

RAIL COACH FACTORY, KAPURTHALA		
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Mech/M&P/3500/GM/27 Rev.- NIL	Diesel Generator Set for Precision AC with Civil Work	

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Issue/ Rev	Changes	Date

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1.0 IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

- 1.1 Bidders are required to give clause wise comments on the technical specifications, confirming compliance/non-compliance with details of deviations if any along with their effect on the performance. Back references to be avoided, offers are likely to be ignored in case of non-compliance of these instructions for furnishing the information.
- 1.2 Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with international (CE/ISO/DIN/JIS)/National standards (IS) (wherever applicable).
- 1.3 Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion indicated in the offer.
- 1.4 Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.
- 1.5 In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.
- 1.6 The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer.
- 1.7 In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.
- 1.8 The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final.
- 1.9 Purchaser reserves the right to verify the details submitted by the bidder by actual site visits.
- 1.10 Tenderer not submitting the requisite information may note that his offer is liable to be ignored.
- 1.11 Other terms & condition of the contract will be as per Indian Railway Standard conditions of contract.
- 1.12 The layout drawing of the Location has been provided with the specification (*Annexure-C*) along with Route of LT Cable (*Annexure-D*) and the acquaintance to both before submission of bid shall be the responsibility of the supplier.

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2.0 PURPOSE

One no. Diesel Generating set (Outdoor Silent type) is required to ensure uninterrupted power supply to IT Center at Rail Coach Factory, during power failure, necessitating AMF(Automatic Main Failure) type control panel for auto change over. The DG set should be suitably housed in a canopy/enclosure and should be able to function in harsh Indian climatic condition.

3.0 DESCRIPTION AND SCOPE OF SUPPLY

3.1 The scope of supply covers design, manufacture, supply, installation and commissioning (including civil works) of Diesel Generating Set as per below specifications and major parameters given in the Schedule-I on turnkey basis.

3.2 The DG set shall include the following equipments

- a) Diesel Engine
- b) Alternator
- c) Acoustic enclosure
- d) AMF Control Panel
- e) Engine Control Panel
- f) Electronic AVR
- g) Day Tank with fuel piping for fuel storage.
- h) Battery and Battery Charger
- i) Exhaust gas system complete.
- j) Concomitant essential accessories.
- k) Any other accessories as required for successful functioning of DG Set.

3.3 The DG Set supplied/installed should be complete in all respect with cables, protections, panels, indications and accessories etc. which the manufacturer considers essential to make the equipment fully functional when installed and put into operation.

3.4 Other concomitant accessories/ equipment which the manufacturer considers essential to make the machine fully operational when installed and commissioned with requirement of utilities, etc if any, should be clearly indicated by tenderer in the offer.

3.5 The total value of the offer will be calculated on.

- i. The cost of the basic machine.
- ii. Cost of the concomitant accessories according to tenderer specification.
- iii. Cost of any other accessory treated as concomitant accessory.
- iv. Cost of Turnkey Charges viz. foundation, installation & commissioning etc.
- v. Application duties and taxes, insurance, and freight etc.

3.6 Technical experts of the manufacturer during commissioning of machine will fully and adequately train the operators/ maintenance staff nominated by the consignee including repairs of electronic gadgets, sub-assemblies and Printed Circuit Boards up to component level.

3.7 ELIGIBILITY CRITERIA

3.8 The tenderer shall have established quality control system and organization to ensure adequate control at all stages of the manufacturing process.

3.9 The tenderer shall provide a performance statement giving a list of major supplies of same/similar equipments in last 5 years to railways giving details of the order no. and date and the quantity supplied and whether the supply was made within the delivery schedule. Such period shall be reckoned from the date of opening of tender. Tenderer should also provide the prove out test certificate of his supply/supplies. All above documents shall be uploaded along with the offer.

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- 3.10 Only OEM of equipment or their authorized dealers can only participate in the tender.
- 3.11 The firm shall provide the calibration certificate of National / International Traceability along with validity of at least two years. (For Measuring/Testing machines and Digital/IOT based Tools)

4.0 GENERAL FEATURES

- 4.1 The DG Set shall be suitable particularly for heavy-duty industrial work.
- 4.2 Suitable industry standard for safety of the operator and maintenance personnel should be built in into the design.
- 4.3 The DG Set design shall be such that it requires minimum maintenance and gives trouble free service.
- 4.4 All assemblies/parts of the DG Set shall be easily accessible for maintenance.
- 4.5 It shall be capable of working in normal Indian Railways workshop environment with maximum ambient temperature up to 50°C and maximum relative humidity up to 98%.

5.0 SPECIFIC CHARACTERISTIC:

- 5.1 Supply, testing, installation and commissioning of 01 no. 62.5 KVA, 415 V, 3 phase, AC Diesel Generator on turnkey basis covers the followings:
- 5.2 The work involves supply, installations, testing, commissioning and proving of 01 No. 62.5 KVA, 415 Volt, 3 phase DG sets and accessories with acoustic enclosure, Engine control panel, AMF control panel, etc.
- 5.3 Supply and erection of exhaust gas system complete with thermal insulation to comply the norms of CPCB/Local Pollution Control Board/authority in respect to air Pollution, complete in all respect.
- 5.4 The work will involve on turnkey basis including designing and construction of foundations by the firm. Fixing of fuel piping, exhaust gas system and the connected civil engineering works involved during the erection i.e., breaking of walls, providing opening for exhaust piping, breaking of flooring, digging of trenches, cabling with finishing touch etc. and restoring it to original condition will be the responsibility of firm. The work will also involve construction of 4 nos. earth pits for DG Set and connection with DG Set and panel with Copper Plates Size **600 mm x 600 mm x not less than 3.15 mm** as per IS 3043. Earth Pits will be at a distance of about 10 to 15 mtrs from DG Set and controls panel and minimum depth of 5.5 mtrs. And copper strip having size 35 mm x 6mm from earth plate to earth pit chamber as per IS:3043 (latest) and 35 mm x 6mm from earth pit chamber to the DG Set for body earthing of DG Set , AMF panel and neutral earthing
- 5.5 The supply, laying and connection of cables between DG Set and Engine control panel, AMF control panel, etc. will be within the scope of work of supplier keeping in purview the drawings attached as *Annexure- C and Annexure-D*.
- 5.6 Arrangement of all manpower including material and facilities required for installation, testing and commissioning of DG set shall have to be arranged by the firm including unloading of DG set and placement at site.
- 5.7 The DG set shall conform to ISO 8528 and when fully installed and commissioned shall be completely functional and deliver rated output as per conditions mentioned under Schedule-I. The Parameters of the DG Set as per Annexure "A" to Schedule-I duly filled in shall be submitted as part of the offer.
- 5.8 The DG sets shall be capable of continuous working under following ambient condition:-
- Altitude of RCF/KXH.
 - Maximum temperature of air 50°C at air intake.
 - Average relative humidity 98%.

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5.9 The DG set shall include –

- (i) Diesel Engine
- (ii) Fly wheel with starter ring
- (iii) Alternator
- (iv) Mechanical Governor
- (v) Exhaust silencer
- (vi) Fuel filters and lube oil filters
- (vii) 12 V system with starter and 12 V/ 90 Ah Batteries for electrical start arrangement
- (viii) Hour Meter
- (ix) Engine control panel consisting of ON/OFF/ START Key, lube oil pressure gauge, ammeter, Water temp indicators etc.
- (x) Radiator water cooled.
- (xi) Dynamo / Battery Charging Alternator.
- (xii) Base frame for Mounting Engine and alternator.
- (xiii) Day tank for HSD oil and its piping.
- (xiv) Scope also includes required clearances and approvals from all statutory bodies.

5.10 For details of the site, firm may visit the RCF/KXH on any working day from 10.00 hrs to 18.0 hrs.

5.11 **Anti Vibration Mounting and Base Frame:** Engine and alternator shall be mounted, coupled and aligned on a common channel iron fabricated Base Frame with pre-drilled holes. The mountings of the DG set shall be liberally designed with reputed make of anti vibration mounting pads.

5.12 **Cabling:** All cabling between the alternator and the control panel is included in the scope of vendor. Suitable cable entry adopter boxes are to be fabricated and fitted to the alternator. A control cable between all instrumentation and control panels is included in the scope of Vendor. Control cables shall be PVC insulated copper conductor multistrand of not less than 2.5 sq mm, with proper shielding as required. All power cabling between the alternator and AMF control panel is also included in the scope of Vendor.

5.13 **Battery and Battery Chargers:-** The battery shall be sealed maintenance free lead acid type, heavy-duty motive power/traction, sufficient for three consecutive starts without recharging. Battery shall be supplied with suitable structural steel stand with wooden base and rubber-mat. Battery charger shall have boost and trickles charging features with built in voltage Regulators. Battery charger shall be suitable for operation on 230V AC, 50Hz supply with voltage variation of + / - 10% Ripple content of the charger DC outlet shall be limited to +/- 2%. Battery shall be conforming to relevant IS. Battery charger with suitable auto manual selection shall be provided for charging battery from mains when DG is not running. Suitable capacity dynamo shall be provided for charging the batteries when DG is in operation. A separate voltmeter and ammeter shall be provided for monitoring battery voltage and current.

6.0 TECHNICAL REQUIREMENTS

6.1 DIESEL ENGINE

6.1.1 The diesel engine shall be of indoor type, multi cylinder, 4 stroke cycle, radiator water cooled, totally enclosed, prime duty, direct fuel injection, turbo charged compression ignition, complete with its self-contained lubricating system, electric battery start, directly coupled to alternator, mounted on a common base frame through flexible coupling. The engine shall be suitable for 10% overload for one hour in every 12 hours continuous running. The diesel engine shall be of suitable capacity and rating as per ISO:8528 and shall be capable of delivering prime power as per ISO:8528 at ISO reference conditions.

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- 6.1.2 The lube oil system shall be provided with engine driven lube oil pump.
- 6.1.3 Engine and alternator shall be mounted on MS base frame structure. The base frame shall be given antirust treatment and shall be painted with one coat of primer and two coats of heat resistant paint. Engine and alternator alignment shall be ensured as per relevant standards.
- 6.1.4 Anti vibration mounts shall be provided with proper spacing such that the static and dynamic load of DG Set is uniformly distributed on the foundation.
- 6.1.5 The engine shall be radiator water cooled. Supply and installation of all items associated with engine cooling system shall be in the scope of Vendor.
- 6.1.6 Engine control panel (Engine Instrumentation Panel) comprising of following:-
- Lubricating Oil pressure gauge:
 - Battery Volt Meter.
 - Coolant Water temperature gauge.
 - Battery Charging Ammeter.
 - Electronic hour meter.
 - RPM indicator.
 - ON/OFF REMOTE start key.
- 6.1.7 Safety Equipment for engine:-
- Over speed tripping cum indication
 - Low lube oil pressure trip cum indication.
 - High water temp. trip cum indication.
 - Fuel level indication.
- 6.1.8 Engine Speed Governor: Engine shall be supplied with inbuilt Mechanical governor to maintain engine speeds within the rated speed under varying load conditions.
- 6.1.9 It shall have a fuel tank with capacity for minimum 12 hours continuous running at full load. The Capacity offered shall be specified in the offer.
- 6.1.10 Lead Acid, semi maintenance free or sealed maintenance free battery of suitable ratings with connecting cables and the battery/ies shall conform to relevant IS specification. The batteries of only following make shall be accepted: Exide, TUDOR, Amco, Amar Raja, Tata Green, Cummins Pulse Lite, Standard Furukawa and Prestolite.
- 6.1.11 Make of Diesel Engines: M/s Ashok Leyland, M/s Kirloskar, M/s Cummins, M/s Mahindra, M/s Greaves & M/s Escorts.
- 6.1.12 All standard accessories and piping between fuel tank and diesel engine with MS clamp etc & suitable for mounting on floor with mounting pedestals or as per manufacturers design will be scope of supply.

6.2 ALTERNATOR:

- 6.2.1 The alternator shall be suitable for 62.5 KVA, 415 Volt, 3 Phase, 4 wire, 50HZ AC system, working at 1200 to 1600 r.p.m., 0.8 lagging Power Factor, Self ventilated, Screen protected and drip proof, Salient pole, Brush less and Revolving field type, Self excited and Self regulating type and shall conform to IS: 4722/IEC: 34 or BS: 5000. It shall be directly coupled with engine by means of flexible coupling.
- 6.2.2 The alternator shall be provided with Automatic Voltage Regulator (AVR) and can deliver rated output at the conditions mentioned in schedule-I.
- 6.2.3 Voltage Regulation: VG3 or better.
- 6.2.4 Enclosure: IP-23 or better
- 6.2.5 Insulation: Class "H"
- 6.2.6 Efficiency at rated power $\geq 90\%$.
- 6.2.7 Permissible over load: 10% for one hour in 12 hours of duration.

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- 6.2.8 The main alternator winding and exciter winding shall be Class H insulated. The enclosure is drip proof and screen protected IP-23. The exciter shall be capable of forcing the field for 3 seconds in the event of short circuit fault at generator terminal.
- 6.2.9 It shall have in built protection for over voltage and rate of rise of voltage. All parameters shall be conforming to ISO 8528.
- 6.2.10 Some of load fed by the alternator are non-linear industrial loads with heavy harmonics. Alternator shall be capable of handling these loads safely without any change in performance.

6.3 AMF CONTROL PANEL:

- 6.3.1 The AMF control panel shall be made of 2.0 mm thick CRCA sheet steel and shall be indoor type, floor mounted, dust and vermin proof. The panel shall have doors at the front and back for proper maintenance with suitable lock and key arrangement. The panel shall have steel channel fabricated thick –plate and bolted type cable gland plate fitted at the bottom. All the joints shall have proper gaskets. Panel for DG Set shall be modular type independent panel. Control supply wiring from DG Panel to AMF Control Panel shall be done by Firm.
- 6.3.2 The panel shall comprise of
- 4 Pole MCCB and Power Contactor of 125 Ampere, 415 volt, 3 phase- 02 nos. (Alternator and Mains)
 - Combined meter for measuring Voltage, Frequency and KWh.
 - Analogue/Digital Ammeters with selector switch.
 - DC Ammeter and Voltmeter.
 - Battery Charger.
 - Indication lamps/ Selector switches for Voltmeter and ammeter (DC and AC).
 - Hour meter.
 - Auxiliary relay for monitoring engine parameters and to generate alarm trip signal.
 - Potential free contacts for remote indication of Alarm / trip conditions.
 - Provision for Engine start / stop from remote location.
 - All control circuits shall be controlled through a separate MCB.
 - AMF Control System for auto start/stop.
 - The temperature indicator for Alternator winding/bearing shall be through RTD.
 - Protection system also includes over voltage, under voltage, earth fault & short ckt. through protection relay on the AMF Panel.
 - The control panel will have aluminum bus-bar not less than 125 Amp rating for power circuit

* During normal supply

Mains in working order i.e in closed position through AMF panel. Mains incomer point connected with normal supply from sub-station.

When main supply fails

Mains switched off through AMF panel, after switching off, DG set start automatically. Close the Alternator (DG Set) after particular set delay time, load shifting to DG supply.

When main supply restores

DG Set Alternator switched off through AMF panel and after switching off Alternator, Mains switched on through AMF Panel.

The DG set stops as per set time by the company.

- 6.3.3 The AMF operation shall automatically start normally within 10 seconds after interruption of mains supply. Also DG set shall automatically stop within 3 minutes after changeover from DG set to main supply. However, it should positively start within 3 attempts hence starting

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time should not exceed 30-40 seconds in normal condition. The AMF panel shall also be capable of starting DG set in the event of voltage below the specified values. The AMF panel shall include the following:-

- i) Status indicating load on mains, load on DG set and DG set failed to start.
- ii) DC control relay and timer for start/stop/three attempt start feature
- iii) Voltage Sensing Unit with Time Relay:
AMF panel shall be provided with this sensing unit with adjustable settings, which should ensure that AMF does not come into operation in the event of voltage variation of limited duration.
- iv) Provision should be made to operate the DG sets both in auto mode and manual mode.
- v) Battery charger working on mains supply.
- vi) Drawing of AMF panel shall be approved from RCF before manufacturing of AMF panel.

6.4 ACOUSTIC ENCLOSURE

- 6.4.1 DG sets shall be provided with integrated acoustic enclosure which shall conform to latest norms of Central Pollution Control Board (CPCB).
- 6.4.2 Acoustic enclosure (canopy) shall be made from CRCA sheet using CNC Machines for precision fit and finish powder coated.
- 6.4.3 The acoustic enclosure offered shall conform to the type approved by Govt. lab, for conformity to noise norms of 75dBA @ 1 meter distance. This aspect shall also be verified at the time of inspection.
- 6.4.4 DG set shall meet the requirements of latest applicable environmental (protection) rules 1986 as laid down by Ministry of Environment & Forests in respect of noise and emission norms. DG set shall also meet all other statutory requirements as notified by Government from time to time.
- 6.4.5 The following test certificates shall be submitted at the time of pre-despatch inspection:
 - a) Type approval certificate (TAC) for emission norms for each model/family of engine
 - b) TAC from for noise level norms EACH Model of DG set.
 - c) COP for EACH node 1 of DG set and engine used in DG set.
- 6.4.6 Firms shall furnish valid BIS license for all engines models upto 19 W rating at the time of registration and inspection.
- 6.4.7 Tenderers shall furnish list of authorized service centers throughout the country with complete address, phone number fax & email etc.
- 6.4.8 DG set manufacturer shall provide a list of Inventories being supplied with the DG sets, to enable the continents to verify then, at the time of delivery. The inventory list shall be attached alongwith the Inspection Notes

7.0 CONCOMITANT ACCESSORIES

- 7.1 DG Set will be supplied with following accessories in addition to the standard fittings and accessories. The cost of each listed concomitant accessory should be quoted separately. Wherever for any reason the cost of any concomitant accessory is included in the basic price of the DG set, the same should be specifically mentioned.
 - i) 4 Pole MCCB and Power Contactor of 125 Ampere, 415 volt, 3 phase- 02 nos. each (Alternator and Mains) for AMF panel
 - ii) 200 meters XLPE armoured, 4 Core Aluminium Conductor 95 sq mm cable, with terminations, conforming to IS: 7098 Pt- I - 01Set.
- 7.2 Any other accessory/ equipment, which the manufacturer considers essential to make the DG Sets fully operational, when installed and commissioned

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- 7.3 The tenderer shall supply a list of concomitant accessories, which will be supplied along with the machine. The cost of each listed concomitant accessory should be quoted separately. Wherever for any reason the cost of any concomitant accessory is included in the basic price of the machine the same should be specifically mentioned.
- 7.4 Any other accessory, which in the opinion of the tenderer can contribute to higher performance, should be indicated and quoted separately.
- 7.5 A maintenance tool kit containing hand tools is required to cover all the fasteners of all sub-assemblies of the equipment.
- 7.6 First fill of lube oil and all filters shall be provided by the supplier. The seller shall also provide 50 litres of Diesel for DG set.
- 7.7 The supplier shall provide consumables for the trial run of DG set. The trial run of the DG set shall be conducted with the available electrical load at site. The available electrical load shall be less than or equal to the rated capacity of the DG set.

8.0 SPARES & CONSUMABLES

- 8.1 Since the machine will be under comprehensive preventive maintenance during warranty period of two (02) years, it is the sole responsibility of bidders to stock such spares as required for smoother execution of PMC during warranty in order to achieve response time in compliance to machine availability as per stipulated requirements.
- 8.2 Tenderers shall indicate the list of spares required for maintenance of the machine beyond warranty period. Current cost of such spares and current service charges for the items of work of repair of machine shall also be indicated.
- 8.3 The list of consumable spares shall be furnished and quoted along with their unit rate.
- 8.4 Consumables shall be supplied along with the machine or as per agreed time table, if ordered.

9.0 OPTIONAL ACCESSORIES

Any other accessory, which is in the opinion of the tenderer can contribute to higher production rates, should be indicated and quoted separately mentioning prices of each accessory.

10.0 INSPECTION OF EQUIPMENT & TESTING AT MANUFACTURERS WORKS

- 10.1 The machine shall be inspected and tested during different stages of its manufacture starting from raw material till the completion of machine, by the purchaser or his authorized representative at the supplier's or his sub-supplier's works. The Quality Assurance Programme shall be submitted along with the bid.
- 10.2 The DG Set shall be tested at manufacturer's work complete with acoustic enclosure which is integrated part of the DG Set. Rigidity of the machine shall be demonstrated to the satisfaction of appointed inspector or inspecting agency.
- 10.3 Manufacturers must have suitable facilities at their works for carrying out various performance tests on the sub-assembly/assembly/machine. The tenderer shall clearly confirm that all facilities exist and shall be made available to the inspecting authority.
- 10.4 **A Sample Inspection Chart for inspecting the equipment shall be supplied along with the bid. The inspection chart should indicate all the tests that are carried out during the machine manufacture and also the tests to be offered to inspecting agency. The standard to which this inspection chart conforms should be clearly indicated. Against each test, acceptable limit/ range of values shall be indicated.**

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The Railway will depute authorized representatives for witnessing the testing of Diesel Generating Set at Manufacturer's works on receipt of the inspection call from the Contractor/Supplier.

The following performance tests necessarily shall be carried out in DG set and it shall be witnessed by Railway representative at firm's premises:-

10.4.1 NO LOAD TEST:-

No Load Run test shall be carried out on DG set on prevailed ambient condition available at the place of test. Firm will also provide the performance certificates issued by original manufacturer of Diesel Engine as well as of Alternator to the inspecting officials

10.4.2 FUEL CONSUMPTION TEST OF DIESEL GENERATOR SET:-

The Diesel Generating Set shall run at full rated load (in KW) continuously for one hour. This shall be followed by 1-hour fuel consumption test as described. "The alternator shall be loaded with rated load in KW. The fuel consumed during the test shall be measured in grams and the generated electrical unit shall be measured in KWH. The ratio of both shall be calculated and compared with declared value."

10.4.3 TESTS ON AMF CONTROL PANEL:-

Insulation resistance test,
High voltage withstand test,
Functional and operation test,
Secondary injection test on meters and relays.

10.5 Following test certificates from original manufacturer will be provided by the tenderer to the authorized representative of Railways:-

10.5.1 ALTERNATOR:-

Insulation measurement,
High voltage test on rotor and stator winding,
Temperature rise test,
Mechanical balance,
Stator voltage balance,
Over speed,
Stator phase sequence check,
Vibration & noise level,
Stator & rotor winding resistance,
Measurement and
Overload capability test

10.5.2 TEST ON EXCITATION SYSTEM

High voltage test on windings,
Measurement of stator & rotor resistance,
Response ratio test,
Open circuit magnetization test, and
Mechanical balance test.

Manufacturer must have suitable facilities at their works for carrying out various performance tests on the plant. The tenderer should clearly confirm that all the facilities exist and shall be made available to the inspecting authority.

10.5.3 TEST CERTIFICATE ON EMISSION

Test Certificate on Emission limit of 62.5 KVA Diesel Generating Set as per environment (protection) third amendment rules, 2002 or latest Central Pollution Control Board/ Punjab Pollution Control Board (CPCB/PPCB) norms to be provided by the firm to the inspecting agency. DG sets shall meet the requirements of Environmental (Protection) Rules 1986 as

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laid down by Ministry of Environment & Forests (MoEF) read with GSR-371(E), GSR-520(E) dated 07.07.2003, No. 448(E) dated 12.07.2004, GSR-771(E) dated 11.12.2013, GSR 323(E) dated 31.03.2014, Gazette Notification No. 167 dated 31.03.2014 and 578 dated 11.11.2014 in respect of noise and emission norms. The latest amendments to above GSRs shall be applicable as and when amended by Ministry of Environment & Forests (MoEF). Firm shall comply Emission Standards for Diesel Engine for Generator Set applications and obtain statutory approvals from Pollution Control Authority/Authorities.

Note: The tenderer shall provide free of cost all consumable items like diesel, mobile oil, grease, water electricity, cotton waste etc. for testing of DG set at firm's premises. Operation of all safety devices and overall operations of electrical systems are to be tested at firm's premises for satisfactory performance.

10.6 SITE TEST AFTER INSTALLATION:-

Full Load Test:- Full Load Test shall be carried out on prevailed ambient condition available at the place of test. The DG set shall be gradually loaded from no load to 25% of rated power, 75% of rated power and then 100% of rated power. For each such partial rating, after stabilization of load, DG set shall run for that rating at least for ½ hour. This shall be followed by load running of DG set for 100% rating for 7 hrs. and followed by one hour run at 10% overload. AMF feature with auto synchronization and auto load sharing shall be tested at above mentioned different loads. The Railway will provide required load and free of cost all consumable items like diesel, mobile oil, grease, water, electricity, cotton waste etc. for testing the DG set.

11.0 FOUNDATION & RELATED DRAWINGS

11.1 Foundation shall be of PCC type with the ratio of 4:2:1. The length and breadth of the foundation shall be 300 mm more from the respective length and breadth of the DG set. The height of foundation shall be 400mm i.e. 200 mm below and 200 mm above the ground level. The foundation work shall be done by the seller.

11.2 SUBMISSION OF GA, FOUNDATION & RELATED DRAWINGS FOR APPROVAL

For each machine, the supplier shall first submit 01 copy of foundation drawings with details of construction of foundations, complete layout of machine elements and other related diagrams (Mechanical, Electrical & Electronics) along with machine weight, overall dimensions, electrical load with length of 3 phase, 415 V AC electric power cable for approval as per time schedule specified in Annexure-I to consignee for approval and to enable the consignee for making necessary arrangements for Installation & Commissioning of Machine on receipt. After getting approval from consignee, the supplier shall supply directly to consignee 6 copies of approved GA foundation drawings and related diagrams for each machine. as per time schedule specified in Annexure-I from the date of approval of GA drawing for information only. This information should be furnished on the pattern indicated in detail in the following IS Specifications (Latest) or relevant international standards

- i) IS: 2974 (Pt.I Para 4.1) for reciprocating type machine.
- ii) IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency).
- iii) IS: 2974 (Pt.IV para 4.1) for rotary type machines of low frequency.
- iv) IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers

11.3 APPROVAL OF GA DRAWING:

To be governed by Time Schedule in Annexure-I and following Stipulations.

11.3.1 General Arrangement Drawings will be sent by the 'Contractor' to the Consignee as per Time Schedule. The 'Contractor' should ensure that drawings sent to consignee are complete in all respects as specified in technical specification. The GA drawings shall be approved by the consignee and given back to the contractor.

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- 11.3.2 Delays in submission of drawings by Contractor will be added to the delay in supply of machine in case submission of GA drawing is delayed beyond stipulated time as per time schedule and LD will be levied as per IRS condition of contract. Thus the number of days delay in submission of GA drawing plus the number of days delay in supply of machine together will be taken as the delay in supply of machine for the purpose of calculations of LD. However if the contractor supply the machine before original delivery period as per PO the number of days by which machine has been supplied earlier than original delivery period that many days will be subtracted from the delay in submission of GA drawings and LD will be levied accordingly. Delays in approval of the drawings by consignee will not be on account of Contractor, except as detailed below.
- 11.3.3 In case Consignee finds some deficiencies in the Drawings and returns the same for rectification to the 'Contractor', the contractor must return the rectified drawings within 30 days from the date of issue of letter by Consignee. This period will not be counted towards LD calculation. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarifications to the firm together at one time only Instead of piecemeal multiple references.
- 11.3.4 A repeat back reference(s) by Consignee to Contractor pointing out further defects/deficiencies in the Drawings, will be considered a delay on account of the contractor, except for special circumstances like change in location, review of arrangement etc. Thus, Contractors must take utmost care in ensuring completeness as per requirements of the Consignee.
- 11.3.5 If an order has been placed on the firm, the firm will have to advise the consignee well in advance regarding requirement of road permit and assistance required from the consignee, if any, so that delay on this account is avoided. Firm should also visit the site before dispatch of machine to assess the condition of path to be used for movement of trailer.

12.0 INSTALLATION, COMMISSIONING AND PROVING TESTS: (ON TURNKEY BASIS)

- 12.1 **Joint Check** – The contractor or his agent would be required to carry out a joint check at consignee's end, along with the consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint receipt inspection be done immediately on receipt of the machine by consignee & bidder's representative to avoid commissioning delays due to shortages/transit damages. After receipt of the machine as above a Joint Receipt Inspection note (JRI) shall be prepared by the consignee and the firm's representative indicating the tentative time schedule for various activities of installation and commissioning.

13.0 RESPONSIBILITIES OF CONSIGNEE AND BIDDER:-

- 13.1 The consignee shall be responsible for:-
- Provision of a clear covered (except where shed is in the scope of contract) site for construction of foundation as per the schedule to ensure its readiness before arrival of machine at site.
 - In case where construction of shed is also in the scope of contractor the consignee shall ensure site is encroachment & encumbrance free.
 - Electricity, water and compressed air for installation and commissioning of machine shall be provided free of cost.
 - Wherever a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site has to be provided.
 - Clear covered space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc.
- 13.2 The bidder shall be responsible for:-

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- i) Design of foundation as well as flooring (if required) of sufficient thickness, suiting local soil conditions at the site.
 - ii) Advise consignee in time regarding schedule for requirement of clear site for Construction of foundation and other infrastructure, resources & facilities required.
 - iii) Construction of foundation as well as flooring (if required) of sufficient thickness suiting local soil conditions, for machine shall be completed by the bidder at the site provided by the consignee before receipt of the machine at their premises.
 - iv) Provision of all tools and equipment, technical and unskilled manpower, material handling accessories/ equipment and material for installation and commissioning.
 - v) Unloading of the machine on receipt (both imported and indigenous machine) and its movement to the site of installation including provision of road mobile crane.
 - vi) The bidder should ensure the proper earthing for the machine and its peripherals/accessories.
 - vii) In addition to above construction of new foundation for DG set & LT panel will be also in the scope of supplier as per approved drawing.
 - viii) 200m LT Cable should be supplied and laid in the soft, pucca soil through bocky/ 1000 mm deep and 400 mm wide trench for 01 cable and cable to be surrounded with a layer of sand and bricks on the cable for protection as per recommended IS, refilling the trench, ramming and bring the original shape of the surface, Testing and commissioning of the same cable by providing required heat shrinkable joint, annotation and gland etc. Cable on the floor should be fixed with suitable type of clamp at 1m apart
 - ix) **STATUTORY CLEARANCES:** The Bidder will be responsible for the statutory clearances from the electrical inspector, factory inspector, pollution control board, regulatory authority, and any other statutory agency appointed for the purpose by the state / central / municipal bodies. The documents / drawings required for obtaining the approval shall be prepared by the bidder.
 - x) **ENERGY CONSERVATION APPLICATIONS:** Please furnish the various methods that have been adopted in the engine, alternator and fuel systems to produce maximum energy per liter of diesel consumed with statistical data's. Bidder shall furnish the preventive maintenance schedule plan for the set to analyse operational expenditure.
- 13.3 Consignee will provide only 415 V+10%-20%, 3 phase 50 Hz+3% AC supply at a single point (mains). All types of cables, connections, circuit breakers etc. required for connecting power supply point to different parts of the machine/control cabinets, shall be the responsibility of the bidder. Requirement of grounding/earthing with required material shall also be incorporated by the bidder during construction of foundation. Electrical work like laying of power/electrical cables & earthing wires from mains to machine control panel (upto 20 meters) as well as within the machine, with supply of all materials shall also be carried out by the supplier.
- 13.4 The supplier shall demonstrate machine performance for successful commissioning at the consignee's works. The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested and meets with the specified capabilities/functions according to the technical specifications. A Joint Commissioning Note (JCN) to this effect shall be made. After issue of JCN the performance shall be watched for a period of one month, after which the PTC shall be issued. If some minor breakdowns are noticed after the issue of JCN, these shall be attended as per warranty obligations and suitable extension of the warranty period.
- 13.5 If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee for the cost of the machine would have to be submitted.

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The bank guarantee should be of adequate value so as to cover the cost of the assembly/sub-assembly/paid up cost of the machine.

14.0 SITE REGULATIONS FOR INSTALLATION WORK:-

Site discipline shall be observed by all the Bidders / erection contractors personnel inside the premises of the site. The contractor and his personnel shall abide by all the rules and regulations laid down by the CONSIGNEE. The contractor shall be required to carry out the installation work simultaneously with other installation work being executed by other contractors and shall extend all co-operation required. Electrical Power required for construction, installation and commissioning of DG shall be provided by the CONSIGNEE at one point near meter location. The Bidder shall have his own cabling and switch gear for power distribution to his work place. Cabling and switch gear arrangement shall be provided in accordance with rules and regulation duly approved by the Railways. RAILWAYS will not be responsible for any damages / compensation payable in case of any accident / injuries to any of the contractor's personnel. In case of any accident at site in connection with the execution of work contractor shall report the accident within 24 hours to the CONSIGNEE. All transports of material to and from site shall be marked clearly and visibly and shall be accompanied by appropriate documents.

15.0 TECHNICAL LITERATURE

15.1 One copy of the printed illustrative catalogue showing technical features of the machine and its elements must be enclosed with each copy of the bid.

15.2 The successful tenderer will have to furnish, for each machine 4 copies of spare parts catalogue giving the part list number of each component with exploded views and assembly drawings of major assemblies, maintenance manual, trouble shooting guide, operational manual of the machine and all electrical circuit diagrams to the consignee directly within 3 months of the placement of order. The bidders should provide a list of literature, they will supply along with the machine. The technical literature shall be provided for complete machine including imported and indigenously purchased components/sub-assemblies.

16.0 SPECIAL FEATURES

Special features incorporated in the equipment, if any, shall be indicated separately by the tenderer, clearly indicating advantages of the features.

17.0 MAKE

17.1 The supplier shall clearly mention whether the system quoted is Indian make or imported. If Indian make, the tender should be accompanied by duly sanctioned factory license & relevant documents & also produce records of installation & satisfactory aftersales service performance of their equipment from at least one govt. Institution of similar or large size for duration at least 3 Years duration.

17.2 If imported item, the OEM firm should be registered for operations in India for a minimum period of last 3 years. In case this is not so, the dealer should be authorised regional supplier & service provide for the late 3 years. He should also produce installation & satisfactory after sales service record of duration at least last 3 years from at least one govt. Institution for a system of similar or larger size. Further the tender should be accompanied by authorisation certificate from OEM.

17.3 The supplier shall furnish the complete details of Model No. Make & Manufacturer's details/ address, Country and authorization details of Dealership.

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18.0 DEVIATIONS:

The tenderer should clearly certify that the machine offered fully meets the specification various design features incorporated in the machine to fulfil different technical performance requirements should be fully explained in the offer. However, minor deviations from this specification, which do not affect or in any way interfere with the stipulated performance standards, or would result in improved safety/reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance.

19.0 SERVICING FACILITIES

- 19.1 Service facility in Punjab, Address and contract details including phone and fax no. to be provided. The facility should have the necessary equipments recommended by the manufacture to carry out preventive maintenance test as per guideline provided in the service / maintenance manual. Firm should provide list of equipment available for providing calibrations and routine maintenance support as per manufacturer.
- 19.2 Supplier will undertake for service repairs & replacement of any needed part as & when needed.
- 19.3 Maintenance contract to be quoted after the expiry of maintenance period quoted above with details of scheduled visits, part covered under contract & cost of parts not covered as well.
- 19.4 The tenderer shall clearly spell out in the offer about the facility available with him or his agent/dealer for providing adequate after sales service in Punjab during warranty period.
- 19.5 The contractor shall give a comprehensive spare part list with OEM details and price for all the sub systems.
- 19.6 The tenderer/contractor shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period as per annexure A.
- 19.7 Tenderer shall provide expected life for the components of the system and provide the maintenance schedule required for 10years for as per Annexure - A
- 19.8 Total up time of the system should be at least 90%. Up time shall be counted in following manner:-
- 19.9 Total breakdown of less than 8 hours shall be ignored for the purpose of this calculation.
- 19.10 Penalty may be imposed if the down time is more than 10% without any valid reasons. The levy of token penalty as deemed fit based on the merit of the case may also be considered.
- 19.11 Tenderer shall provide the service charges /per day/per man for deputing service engineer on the machine on requirement separately for Indian and Foreign engineer.

20.0 WARRANTY

- 20.1 As per IRS conditions or as quoted by the tenderer whichever is later.
- 20.2 Warranty period for part or machine shall be extended after completion of warranty period by the duration under which the part or machine remains under breakdown during warranty.
- 20.3 Firm along with its offer shall provide separate sheet for Warranty period of different components of DG set including engine parts like crankshaft, cylinder head etc.
- 20.4 The following conditions regarding Maintenance and reliability shall also apply:-
 - i. The machine shall be designed for a life of 15 years with regular maintenance and all the structural members of the machine and the foundation shall be guaranteed for 15 years against cracks breakages and etc. during the course of normal operations. Tenderer would submit suitable undertaking.
 - ii. The warranty period would also cover comprehensive preventive maintenance, which will be inclusive of all spares, material and labour cost. All maintenance consumables like lubricants and grease except hydraulic oil / machine coolants shall form part of the scope

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- of the preventive maintenance during the warranty. The cost of preventive maintenance to be carried out during warranty period should be quoted separately.
- iii. The payment of preventive maintenance schedule carried out during warranty period shall be made by RCF annually at the end of each year after completion of the Work and issue of certificate by the consignee.
 - iv. The machine shall at all times give contractual out-put and accuracy. Any deficiency or break down for a total of 02 hr. or more for a day would be treated as failure for the day, for the purpose of extending warranty period.
 - v. The tenderer shall ensure that in case a failure is reported by a consignee qualified service engineers shall visit the site within two days from the date of complaint on calendar day's basis. The period of three days (excluding date of complaint) after the failure reported shall be treated as grace period, which will not count towards breakdown time for up to one failure per month and a maximum of 3 failures per quarter. In case the number of failure exceeds one failure per month or three during any quarter of warranty, grace period of only 1 day will be permissible for such additional failure. Complaints shall be lodged by consignee by fax phone, e-mail or per bearer at address given by the tenderer.
 - vi. The details of preventive maintenance to be provided during warranty period shall be indicated by the tenderer giving details of type of preventive schedule, periodicity on items to be checked, items to be replaced and expected plant down time. Preventive maintenance schedules shall be conducted on weekends as far as possible or any other day through mutual agreement with consignees. Total breakdown hours shall be calculated after discounting grace period and preventive maintenance period.

21.0 SCHEDULE OF ANNUAL MAINTENANCE CONTRACT (AMC) FOR PERIOD OF 5 YEARS AFTER COMPLETION OF WARRANTY PERIOD

- 21.1 Tenderer shall provide proposal for 5 year Annual Preventive Maintenance schedule to be executed after completion of warranty period in the format as per annexure-B.
- 21.2 The firm shall maintain the machine in good working condition during the contract period and shall correct the fault or failures, repair or replace the worn or defective parts/equipment during the normal working hours of shop where the equipment has been installed. Unserviceable parts/equipment need to be replaced at no extra cost with brand new parts/equivalent or superior specification.
- 21.3 The firm shall respond by deputing service personal to oral / telephonic/ or other modes of intimation for repair and maintenance of the said machines within 2 hours.
- 21.4 The firm shall ensure that the machine is in proper working condition, to the full capacity, after repair and maintenance.
- 21.5 To have a timely supply of spares during AMC, the contractor shall furnish a total list of spares which should contain list of spares that shall be arranged by the firm, both chargeable, duly mentioning the charge against each item, and spares which shall be non-chargeable, and list of spares to be held by RCF.
- 21.6 The contractor shall clearly list-out the list of consumables required for day-to-day operation of the machine. It shall be the scope of RCF to arrange the consumables once the completion certificate is issued for the retrofitted machine.
- 21.7 The tenderer/contractor shall provide suitable standby when repairs exceeds 2 hours. When any equipment is taken for repair to the tenderer/contractor's premises suitable standby equipment should be provided.
- 21.8 Besides attending the breakdown calls, the firm shall attend to the corrective and preventive maintenance of the machines once in a month.

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- 21.9 The AMC is valid for five years from the date of completion of the warranty period . No freight is admissible.
- 21.10 During the AMC period, whatever equipment is defective shall be handed over to RCF. During completion of the AMC period the machines should be handed over in full working condition to its full capacity.
- 21.11 The firm should maintain a register duly indicating the nature of defects and repair attended and got signed by RCF authority. Preventive maintenance schedule should be made. The schedule should be made in such a way that more than one machine should not be attended on the same day. A copy of the schedule should be given to RCF at the beginning of the AMC and the schedule should be strictly followed and on carrying out the preventive maintenance the same should be entered in the register and got signed by RCF authority.
- 21.12 AMC charges shall be paid quarterly as one quarter of the total AMC charges applicable for that year on submission of bills duly certified by the engineers in charge with regard to the satisfactory execution of AMC during the period for which the bill is claimed. Duties & taxes as applicable at the time of payment shall be deducted at source.

22.0 PAYMENT TERMS

90 % on receipt of machine and balance 10 % after successful commissioning of machine and also after submission of Bank guarantee equivalent to 10% of P.O value valid up to the warranty period of the machine

23.0 BOUGHT OUT ITEMS:

- 23.1 The bidder shall furnish along with the offer a list of all critical items/ sub-assemblies which are bought out by the bidder and proposed to be used, along with the manufacturer's name, brand model etc. The successful bidder may be required to produce invoices to ensure genuineness of such products / verification by the Inspecting agency.
- 23.2 Firm shall use bought out items of following listed sources:-

S.No.	Description	Make
i.	ENGINE	M/s Ashok Leyland, M/s Kirloskar, M/s Cummins, M/s Mahindra, M/s Greaves & M/s Escorts.
ii.	ALTERNATOR	LEROY SOMER/AVK/STAMFORD/TDPS/ KEC
iii.	Measuring instruments	L&T/AE/Meco/Conzerv
iv.	Indicating Meters	AE/ Conzerv/ Secure/ Rishab
v.	Power contactors	ABB/Telemecanique/ Merlin Gerin/Siemens/C&S
vi.	Current transformer	Kappa/Intrtrans/AE
vii.	Overload relays/Timers	L&T/C&S
viii.	Indication lamps/Pushbuttons LED	star/Vaishnov/ Teknic
ix.	Line Voltage monitors	Minilec (VMI).
x.	Three attempt starter	PIC
xi.	Low fuel sensor	PIC
xii.	Control relays	PLA
xiii.	Selector switches	Kaycee/L&T
xiv.	DC Hooter with audible control	Vaishnov
xv.	Power & Control cables	Gloster/Finolex/ Nicco/ Polycab/Mescab
xvi.	MCCB/ELMCB/RCCB/	Siemens/ Merlin Gerin/ ABB/ L&T/C&S/Schneider

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	MCB/ISO	
xvii.	Air Circuit Breakers	Siemens/L&T/ABB/Schneider/Merlin Gerin/Crompton/C&S
xviii.	PLC	Siemens/ Allen Bradley/GE FANUC
xix.	Contactors	Merlin Gerin/Siemens/ ABB/ Legrand/ C&S/ Schneider
xx.	Phase reversal protection	Minilec (VMR)
xxi.	Meter Digital type	Conzerv/Secure, with communication facility
xxii.	RS485 port	Modbus protocol
xxiii.	Selector switches	Kaycee/ L & T
xxiv.	Indicating lamps	Teknic with LED lamps
xxv.	Power & Control cables	Gloster, Finolex, Nicco, Polycab, Havels, KEI, Polycab
xxvi.	Low voltage signal cables	LAPP Kabel, Polycab,
xxvii.	Terminations Dowell,	Jainson, Dowell, ASCON
xxviii.	Cable glands Commet	VBI
xxix.	Terminal Connectors	Elmax
xxx.	Battery	Exide, TUDOR, Amco, Amar Raja, Tata Green, Cummins Pulse Lite, Standard Furukawa and Prestolite.
xxxi.	Push Buttons	Technic/ L & T/Siemens
xxxii.	Terminal Block	Elmex / Connectwell
xxxiii.	Glass wool	Twaiga / Lloyd
xxxiv.	Fresh air /Exhaust fan	GEC / Almonard
xxxv.	Cooling Tower	BELL, Advance, Paharpur

NOTE: The approved make of material are approved subject to their meeting the tender specification & site requirement. The contactor shall supply material as per the make listed above. In case of non availability of the above listed makes, or for the items not covered in the above list, the bidder will specifically propose the makes to be used and get the same approved from CONSIGNEE.

24.0 DOCUMENTS TO BE UPLOADED

Following documents must be submitted by the bidder along with the offer:

- (i) Clause wise comments on technical specification
- (ii) Documentary evidence of previous supplies to other Railways
- (iii) Authorisation certificate of OEM in case of Authorised dealer
- (iv) Details list of spares covered under warranty.
- (v) Details asked as per Annexure-I, Annexure-A and Annexure-B.
- (vi) Tenderer not submitting the above information may note that his offer is liable to be ignored.

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SCHEDULE-I

Leading parameters:-

Sr No.	Description	Minimum Parameters required	Offered by bidders (to be filled by bidder)
1.	Nominal Rated Capacity (KVA)	62.5	
2.	No. of Phase	Three Phase	
3.	Output Voltage	380-440 V	
4.	Power Factor	0.8 lagging	
5.	Current	87	
6.	Frequency (Hz) rpm	1200-1600 rpm	
7.	Type of Governor	Mechanical	
8.	Class of Governor	A1	
9.	Rated RPM of Engine	1200-1600	
10.	Control Panel	AMF(Auto Main Failure)	
11.	IP rating of Control Panel	IP 53 or better	
12.	MCCB and Power Contactor (Alternator & Mains)	not less than 125A	
13.	Sheet Thickness of Enclosure	1.6-2.0 mm	
14.	Capacity of Engine	3000 to 4000 cc	
15.	Engine Power (kWh)	62	
16.	Specific Fuel Consumption (gm/kWh)	215 or lower	
ENGINE			
17.	Type of Governor	Mechanical	
18.	Class of Governor	A1	
19.	Nos. of Cylinder	4	
20.	Nos. of Strokes	4	
21.	Type of Engine Cooling	Liquid Cooled (EG Compleat 50:50)	
22.	MoEF Certified Power	84 hp	
23.	Aspiration	Turbocharged, Air cooled	
24.	Compression Ratio	19:1	
25.	Fuel Tank (with 2mm thick CRCA sheet) capacity	Not less than 150 l	
26.	Fuel Consumption @ 75% load with radiator and fan	11-12 litre/hr	
27.	Fuel Consumption @ 100% load with radiator and fan	15-16 litre/hr	
28.	Performance class of DG set	ISO 8528-5 G2	
29.	Lube oil Sump Capacity (high-low level	7-5 litre	
30.	Total Coolant Capacity	13 litre	
31.	Exhaust Temperature	480- 500°C	
32.	Overloaded capacity for one hour for every 11 hours continuous running at full load (%)	10	

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33.	Starting Voltage (volt)	12	
ALTERNATOR			
34.	Rating of AC Generator	62.5	
35.	Power factor of AC Generator	0.8 or better	
36.	Efficiency at rated power	≥ 90%	
37.	Compliance of Alternator to IS: 1336(part-1)	Yes	
38.	Type of Alternator	Brushless	
39.	Voltage Regulation Grade	VG3 or better	
40.	Alternator IP rating	IP23 or better	
41.	Class of Insulation	H	
42.	Stator winding	Double layer lap	
43.	Rotor	Dynamically Balanced	
ACOUSTIC ENCLOSURE			
44.	Sheet Thickness	1.6-2.0 mm	
45.	Thickness of Foam	40 mm	
46.	Density of foam for sound insulation (kg/m ³)	≥ 30	
47.	Noise level measured at 1 meter (dB)	75 or less	
Battery			
Sr No.	Description	Minimum Parameters required	Offered by bidders (to be filled by bidder)
48.	Battery Type and specification	Low Maintenance free to IS: 14257 for high cranking performance	
49.	Battery Capacity (AH)	90 Ah SMF Battery	
50.	No. of batteries	1	
Ambient Condition			
51.	Temperature	0° C to 48° C	
52.	Relative Humidity	Up to 98%	
53.	Controller	Advance Digital Controller	
Others			
54.	Warranty	Min. 2 years	
55.	Availability of suitability Tests Report of Engine from Central Govt./NABL/ILAC accredited laboratory	Yes	
56.	Availability of Type Tests Report for Alternator Engine from Central Govt./NABL/ILAC accredited laboratory	Yes	
57.	DG set meet requirements of Environment (Protection) Rules, 1986 in respect of noise and emission norms, as described in STC	Yes	

Prepared by
JE/M&P

Agreed by
Dy.CPE-I

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Schedule-II

GENERAL ELECTRICAL SPECIFICATION:-

- 1.1 The provision of this General Specification shall apply, where ever relevant.
 - 1.2 All equipments and material shall comply with appropriate Indian Standards (latest), International Standards or National Standards of the country of origin provided the latter are equivalent to or better than the former. The tenderer shall indicate the Standards applicable. The following standards are applicable in particular.
(Corresponding International Standards like ASA, NEMA, BSS, DIN etc. may also be quoted).
 - IS : 325-1979 (latest) - Three phase induction motors (corresponding to IEC pub-34-1) (Latest).
 - IS : 1248 (Latest) - Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding to IEC Pub-51) (Latest).
 - IS : 1231-1974 (Latest) - Dimensions of three phase induction motors (corresponding to IEC Pub-72-1) (Latest).
 - IS : 1271-1985 (Latest) - Classification of insulation material for electrical Test Benchry & apparatus in relation to their thermal stability in service (corresponding to IEC-Pub-85) (Latest).
 - IS : 6875 (Latest) - Push Buttons and related control switches corresponding to IEC Pub/73) (Latest).
 - IS : 375-1963 (Latest) - Marking and arrangement of switch gear, bus bars, main connection & auxiliary wiring.
 - IS : 996-1979 (Latest) - Single phase small AC and universal electrical motors.
 - IS : 1356 (Latest) - Electrical equipment of machine tools.
 - IS : 2516 (Latest) - Circuit breakers (corresponding to IEC Pub-56) (Latest)
 - 1.3 Unless specified in the main specification, the AC motors and starters shall be of the following type. Tenderer is, however, free to give alternative proposal along with justification, if in his view alternative proposal in warranted by site conditions. Type of motor type of starter.
- | TYPE OF MOTOR | TYPE OF STARTER |
|---|--------------------------------------|
| 1.3.1 Any type of AC motor starting current of which does not exceed 75 amps. | Direct on line. |
| 1.3.2 AC squirrel cage, introduction motors, starting current of which is above 75 amps. if started direct on line | Star delta or Auto transformer type. |
| 1.3.3 AC slip ring type motor | Resistance type air/fan Cooled |
| 1.3.4 AC synchronous or synchronous induction motor. | Suitable makers standard. |
| 1.3.5 DC motor | Resistance type/Thyristor type. |
| 1.4 The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories. | |
| 1.4.1 No Voltage Protection - No voltage protection shall be provided so that machine will not start up again by itself when, following an interruption the supply is restored. | |
| 1.4.2 Short Circuit Protection - To protect against short circuits due to insulation failure of faulty connections HRC fuses shall be provided for each motor. The rating of the fuse shall be such as to take care of the over current due to motor starting. | |
| 1.4.3 Over Load Protection - To prevent motors from overloading, overload protection shall be provided separately for each motor. Three phase motors shall be protected by overload tripping devices on each phase. | |

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- 1.4.4 **Single Phasing Protection** - A separate current sensitive delayed action single phasing preventor shall be provided for each motor separately. Overload protection shall not be treated as single phasing preventor.
- 1.5 Control equipment shall be mounted in separate drip proof enclosures. Control enclosures and compartments are to be so designed as to give adequate protection against ingress of dust, oil, coolant or chips. All control devices like contractors etc. shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be installed that they are readily accessible when the doors and covers are opened. Hinged covers shall be interlocked with the machine tool control to prevent operation of the machine when cover is open.
- 1.6 The motor shall be totally enclosed with or without fan cooled frame. Screen protected drip proof type motor may be provided if it is mounted inside protective enclosures.
- 1.7 The electrical equipments shall comply with the requirement of Indian Electricity Act and Rules (latest).
- 1.8 All instruments shall be of the Industrial Grade "A" (IS-1248) switch board type the range of the instrument shall be such that the maximum load expected in the circuit shall produce a deflection of 60% to 80% of the full scale.
- 1.9 The supplier shall furnish 3 sets of complete electrical and electronic wiring diagrams in full details to enable the maintenance staff to locate faults in the circuits, 3 sets of part catalogues, maintenance manuals operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied.
- 1.10 For main motor class minimum "B" Class insulation shall be provided. If any other class of insulation is proposed, detailed justification for providing different class of insulation shall be given.
- 1.11 Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.
- 1.12 Two earthing terminals shall be provided on all electric motors including the control gear.

1.13 POWER SUPPLY

- 1.13.1 The machine shall be suitable for operation on 415 volts 3 phase 50 cycles AC 3 wire or 4 wire system with neutral solidly earthed. The supply voltage may vary up to +10% - 20%. The frequency may vary up to $\pm 3\%$. However, full rated power of the motor shall be available at the lower voltage. Firm should confirm satisfactory performance of the machine at incoming power supply in the range 415V+10%-20% and 50HZ $\pm 3\%$ frequency or should provide voltage stabilizer as specified against clause 2.13.2 below of required capacity.
- 1.13.2 The voltage stabilizer, if required, shall conform to :
- i) Input Voltage - 320 to 460 volts 3 phase 4 wire supply.
 - ii) Out put Voltage - 415 volts
 - iii) Regulation - $\pm 1\%$ from No load to Full load.
 - iv) Rate of correction - 20 volts per second per phase.
 - v) Wave from distortion - NIL
 - vi) Efficiency - Not less than 97%.
 - vii) Winding and class of insulation - Copper wire wound with "B" class of insulation or better.
- 1.13.3 In case of machines equipped with NC, SS, CNC, Thyristor controlled devices and other sophisticated electronic gadgets including microprocessors etc. which are susceptible to power line spikes and surges, a suitable voltage stabilizer and ultra isolation transformer of adequate capacity to cover for the entire electrical load of the machine shall be

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offered as a concomitant accessory conforming to Specification for voltage stabilizer as mentioned in clause 2.13.2 above and isolation transformer to the parameters mentioned below.

- i) Transformer ratio - 1:1
- ii) Winding - Copper wire wound with "F" class insulation or better.
- iii) Protection - To arrest spikes and surges to the order of 3 KV for 200-400 micro seconds duration.
- iv) Common mode rejection ratio - 120 dB
- v) Isolation - Capacitance 005 Pf: resistance greater than 1000 Mega Ohms.

1.13.4 Voltage stabilizer shall be equipped with a protective relay to trip to trip the AC power supply to the machine instantaneously with audio and visual indication to the operator. Settings of the protective relay for low and high voltage shall be 320 volts and 460 volts respectively.

1.14 ATMOSPHERIC CONDITIONS

- 1.14.1 The ambient temperature at the site at which the machine will be installed may vary from -4°C to +50°C over the year. The relative humidity may be as high as 98%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalised to work under these atmospheric conditions without any adverse effect on their performance.
- 1.15 The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.
- 1.16 The drive shall be capable of operating at any one of the speed required independent of the load in accordance with the requirements of the machine.

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Annexure-I

DELIVERY SCHEDULE CHART:

In the event of acceptance of the offer, the DG Set shall be supplied as per the following Milestone Chart:-

S. No.	Activity	Activity Code	Outer limit of Time Schedule expected by RCF	Offer by bidder's
1.	Issue of PO	D1	--	
2.	Submission of GA drawings to consignee by successful bidder/supplier along with information on power and other utilities required for machine.	D2	D1+45 Days	
3.	Approval of GA drawings by consignee	D3	D2 + 45 Days	
4.	Confirmation of availability of clear site by consignee	D4	By D3 (i.e at the time of approval of GA drawing).	
5.	Completion of foundation	D5	D4+30 Days or latest by D6.	
6.	Supply / Delivery of machine	D6	D1+120 Days.	
7.	Installation, commissioning and proving out of Machine by supplier	D7	D6+45 Days	

Annexure-A

S.N.	ITEM	PART NO.	SERVICE LIFE	PRICE

Annexure-B

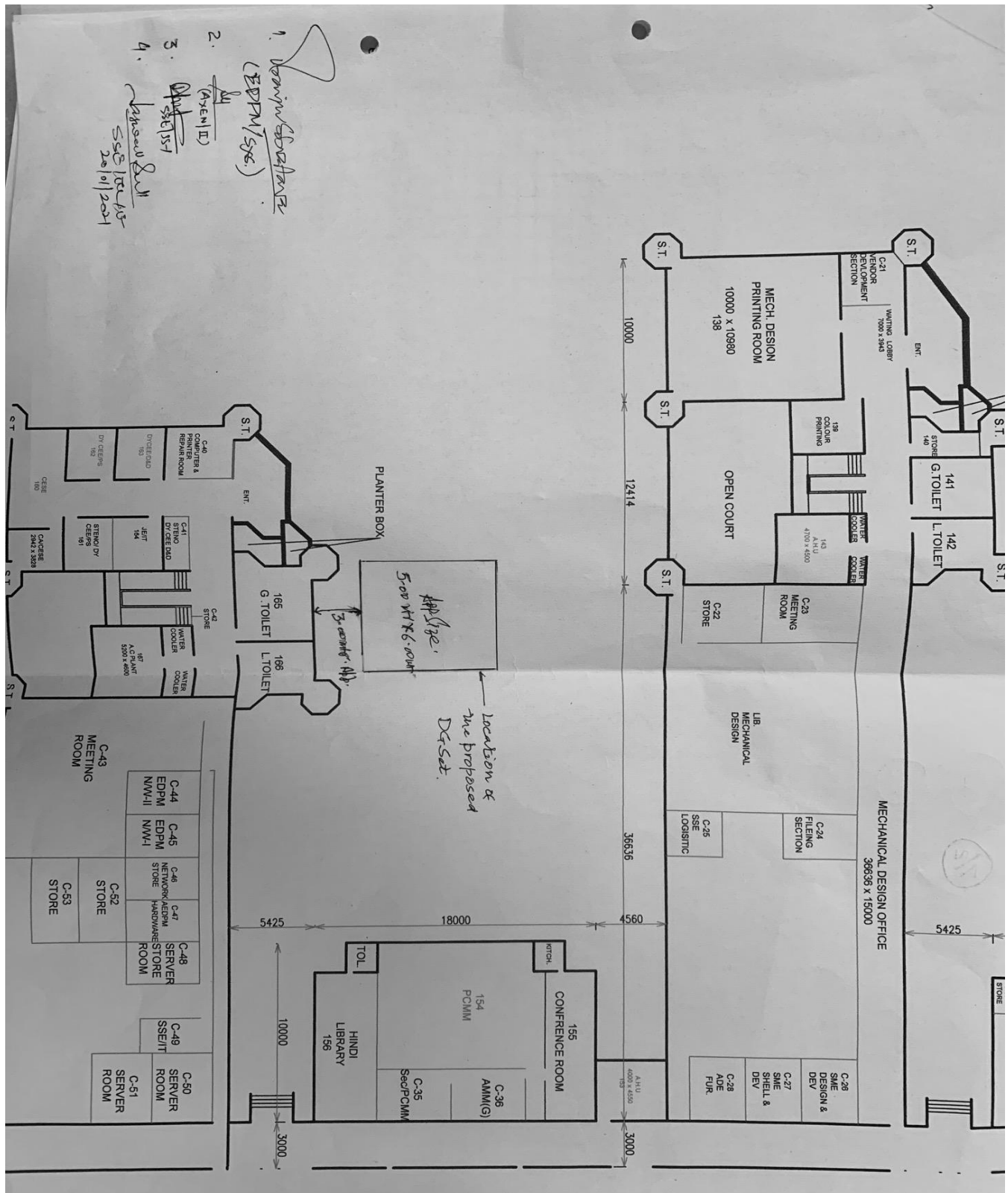
S.N.	YEAR	AMC CHARGES
1.	IST YEAR	
2.	IIND YEAR	
3.	IIIRD YEAR	
4.	IVTH YEAR	
5.	VTH YEAR	

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JE/M&P

Agreed by
Dy.CPE-I

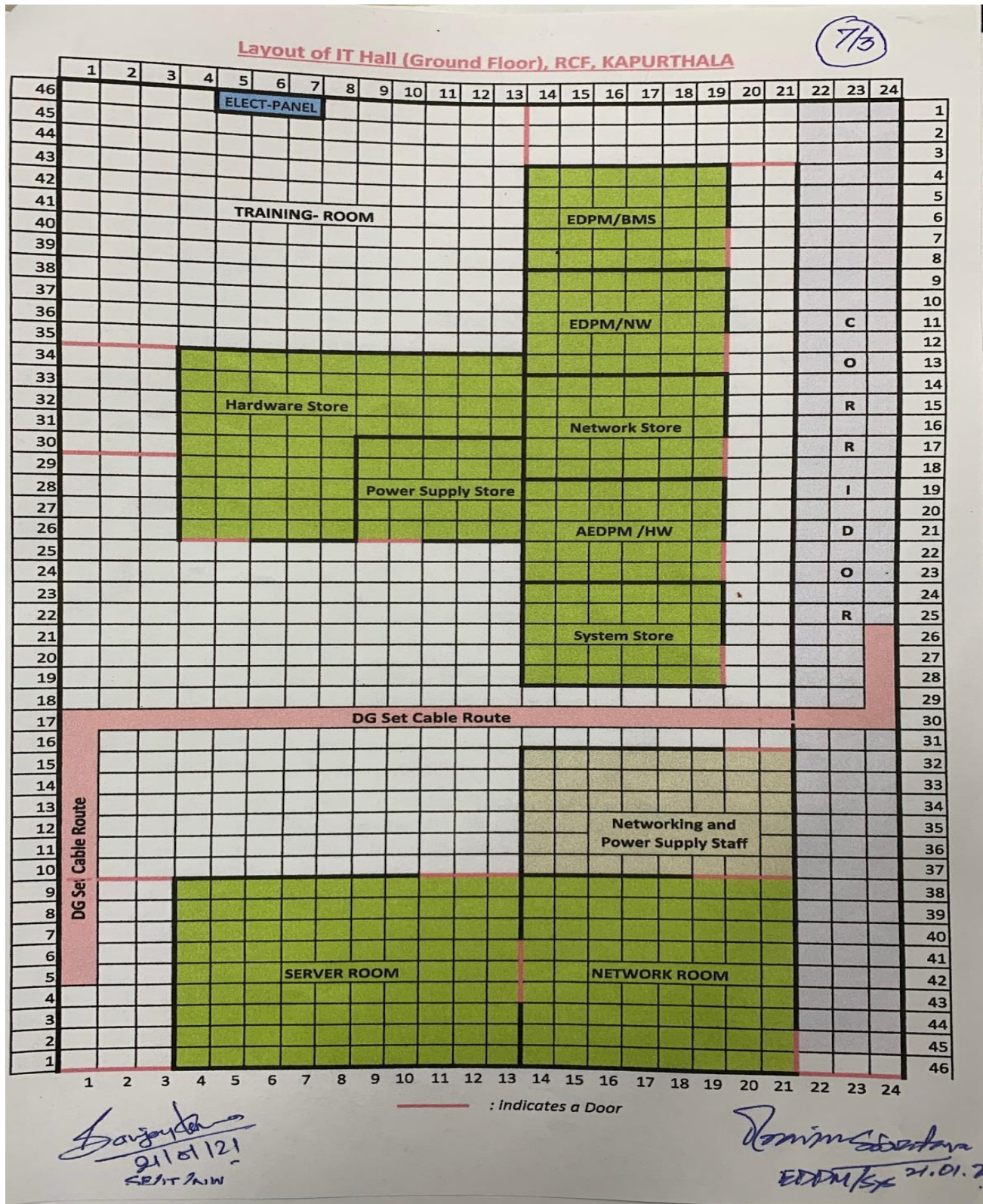
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Annexure-C



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Annexure-D



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