan (QAP) by Bidder. The category of test i.e whether it is a routine test or type test or both, must also be brought out clearly in the QAP with specific mention of relevant standard Number against each test.

a)	BOM verification	100 % Witness
b)	Dimensional check , Painting thickness , finish quality & workman ship	100 % Witness
c)	One Set of Manufacturer's Test certificates for major bought out equipment shall be made available during inspection	100 % Review
d)	All Routine & acceptance tests in including Load test for DG set as per relevant standards shall be conducted.	100 % Witness
e)	All type tests shall be as per the relevant IS/IEC standard .	100 % Review
f)	The DG Control Panel shall be subjected to all the routine tests with test procedures as per the codes and standards for the equipment.	100 % Witness

4.01.00 Test certificates for the type tests (as per Latest & relevant standards) of not older than 5years (as on date of enquiry) issued by any recognized laboratory for the similar rating DG set shall be furnished for BHEL's review along with Technical data sheets. If Type test certificates are not available same shall be conducted by vendor at his own cost in any recognized laboratory.

4.02.00 Shop Tests

4.02.01 All equipment and material shall be subjected to manufacturer's standard shop tests. Tests shall be carried out at the manufacturer's works during and after completion of manufacture of different component parts in accordance with the requirements of relevant codes, and wherever not specified in the said codes/regulations, the tests shall be carried out in accordance with the standards approved by the Purchaser.

4.02.02 Factory tests of components to be conducted shall include, but not limited to the following:

a) Manual analysis and testing

b) Static and dynamic balance tests of all rotating parts, at specified over speed and to determine the mass center and vibration level.

5.00.00 DRAWINGS, DATA AND MANUALS

5.01.00 To be submitted with the Offer

Sl.No.	Documents to be submitted with the Offer
i.	Electrical single line diagram showing ratings of all equipment
ii.	Layout drawings showing arrangement of the Diesel Generator and Auxiliaries, Control Panels, Oil Day Tanks, etc.
iii.	Type test certificates on similar equipment

5.02.00 To be submitted for Approval and Distribution

Sl.no	Document to be submitted for Approval	Approval/ Information
i.	Electrical single line diagram showing rating of all equipment.	Approval
ii.	GA / OGA Drawing and BOM of Diesel Engine, ECP, Fuel Tank, Associated accessories, Alternator . Terminal Box /Adopter Box; DG Set , Base Frame	Approval
iii	Data Sheets of DG Set & all accessories	Approval
iv	Foundation Plan & Loading Details of DG Set.	Information
v	DG area Layout and Cross Section considering acoustic enclosure, exhaust piping, cable trenches, cable trays, fuel trenches etc.	Approval
vi	Sizing Calculations for battery & battery charger and catalogue of Engine, Governor, Alternator, AVR, wiring diagram of Engine Control Panel	Information
vii	GA,BOM,Schematic diagrams of AMF PANEL	Approval
viii.	Co-ordinated relay setting chart for all protective relays supplied under this specification.	Information
ix	Any other relevant drawings, documents or data necessary for satisfactory installation, operation and maintenance	Information
x	Type test certificates	Approval
xi	O&M, Storage & Erection instruction manual	Information
xii	As built & Commissioned / final document	Information
xiii	PG test, all required documents & support for obtaining statutory clearances for explosive, electrical etc for one DG Set, accessories & control panels	Information

Note :i)The manuals shall clearly indicate method of installation, check-ups and tests to be carried out before commissioning of the equipment.

ii)The Vendor may note that the drawings, data and manuals listed herein are minimum requirements only.

iii)The Vendor shall ensure that all other necessary write-ups, curves, calculations and information required to fully describe the equipment offered are submitted with his bid.

6.00.00 Make of components:

Sub vendors for the DG set/AMF panel components shall be as per the following.

S.NO	ITEM	RECOMMENDED ELECTRICAL VENDOR
1	Auxiliary Relays	ABB, Jyoti, Areva
2	Bi-metal Relays	ABB, BCH Electric, C&S Electric, Larsen & Toubro Ltd., SchneiderElectric, Siemens, GE
3	Contactors	ABB, BCH Electric, C&S Electric, GE India, Larsen & Toubro, SchneiderElectric, Siemens
4	Control switches(Breaker)	Areva T&D India Ltd, Reliable Electronic Components, Switron Devices, Alstom, Kaycee
5	Control switches/Selector switches	Areva T&D, Hotline Switchgear & Controls, Kaycee Industries Ltd.,Larsen & Toubro, Reliable Electronic Components Pvt. Ltd., SiemensLimited, Switron Devices.
6	Earth Leakage Circuit Breaker	Datar Switchgear, Indo Asian Fusegear , Legrand, Havell's, ABB,Siemens, Schneider
7	Fuses	GE India Industrial, Indo Asian Fusegear., Larsen & Toubro, Siemens,Cooper Bussman
8	Heavy duty switches	C&S Electric, Indo Asian Fusegear, Larsen & Toubro, Siemens
9	MCBs	Datar Switchgear, Havell's, Indiana Current Control, Indo Asian Fusegear, Legrand , Standard Electricals, Schneider, ABB, Siemens
10	MCCBs	GE India, Siemens, Larsen & Toubro, Schneider Electric
11	Meters	Automatic Electric, MECO Instruments, Nippen Electrical InstrumentsCo., Rishabh Instruments.
12	Protection Relays (Conventional & Numerical)	ABB, Areva, Easun Reyrolle, Larsen & Toubro (P&B), Schneider Electric , Siemens, Schweitzer Engg.
13	Push buttons & Indicating lamps	BCH Electric, C& S Electric, Hotline Switchgear & Controls, Larsen &Toubro, Precifine Products, Schneider Electric India, Shri Tulsi Switchgears., Siemens, Teknic Controls, Essen Deinki
14	Fuse-switch combination	ABB, C&S Electric, Havell's, Indo Asian Fusegear, Larsen & Toubro, Schneider Electric India, Siemens, Standard Electricals, GE
15	Timers	BCH Electric., Electronic Automation Pvt. Ltd., Larsen & Toubro Ltd.,Siemens Limited
16	CT & PTs (MV)	Gilbert & Maxwell Electricals Kalpa Electrikal., Kappa Electricals,Narayan Powertech, Pragati Electricals Precise Electricals, Silkaans Electricals.

NOTES:

1. Vendor shall strictly follow the list of makes for equipments as specified above.
2. For components other than the above, vendor shall submit past track record for the proposed sub-vendors and obtain written approval from BHEL before placing order.

7.00.00 PRICE FORMAT FOR DG SET :

Project : Sewage Treatment Plant Equiry no :

Sl. No	Description	Unit Price	Qty	Total Value	Quoted Yes/No	Remarks
1	415V, 50Hz 450kVA (Prime Continuous rating) DG set as described in specification **(PY9755085009)**		1 Set			
2	Lump sum Price for supervision of installation, testing & commissioning of DG Set for each visit (**each visit constitutes of 5-Mandays @ field**) **(PY9755085017)**		2 (visits)			Refer Note-2
3.	Commissioning spares as per Annexure-3 **(PY9755085025)**		1 Set			
4.	Tools & Tackles as per Annexure-3 **(PY9755085033)**		1set			

Notes:-

1. The evaluation shall be done considering Sl.No 1, 2, 3 & 4 above.
2. Lump sum prices for each visit for Supervision of Installation, testing & commissioning of Equipment at site shall include Travel expenses, Incidental charges, Man-day charges and any other charges if applicable.
3. The validity of prices for the main & Spares shall be kept firm till the execution of order or minimum of 12 months from the date of P.O, whichever is later.
4. Vendor shall submit the prices in the above format only. No other format is acceptable. Vendor shall submit above format duly signed & indicating each item as quoted or not quoted (without prices) along with technical offer.
5. Check list regarding requirements to be finalized at site before his visit.
6. When the no.of Visits mentioned above exceeds unit prices quoted above will be applicable.

Ref. Doc

ANNEXURE –1

DATA SHEET FOR ENGINE TO BE SUBMITTED

1	Manufacturer	
2	Engine Model / frame	
3	WT of Engine	
4	Dimension of Engine	
5	O/L Capacity of Engine in %	12 hours continuous of which 110% for 1 hr at every 12 hrs of running
6	Duty	Prime continuous Duty
7	No. of Cylinders & Arrangement	
8	Bore/Stroke	
9	Speed (rpm)	
10	Mean piston Speed(m)/sec	
11	Compression Ratio	
12	Type Combustion Chamber	
13	Rotation viewed from coupling end	
14	Engine cooling	Water Cooled Radiator
15	Method of starting	Electric Start
16	Mode of starting	Auto /manual
17	Mode of stopping	Manual
18	Cold starting	Required
19	Rated engine power at operating Site condition in BHP / KW (with engine driving all its ancillaries including radiator fans & Motor Driven Pumps)	
20	Power required for following Auxiliaries driven by Engine	

Radiator Fan Motor	Fuel Pump (if applicable)	Other Auxiliary (VENDOR TO SPECIFY)

21	Engine Governing	Class A1 as per BS-5514 with facility for synchronizing with mains.
22	Lube oil consumption	
23	Fuel consumption in ltr/ kw/ hr at following load	

¼ Load	½ Load	¾ Load	Full Load	110% Load

23	Mechanical Efficiency	
24	Vibration Level	
25	Noise Level	
26	Time required for starting from cold to full load	10 to 15 sec
27	Time Intervals between starting impulses	
28	No. of Starting impulses	
28	Capacity of fuel tank	550 ltrs
30	Battery & Battery charger	
31	List of electrical & Mechanical Aux. And their Power consumption	
32	Complete technical literature and catalogue of Engine along with all its accessories including starting device, cooling system, governing system, fuel oil system etc	

ANNEXURE 2

DATA SHEET FOR ALTERNATOR TO BE SUBMITTED					
1	Make				
2	Design ambient		50 deg. C		
3	Alt above MSL		< 1000 MTR		
4	Humidity		85%		
5	Area classification		Safe		
6	Frame designation				
7	**Rated output**				
8	Applicable Code				
9	NO.of units				
10	Type of driver		Diesel engine		
11	Terminal Voltage		415V		
12	Enclosure		IP 23		
13	Rated P.F		0.8 Lag		
14	Phase/connection/ no. of terminals		3 Phase , 3 /4 Wire		
15	Full load current				
16	Speed		1500RPM		
17	Rated frequency		50 HZ		
18	Cooling system		Air cooled		
19	Max. permissible inductive loading				
20	Excitation system				
21	Steady state 3 - phase S.C currents				
22	Type of voltage regulator				
23	3- phase S.C withstand time				
24	Painting				
25	Colour shade				
26	Insulation class		Class H temp rise limited to Class F		
27	Type of excitation system		Brush less.		
28	Type of cooling		Air cooled		
29	Enclosure for terminal box		IP-54		
30	Continuous parallel operation		Applicable.		
31	Black start facility		Required		
32	Generator line side termination		Cable		
33	Line side cable - type / size				
34	Neutral side cable -type / size				
35	Max. permissible impact load				
36	Method of Drive		As per OEM standard		
	Reactances :				
37	Direct axis transient reactance Xd'				
38	Direct axis sub transient reactance Xd				
39	Synchronous reactance Xd				
40	Zero sequence reactance Xo				
41	Negative sequence reactance X2				
42	**Resistances and time constants** :				
43	Armature resistance (25 deg.C)				
44	Armature resistance (100 deg.C)				
45	Transient time constant Td'				
46	Sub - transient time constant Td'				
47	Efficiency	P.F	25% load	75% load	100% load
	%	0.8(lag)			
	%	Unity P.F			

The above lists are indicative. Any other relevant information, if required shall be given as and when required.

ANNEXURE 3

COMMISSIONING SPARES:

Sl.no	Description	Quantity
1	Lube Oil filters	1SET
2	BY pass oil filters	1SET
3	Fuel oil filter kit & its sealing ring	1SET

Anything else required beyond the above mentioned list shall be considered by vendor and the same shall be quoted in their offer.

LIST OF TOOLS AND TACKLES

SPECIAL TOOLS & TACKLES: Vendor to supply new tools for each DG set for the maintenance of the equipment exclusively by customer. These tools should be separately packed and shipped. Tentative list of tools is enclosed. Vendor to confirm suitability of the following tools for their equipment. If any addition / deletion / new list is required for the DG , it may please be furnished and will be decided after discussion .Tools supplied should be specific to equipment supplied by vendor.

LIST OF TOOLS &TACKLES :

Sl.No	Description	QTY
1	Torque Wrench (2-8 ft lb),3/8" square drive	1 set
2	3/8" to ½" square drive	1 set
3	Dial gauge – 1" Travel, Least count 0.001"	1 No
4	Extension – ½" square drive, 5" long	1 set
5	Socket 1/2" – ½" square drive	1 set
6	Adjustable wrench – 10" long	1 No
7	Allen wrench set – 1/16", 5/64," 3/32," 1/8" , 5/32" , 3/16", 7/32", 1/4", 5/16" , 3/8"	1 set
8	Feeler gauge set – 4" long (0.0015" , 0.002" , 0.003" , 0.004" , 0.006" , 0.008" , 0.010" , 0.012" , 0.015" , 0.023"	1 set
9	Vacuum gauge 0-30"hg	1 No
10	Pressure gauge 0-300psi	1 No
11	Hand Tachometer – 0-1500 rpm	1 No
12	Socket 7/8" – ½" square drive	1 set

ANNEXURE-4

DEVIATION SCHEDULE

ENQUIRY No. _____ NAME OF BIDDER _____

ITEM _____ OFFER REF NUMBER _____

Sl.No.	Clause.no. & Spec.no	Description as per specification	Deviation taken	Nature of Deviation	Remarks

NOTES

1. Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule. Deviation Schedule constitutes this sheet (with these Notes) duly signed and stamped.
2. Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored.
3. Additional sheets in the same format can be attached by the vendor, if necessary.
4. Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market.
5. No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
6. Reasons for the deviations shall be specified in the Remarks column.
7. If there are no deviations from the specifications, bidder still has to submit the Deviation Schedule by writing “NO Deviations” in this format.
8. If the “Deviation Schedule” is not submitted along with the offer, the bidder’s offer is likely to be rejected without any further interaction with the bidder.
9. Only the accepted deviations in conjunction with the original tender shall constitute the contract document for the award of job to the bidder.

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

DATE _____

COMPANY SEAL

ANNEXURE-5

PACKAGE EXECUTION MILESTONES/SCHEDULE

Sl. No.	Event	Schedule	
		For GA & Layouts	For Scheme Drawings , BOM,SLD
1	Drawings submission	Within 2 week from P.O. date	Within 2 week from P.O. date
2	BHEL Comments (along with Final/Firm inputs and revisions)	Within 2 week from receipt of the "Drawings in line with Inputs" (Note-2)	Within 2 week from receipt of the "Drawings in line with Inputs" (Note-2)
3	Revised Drawings submission	Within 1 week from BHEL's comments date	Within 1 week from BHEL's comments date
4	BHEL Comments / Approval for Manufacture Clearance	Within 1 week from receipt of the revised Drawings	Within 1 week from receipt of the revised Drawings
5	Revised Drawings submission	Within 1 week from BHEL's comments / Manufacture Clearance date	Within 1 week from BHEL's comments / Manufacture Clearance date
6	BHEL Approval on Revised Drawings	Within 1 week from receipt of the revised Drawings	Within 1 week from receipt of the revised Drawings
7	As-Manufactured Drawings + Commissioning Manuals	Note-3	

Notes:

1. Kick off Meeting will be held after order placement at BHEL-Hyderabad. It is Vendor's responsibility to call and fix up date for the meeting. It is intended to provide revised inputs (if any) and clarifications on the inputs during the Kick off meeting. It is vendor's responsibility to collect the above within 2 weeks from P.O. / L.O.I. beyond which delays will be to the vendor's account.

2. It is Vendor's responsibility to submit the Drawings in line with the latest inputs else the drawings will be rejected. Delays on account of this will be attributed to the Vendor.

3. Six sets of all As-Manufactured drawings and Commissioning Manuals shall be dispatched along with the first consignment.

4. The total delivery time from P.O. / L.O.I. date is 20 weeks progressively. For package execution schedule and accounting of delays, the schedule for GA & SLD drawings shall be taken as reference.

ANNEXURE-6

CHECK LIST FOR DG-SET

(FOR INTIAL CHECK OF BIDDER OFFERS DOCUMENTATION)

1.0 CHECK LIST

(TO BE FILLED BY BIDDER AND SUBMITTED ALONG WITH TECHNICAL OFFER)

Sl. No.	Check point description	Supplier Confirmation
1.	Completely filled-in Technical Datasheet of Alternator & Engine as per specification enclosed.	YES/NO
2.	Duly signed Deviation Schedule(Technical) enclosed	YES/NO
3.	Relevant Type Test Certificates enclosed	YES/NO
4.	Unpriced Schedule enclosed as per BHEL specification complying to following: 1. Signed & Stamped 2. In BHEL format. 3. All items are quoted	YES/NO
5.	Clause wise confirmation to BHEL specification included in technical offer except the deviations listed in deviation schedule.	YES/NO
6.	Bidder Credentials attached	YES/NO

1.1 Along with the offer, bidder to furnish **this checklist** duly filled and signed. No deviation is acceptable in this regard. Without duly signed & stamped checklist offer shall not be considered for evaluation.

BIDDER'S STAMP & SIGNATURE

RECORD OF REVISIONS

Rev. No.	Date	Revision details	Revised by	Approved by
00	20.11.14	Original Issue	---	-sd- J.K Pattanaik
01	14.02.15	Generally Revised	Suresh.P 14.02.15	J.K Pattanaik 14.2.15