

Date: 05-09-2022

Corrigendum 01

With reference to the tender notification for “**500 KVA 3 Phase Diesel Generator with AMF Panel**”(Tender **Notification No: NITK/CRF/3PH-GEN/04 Dated: 30-08-2022**), please note the following changes:

- Under tender document, Page no. 39 of 49, Under Annexure – ‘L’, **Please note the following revised “Detailed Technical Specification”.**
- **All the bidders are advised to quote for the revised technical specification only and same will be considered for the technical evaluation.**

Detailed Technical Specifications

Diesel Engine:

➤ Engine rating

The engine shall be multi cylinders, vertical, 4 stroke cycles, water-cooled, diesel engine developing suitable BHP for giving a prime power output of 500 kVA at 0.8 P.F. at the load terminals of the respective alternators (exclusive of the power requirements of auxiliaries deriving power from the engine) (as per ISO 8528 part- I).

The engines shall be capable for delivering specified prime power rating at variable loads for PF of 0.8 lag with 10% overload available in excess of specified output for one hour in every 12 hours. The average load factor of the engine over a period of 24 hours shall be 0.85 (85%) for prime power output. The engines shall conform to BS 5514/ BS 649/ IS10000/ ISO: 3046 amended up to date. The engines shall be fitted with the following accessories.

- i) Dynamically balanced Fly-wheel.
- ii) Necessary flexible coupling and guard for alternator and engine.
- iii) Air cleaner dry type with replaceable elements.
- iv) Corrosion Inhibitor Coolant, if applicable.
- v) An Electronic speed governor to maintain engine speed at all conditions of load.
- vi) For 500 kVA DG set minimum inbuilt fuel tank capacity should be 990 Ltrs.**
- vii) Residential exhaust silencers with flanges.
- viii) Self-starter 12 / 24 V D.C.
- ix) Battery Charger unit and voltage regulator, required a number of 12 Volts pure lead thin tin plate batteries of Ampere hour rating as recommended by the manufacturer, insulated battery racks with interconnecting leads and terminals. The connection between battery charger and batteries shall be provided with suitable copper leads with lugs etc.
- x) Necessary pumps for lubricating oil, priming of the engine fuel system, etc. as required.
- xi) Exhaust gas turbocharger with aftercooler.
- xii) Lubricating oil cooler.
- xiii) Lubrication oil filters with replaceable elements.
- xiv) Fuel injector.
- xv) Fuel control solenoid.
- xvi) Fuel pump with engine speed adjustment.
- xvii) Necessary excitation control and voltage regulating equipment's.
- xviii) Engine Control Panel fitted and having a digital display for following:
 - (a) Start/stop key switch.
 - (b) Lube oil pressure indication.
 - (c) Water temperature indication.
 - (d) RPM indication.
 - (e) Engine Hours indications.
 - (f) Battery charging indication.
 - (g) Low lube oil trip indication.
 - (h) High water temperature indication.
 - (i) Over speed indication

- xix) Safety controls against low lube oil pressure, high lube oil temperature, high cooling water temperature and fail to start.
- xx) Base frame as per manufacturer's specification including required nos. of anti-vibration cushy foot mountings.
- xxi) A necessary over-speed trip on the engine.
- xxii) Exhaust piping wrapped with mineral wool/rock wool complete with aluminum cladding
- xxiii) Heavy Duty Radiator, radiator fan, and mounting.

All moving parts of the engine shall be mechanically guarded in such manner that a human finger cannot touch any moving part.

Necessary certificate indicating the compliance of the above capacity requirement for the engine model so selected along with compliance of Noise and Emission norms as per latest CPCB guidelines for DG set capacity up-to 1000 kVA, should be furnished from the manufacturers along with the technical bid. However, above 1000 kVA DG set, manufacturers shall furnish certificate that the engine for the DG set complies with the CPCB Emission norms.

1. Governor

1.1 The Governor shall be Electronic type conforming to class A1 and shall be a self-contained unit capable of monitoring speed. This should conform to ISO 3046 / BS 5514 with actuator as per standard design of manufacturer.

1.2 Frequency variation

The engine speed shall be so maintained that frequency variation at constant load including no load shall remain within a band of 1% of rated frequency.

1.3 Fuel System

It shall be fed through engine driven fuel pump. A replaceable element of fuel filter shall be suitably located to permit easy servicing. The daily service tank shall be complete with necessary supports, gauges, connecting pipe work etc. Pipe sealant should be used for sealing all connections. No Teflon tape is to be used.

1.4 Lubricating oil system

It shall be so designed that when the engine starts after a long shut down lubricating failure does not occur. Necessary priming pump for the lube oil circuit as per the recommendation of the manufacturer shall be installed, to keep bearings primed. This pump shall be normally automatically operative on AC/DC supply available with the set.

1.5 Starting System: -

This shall comprise of necessary set of pure lead thin tin plate batteries 12 V D.C. and suitable starter motors, axial type gear to match with the toothed ring on the fly wheel. Battery capacity shall be suitable for meeting the needs of the starting system as well as the requirements of control panel, indications and auxiliaries such as priming pump etc. as applicable. The scope shall cover all cabling, terminals, including initial charging etc. The system shall be capable of starting the DG Set within 20-30 sec, even in winter condition with an ambient temperature down to 0⁰ C.

1.6 Piping work

All pipe lines and fittings and accessories required inside the engine room /enclosure and outside for exhaust piping shall be provided by the contractor. This shall include necessary flexible pieces in the exhaust, fuel, lube oil and water as are necessary in view of the vibration isolation requirement in the installation. Piping of adequate size shall be used for lube. Oil of the materials as per manufacturer's standard. However, only MS pipes for the exhaust and fuel oil lines shall be used.

The pipe work shall be inclusive of all fittings and accessories required such as bends, reducers, elbows, flanges, flexible connections, necessary hardware's etc. The installation shall cover clamps, supports, hangers etc. as are necessary for completing the work.

1.7 Common bed plate

Engine and alternator shall be coupled by means of flexible coupling as per manufacturer's standard design and both units shall be mounted on a common bed plate together with all auxiliaries to ensure perfect alignment of engine and alternator with minimum vibrations. Fabricated bed plate will be acceptable. The bed plate shall be suitable for installation on suitable anti-vibration mounting system.

1.8 Exhaust System

1.8.1 Exhaust piping: All MS pipes for exhaust lines shall be conforming to relevant IS. The runs forming part of factory assembly on the engine, flexible connections up to exhaust silencer shall be exclusive of exhaust piping item. The work includes necessary cladding of exhaust pipe work using mineral wool/ glass wool/ rock wool of 50 mm thick & aluminum cladding (0.80 mm thick) for the complete portion. The exhaust pipe work includes necessary flexible vibration damper etc. to avoid any load & stress on turbo charges / exhaust manifold. The exhaust pipe support structure shall be got approved by engineer -in-charge before execution.

1.8.2 Exhaust system should create minimum back pressure.

1.8.3 Number of bends should be kept minimum and smooth bends should be used to minimize back pressure.

1.8.4 Pipe sleeve of large dia should be used while passing the pipe through concrete wall & gap should be filled with 'felt lining.

1.8.5 Exhaust flexible shall have it's free length when it is installed.

1.8.6 'Class B' MS pipes and long bend / elbows should be used.

1.8.7 The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet / windows etc.

1.8.8 When tail end is horizontal, 45 Degree bevel cut should be given at the end of the pipe to avoid rain water entry into exhaust piping.

1.8.9 Optimum Silencer Location: Location of the silencer in exhaust system has very definite influence on both reduction of noise and back pressure imposed on the system.

1.8.10 Care should be taken to ensure that no carbon particle emitted due to exhaust leaking enters and deposits on alternator windings and on open connections.

1.8.11 Support to exhaust piping: Exhaust piping should be supported in such manner that load of exhaust piping is not exerted to turbo charger/exhaust manifold.

2 Air System

It is preferable to provide vacuum indicator with all engines to indicate choked filter. Maximum air intake restrictions with clean and choked filters should be within prescribed limit as per OEM / manufacturer recommendation for particular model of the engine. Genset should be supplied with medium duty air cleaners.

3 Cooling System

I. System should be designed for ambient temperature of 40 Deg.C.

II. Coolant should be used mixed with additive (in suitable proportion) as per recommendation of OEM / Manufacturer for various engine models.

Radiator fan flow should be free from any obstruction and providing additional exhaust duct for radiator air (As shown in the drawing)

4. Alternator

4.1. Synchronous Alternator: Self excited, screen protected, self-regulated, brush less alternator, Horizontal foot mounted suitable for the following:

Rated PF	0.9 (lag)
Rated voltage	415 Volts
Rated frequency	50 Hz
No. of phases	3
Enclosure	SPDP
Degree of protection	IP-23
Ventilation	Self-ventilated air cooled
Ambient Temperature	40° C maximum
Insulation class	H
Temperature Rise	Within class H limits at rated load
Voltage regulation	+/- 1%
Voltage variation	+/- 5%
Overload duration/capacity	10% for one hour in every 12 hours of continuous use.
Frequency variation	As defined by Engine Governor (+/- 1%)
Excitation	Self-excited
Type of AVR	Electronic
Type of Bearing and lubrication	Anti-friction bearing with Grease Lubrication arrangement
Standard	BS:5000/IS – 4722 & IEC: 34 as amended up to date

4.2 Excitation: The alternator shall be brushless type and shall be self-excited self-regulated having static excitation facility. The exciter unit should be mounted on the control panel or on the alternator assembly. The rectifier shall be suitable operation at high ambient temperature at site.

4.3 Automatic Voltage regulators (AVR): In order to maintain output terminal voltage constant within the regulation limits i.e. +/- 1%, Automatic voltage regulator unit shall be provided as per standard practice of manufacturer.

4.4 Fault Tripping: In the event of any fault e.g. over voltage / high bearing temperature high winding temperature or an external fault, the AVR shall remove the excitation voltage to the alternator. An emergency trip shall also be provided.

4.5 Standards: the alternator shall be in accordance with the following standards as are applicable.

4.5.1 IS: 4722/BS: 2613 / 1970 the performance of rotating electrical machine.

4.5.2 IS: 4889/ BS: 269 rules for method of declaring efficiency of electrical machine.

4.6 Performance: Voltage dip shall not exceed 20% of the rated voltage for any step load or transient load as per ISO:8528 (part I). The winding shall not develop hot spots exceeding safe limits due to imbalance of 20% between any two phases from no load to full load.

The generator shall preferably capable of withstanding a current equal 1.5 times the rated current for a period of not more than 15 second as required vide clause 14.1.1 of IS 4722: 1992

The performance characteristics of the alternator shall be as below:

- | | |
|-----------------------------|--|
| (a) Total distortion factor | Less than 3% |
| (b) (i) 10% overload | One hour in every 12 hrs. of continuous use. |
| (i) 50% overload | 15 sec |

4.7 Terminal Boxes: Terminal boxes shall be suitable for UG cables and shall have provision for connecting 2 runs of 3.5 core x 300 sq. mm UG cable. The terminal box shall be suitable to withstand the mechanical and terminal stresses developed due to any short circuit at the terminals.

4.8 Earthing & Earth terminals: 6 nos. of chemical earth pits should be provided for energizing the DG of below specification: Chemical earthing for grounding conduits IC cut-outs and other equipment's on the meter board by using copper bonded /SS rod with earth enhancing backfill compound which is non-corrosive, thermally conductive potential to permissible limits superior fault conduction capacity nontoxic, weather resistance and capable of achieving ohmic value less than one ohm. using 6ft copper bonded rod with back fill compound with earth chamber and naming of earth pit.

Test certificate should be provided for the same by authorized agency.

5. AMF/Engine Control Panel

Fabricating, Installing, Testing & Commissioning of automatic mains failure control including manual by-pass panel, suitable for 500 KVA silent type DG set complete with relays, timers, set of CTs for metering & protection and energy analyzer to indicate currents, phase and line voltages, frequency, power factor, KWH, KVARH & provision for overload, short circuit, restricted earth fault, under frequency, control cabling from AMF panel to diesel engine and elsewhere if required all complete and inter locking including the following:

- 1250 Amps, 4 poles by pass arrangement- 2 Set.
- 1250 Amps, 50 kA (Ics=Icu), 4 pole motorized electrically operated draw out with cradle type 3 position ACB with electronic release for O/C & E/F and shunt trip - 2 Nos.
- 800 Amps, 50 kA (Ics=Icu), 4 pole motorized electrically operated draw out with cradle type 3 position ACB with electronic release for O/C & E/F and shunt trip for outgoing - 1 Nos.
- Electrolytic Grade Cooper flat Busbars of size 1 run 80 x 10 mm for each Phase and 1 run 80 x 6 mm for Neutral.
- 400 Amps (35kA) – 2 nos & 630 Amps (50kA)- 1 no, MCCB with door handle for outgoing connections.
- **GPS enabled Microprocessor based Engine/AMF Panel control unit** for automatic function/emergency/stand by power supply system - 1no
- IDMT relay for over current protection for 3 phase - 1 Set
- Auto/Manual/Test/Off selector switches.
- 2 Nos. over voltage relay and 2 Nos. under voltage relay and 9 Nos of current transformers 15 P 10 accuracy for protection and 15 VA class-I for metering
- Energy analyzer unit to indicate KWH.
- Multi-function meters to incomers and outgoing ACB.
- Indicating lamps for load on mains and load on set and trip indications of incomers.
- Indicating lamps for each outgoing switch (ON, OFF & Trip) indications.
- Fuses for instruments
- Battery charger, complete with transformer/rectifier, D.C. voltmeter and ammeter, selector switch for trickle, off and boost and current adjustment
- Main supply failure monitor, Supply failure timer, Restoration timer
- Control unit with three impulse automatic engine start/stop and failure to start lockout.
- Impulse counter with locking and resets facility
- ON/OFF/Control circuit switch with indicator
- Audio/Video annunciation for: Low lubricating oil pressure, Engine over speed, Engine fails to start, Full load / maximum load warning

- 51 Labelling: All internal components shall be provided with suitable identification labels suitably engraved. Labels shall be fixed on buttons, indication lamps etc.
- 52 Equipment requirements: The AMF control cubicle shall incorporate in to assembly the general equipment and systems as under:

- (a) Control system equipment's and components such as relays, contactors, timers etc. both for automatic operation on mains failure and as well as for manual operation.
- (b) **GPS enabled remote monitoring system to ON/OFF & monitor the AMF through app/website.**
- (c) Equipment and components necessary for testing generating sets' healthiness with test mode and with load on mains
- (d) Necessary instruments and accessories such as combined meters for voltage, current, power factor, frequency, KW, KVA etc. and KWH meter with selector switch/ buttons for to obtain the reading of desired parameters.
- (e) Necessary indication lamps, fuses, terminal blocks, push buttons, control switches etc. as required.
- (f) Necessary engine/ generating set shut-down devices due to faults/ abnormalities.
- (g) Necessary Visual Audio alarm indication and annunciation facility, as specified.
- (h) Necessary Battery charger.

6. System Operations: The above-mentioned facilities provided shall afford the following operational requirements

6.1 Auto Mode: -

- a) A line voltage monitor shall monitor supply voltage on each phase. When the mains supply voltage fails completely or falls below set value (variable between 80 to 95% of the normal voltage value) on any phase, the monitor module shall initiate start-up of diesel engine. To avoid initiation due to momentary disturbance, a time delay adjustment between 0 to 5 second shall be incorporated in start-up initiation.
- b) A three-attempt starting facility shall be provided 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF, 6 seconds ON. If at the end of the third attempt, the engine does not start, it shall be locked out of start and a master timer shall be provided for this function. Suitable adjustment timers are to be incorporated which will make it feasible to vary independently ON-OFF setting periods from 1-10 seconds. If alternator does not build up voltage after the first or second start as may be, further starting attempt will not be made until the starting facility is reset.
- c) Once the alternator has built up voltage, the alternator circuit breaker shall closely connect the load to the alternator. The load is now supplied by the alternator.
- d) When the main supply is restored and is healthy as sensed by the line voltage monitor setting, both for under voltage and unbalance, the system shall be monitored by a suitable timer which can be set between 1 minute to 10 minutes for the load to be transferred automatically to main supply and the DG set is shut down after the preset duration of idle run.
- e) The diesel alternator set reverts to standby for next operation as per (a), (b) and (c) above.

6.2 Manual Mode

- a) It should be feasible to start-up the generator set by the operator on pressing the start push button.
- b) Three attempts starting facilities shall be operative for the startup function.
- c) Alternator circuit breakers closing and trip operation shall also be through the operator only by pressing the appropriate button on the panel and closure shall be feasible only after alternator has built up full voltage. If load is already on 'mains', pressure on 'close' button shall be ineffective.

d) Engine shut down, otherwise due to faults, shall be manual by pressing a stop button.

63 Test Mode

- a) When under 'test' mode, pressing of 'test' button shall complete the startup sequence simulation and start the engine. The simulation will be that of mains failure. Sequence 11.1 (a) and (b) shall be completed.
- b) Engine shall build up voltage but the set shall not take load by closing of alternator circuit breaker. When the load is on the mains, monitoring of performance for voltage/frequency etc. shall be feasible without supply to load.
- c) If during test mode, the power supply has failed, the load shall automatically get transferred to alternator.
- d) Bringing the mode selector to auto position shall shut down the set as per sequence 11.1 (d) provided main supply is ON. If the mains supply is not available at that time, the alternator shall take load as in (c) above.

64 Engine shut down and alternator protection equipment's

Following shut down and protection system shall be integrated in the control Panel.

- a) Engine
 - i) Low lubricating oil pressure shut down. This shall be inoperative during start-up and acceleration period.
 - ii) High coolant (Water) temperature shut down.
 - iii) Engine over speed shut down.
- b) Alternator protection
 - i) Overload
 - ii) Short circuit
 - iii) Earth fault
 - iv) Over voltage and Over current

65 Monitoring and metering facilities required in AMF panel

- a) Necessary instruments for visual monitoring of mains, alternator and load voltage, current, frequency, power factor, KW, KVA, KWH, etc.
- b) Whenever AMF panel starts/stops the DG, a message should be sent to registered mobile no's the details regarding the failure/disturbance of main power and vice versa.
- c) The AMF panel should start/stop the DG whenever the command from app/website receives.
- d) The Fuel gauge shall be electrically operated - fuel gauge shall have to be provided inside the enclosure. The fuel gauge should be able to show the level of the fuel even when the DG Set is not running. Whenever the fuel is low the AMF should send the message to registered mobile no's regarding the low fuel quantity.
- e) A set of visual monitoring lamp indication for:
 - i) Load on set
 - ii) Load on mains
 - iii) Set on Test (Alternator on operation duty, Alternator on standby duty)
 - iv) Set of lamps for engine shut down for over speed, low lube oil pressure and high coolant water temp, overload trip of alternator, earth fault trip of alternator, engine lock out and failure to start etc. All these indications shall have an audio and visual alarm. When operator accepts the alarm, the hooter will be silenced and the fault indication will become steady until reset by operating a reset button.

66 Operating devices

A set of operation devices shall be incorporated in the front of panel as under.

a) Master Engine Control Switch

This shall cut off in "OFF" position DC control supply to the entire panel, thus preventing start-up of engine due to any cause. However, battery charger, lamp test button for testing the healthiness of indication lamps, DC voltmeter, ammeter etc. shall be operative. It shall be feasible to lock the switch in OFF position for maintenance and shut down purposes.

- b) Operation selector switch OFF/AUTO/MANUAL/TEST position.
- c) A Set of push buttons as specified.
- d) Necessary battery charger with boost / trickle selector, DC voltmeter and DC ammeter.

7. Battery / Electrical System

7.1 Battery

- 7.1.1 Batteries supplied with Genset are generally dry and uncharged. First charging of uncharged batteries should be done from authorized battery charging Centre.
- 7.1.2 Batteries should be placed on insulated stands and relatively at cool place.
- 7.1.3 The battery capacity should be as per the recommendations of the manufacturer with 24 Volts electrical system and the size of copper conductor battery cable should be of 70 sq.mm.
- 7.1.4 Battery shall be of pure lead thin tin plate type any.

7.2 Cabling

- 7.2.1 Power cabling (including their termination) between alternator to the AMF panel should be done with 2 run 3.5 core 300 Sq. mm size aluminum conductor cable of total 80 meters (Minimum).
- 7.2.2 Multi core copper cable should be used for inter connecting the engine controls with the switch gear and other equipment's.

Scope of Work:

The detailed scope of supply, Installation, and commissioning of 500 kVA DG in NITK with AMF panel and all other accessories of the institute includes the following:

- a) Diesel Generating Set with 500 kVA capacity at 0.8 power factor developing 415 volts 3 phase 4 wire output with the engine and alternator mounted on common bedplate completely and all accessories required. The DG Sets shall be capable of delivering the desired kVA at 0.8 P.F. for the external load after meeting its own requirement for auxiliaries etc. and after accounting for de-rating due to various factors.
- b) Necessary acoustic enclosure.
- c) Necessary piping required for Fuel, Lubricating oil system, and exhaust piping.
- d) Necessary batteries for started including cable work as per the schedule of quantities.
- e) Necessary Engine control Panel and AMF panel as per detailed specification.
- f) Necessary set of suitable vibration isolation mountings.
- g) Minor building work including cutting and making good of openings in wall and floors, grouting, etc. as required.
- h) All clamps support etc. for all components of the installation as required.
- i) Necessary earthing sets for the system neutral and body earthing and earth leads for connections and naming of pits etc.
- j) Power cable from 500 kVA D.G. Set to its AMF panel.

STATUTORY CLEARANCE(S): Approval/clearance of the complete installation shall be obtained by the contractor/authorized agency from CPCB/State Pollution Control Board/Local Bodies/Central Electricity Authority (CEA)/other Licensing Authorities, wherever required. However, the application shall be made by Department and any statutory fee, as applicable, shall be paid by Department directly to the Govt. Authorities concerned.

INSPECTION AND TESTING

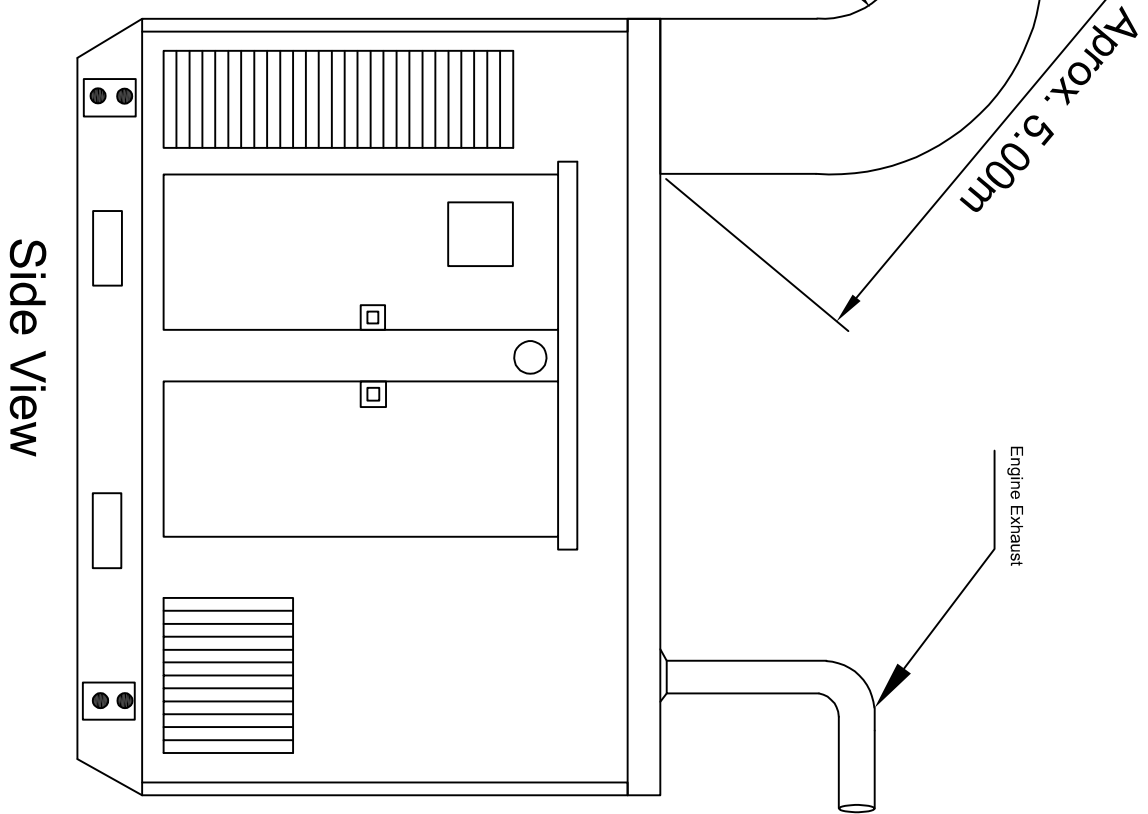
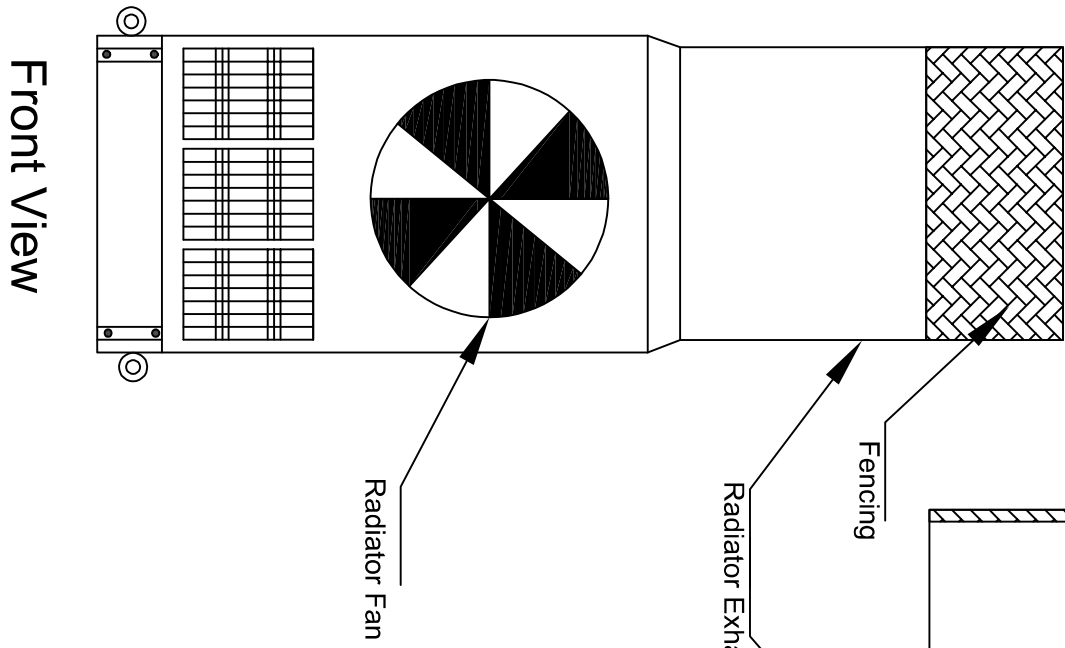
a. The Supplier/Contractor will arrange staff/fuel/POL for a test run at his cost.

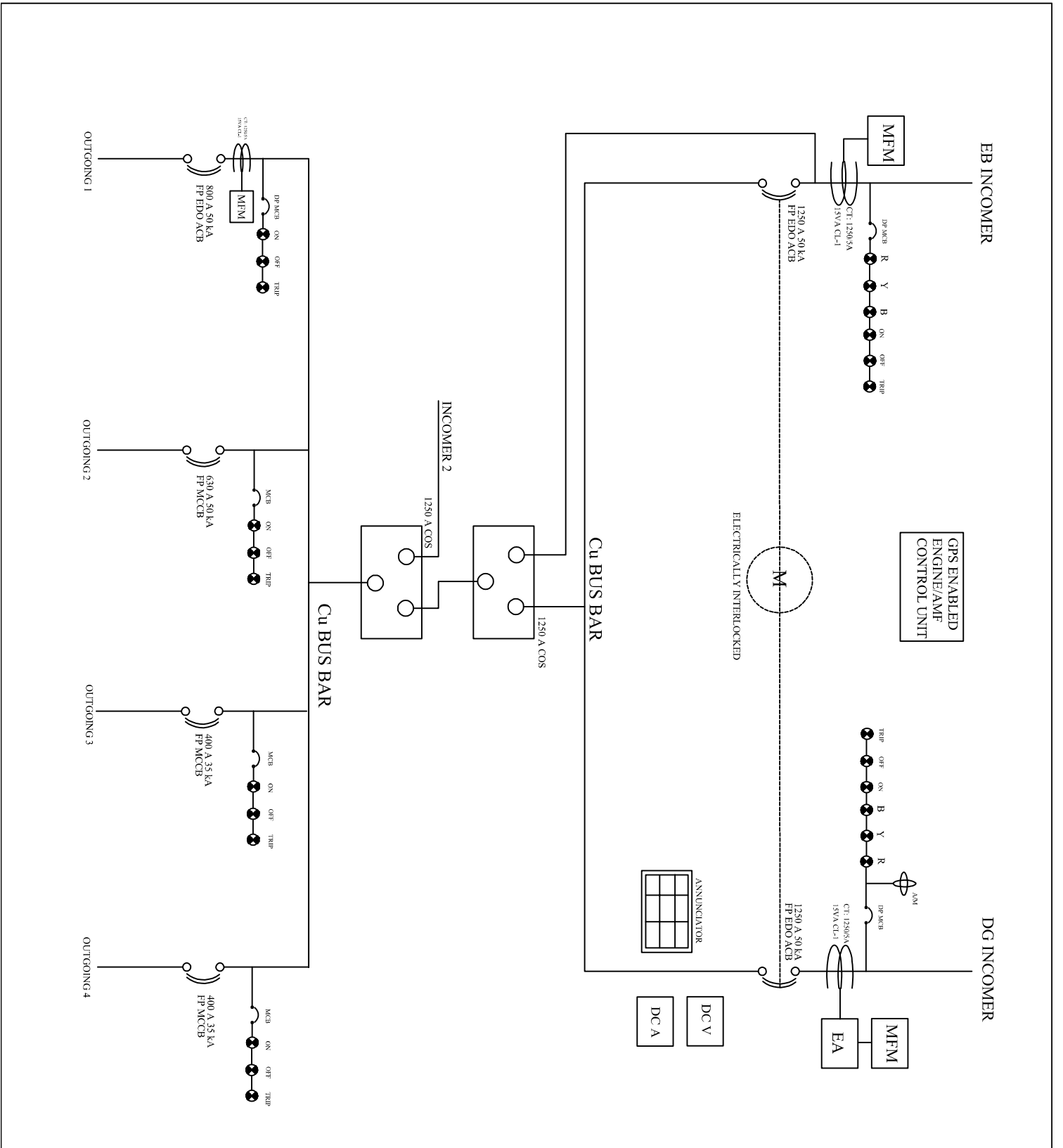
b. **Pre-dispatch Inspection and Testing of DG sets:** All functional testing including 110% overload testing shall necessarily be carried out at factory/ manufacturer premises in presence of a representative of the Department.

For testing, following procedure will be followed: All major items/equipment i.e. engine & alternator in assembled condition, associated electrical control panels, etc. shall be offered for inspection and testing at factory/ manufacturers works. The successful tenderer shall give notice of minimum of two weeks for carrying out such tests. The Engineer-in-charge/ or his authorized representative shall witness such inspection & testing at the mutually agreed date.

Warranty:

- **2 years comprehensive warranty and 3 years comprehensive AMC after warranty period.**
- On-site comprehensive warranty will be effective from the date of successful installation and commissioning. Any defects found in the product/sub-product within the warranty period of 2 years shall be rectified/ replaced by the vendor free of cost. During this period of warranty, servicing at the quarterly interval or earlier without any additional cost besides attending to call back services in case of break down shall be carried out free-of-cost. This includes replacement of parts and spare parts and any number of break down call.
- The comprehensive maintenance shall be carried out primarily at the premises of NITK on all working days during office hours or even beyond office hours or on holidays depending upon exigency of work as and when so required. In case, the service provider feels that the equipment cannot be repaired at site, they will carry and deliver the equipment at their own cost and get it repaired within 24 hours, failing which replacement shall be provided, the firm shall maintain proper service call sheets which will be duly signed by the Engineer and the concerned official of the department.
- The agency shall ensure that the equipment is retained in its original or higher configuration and form. In the event of any downward alteration to the equipment by the agency or any attachment made thereto, the agency shall pay for any repair/replacement and adjustments required to restore the equipment to its original state. The faulty equipment parts replaced must be new and equivalent in performance of existing parts.
- It shall be ensured that all the equipment is operational under the controlled power supply and all defective equipment if any shall be rectified/replaced without any additional cost to the NITK. The vendor will not raise any condition with regard to the working environments including voltage, earthing, etc. for equipment covered under WARRANTY.





Additional Mandatory Requirements:

1. General warranty is for two years, which is the minimum.
2. Comprehensive AMC for three years after warranty period. L1 will be calculated considering CAMC period. Payment for CAMC will be done after the 2 years Warranty period on yearly basis in advance.
3. Any breakdown/service issue is to be sorted out within 72 hours. In case of delay beyond 72 hours, warranty period will be proportionally extended.
4. Companies have to ensure equipment lands at NITK.

Please note the following changes to submission of bid document.

- Last date for Bid submission: **15/09/2022 on or before 11.00 a.m.**
- Bid opening date: **16/09/2022 at 11.00 a.m.**

**Sd/-
Buyer
(DR. P. Parthiban)**

**Sd/-
Chairman
Central Research Facility
NITK, Surathkal**