استدراج عروض

"شراء مولد كهربائي"

السادة :.....

العنوان : ..... **التاريخ :** .....

ترغب جمعية الجليل للرعاية والتأهيل المجتمعي الخيرية في جنين ضمن مشروع المساهمة في تجنيد المجتمع المحلي للمشاركة في التأثير في السياسات العامة التي تخص الفئات المهمشة من المعاقين في محافظة جنين " تمكين حقوق المعاقين " وضمن برنامج تعزيز مشاركة المجتمع المدني المنفذ من قبل مؤسسة خدمات الإغاثة الكاثوليكية (CRS) والممول من قبل الوكالة الأمريكية للتنمية الدولية (USAID) ، بشراء مولد كهربائي للجمعية وذلك ضمن الشروط التالية:

ملاحظات:

1- **ان يكون عرض السعر والفاتورة موجه لاسم جمعية الجليل للرعاية و التأهيل المجتمعي مشروع تمكين حقوق المعاقين USAID – CPP .**
2- **السعر في الشيكل غير شامل ضريبة القيمة المضافة.**
3- **المورد ملزم بإصدار فاتورة صفرية + شهادة خصم مصدر.**
4- **على المورد الالتزام بالمواصفات المرفقة ادناه وان يكون لديه القدرة على تركيب وتشغيل المولد في مقر الجمعية في مدة لا تتجاوز 2014/6/15**
5- **آخر موعد لاستلام العروض يوم الأربعاء الموافق 2014/6/4 الساعة الثانية عشر ظهرا بالظرف المختوم في مقر الجمعية الكائن في مخيم جنين / خلف مستشفى جنين الحكومي.**
6- **تعتبر وثيقة الشروط الإلزامية الخاصة بالوكالة الأمريكية للتنمية الدولية (USAID Mandatory Clauses) وتوقيعها جزءا أساسيا.**

إخوتكم

جمعية الجليل للرعاية

والتأهيل المجتمعي الخيرية

جمعيه الجليل للرعاية والتأهيل المجتمعي الخيرية – جنين –بجانب اللجنة الشعبية للخدمات- مخيم جنين خلف مستشفى الشهيد الدكتور خليل سليمان الحكومي
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EMERGENCY DIESEL GENERATOR SET

PART 1 - GENERAL

1.01 GENERAL REFERENCE

A. The work of this Section is integral with the whole of the Contract Documents and is not intended to be interpreted outside that context.
B. Coordinate the work with all other services affecting the work of this Section.
C. Diesel Generator submittal without compliance statement from the manufacturer shall not be acceptable.

1.02 DESCRIPTION OF WORK

A. The Contractor shall comply, install, commission, test and hand over in good operable manner including one year guarantee and maintenance. 415 V automatic starts on mains failure, standby diesel generator set as indicated on the drawings. The set shall be complete with diesel engine, generator, control panel, batteries, starting motor, built-in air cooled radiator, main fuel storage tank, daily fuel storage tank, fuel transfer pumps and all other accessories as specified and mentioned in the B.O.Q

1.03 RELATED WORKS SPECIFIED ELSEWHERE

A. General Provisions for Electrical Installation
B. Basic Materials and Methods
C. Cable Trays
D. Conduits
E. Trunking
F. Wires and Cables
G. Earthing System

1.04 APPLICABLE STANDARDS REFERRED TO IN THIS SECTION

A. BS 5514: Engines
B. BS 4999: Alternators

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualification

1. The generator set shall be the product of a single manufacturer regularly engaged as a manufacturer of such equipment. The engine, alternator, control panel shall be designed, manufactured, assembled and tested by single manufacturer. The manufacturer shall be responsible for a single source warranty for the entire diesel generator set, including the controls.

B. Installer's Qualification

1. All the Diesel Generator installation work shall be carried out by a Diesel Generator Sub-Contractor. Diesel Generator Sub Contractor shall be one who is normally and agent representing one or more of the approved makes of D/G sets. Diesel Generator installation shall be supervised, checked and tested by a qualified representative of the manufacturer and hand over the works in perfect running order to the satisfaction of the Engineer.

C. Source Quality Control

1. Test the combined engine generator set at the factory and submit the certified test copies of all tests to the Engineer for his approval.

D. Design Criteria

1. All materials and equipment shall comply with relevant IEC and BS specifications in regards to quality of materials, performance and proving tests.
2. The emergency power supply and its components shall be such as properly maintained and services without the necessity of carrying expensive spare parts stocks, or being subjected to interrupted service due to the lack of spare parts.
3. Emergency generator set shall be designed to allow easy replacement of major items subject to wear.

1.06 SUBMITTALS

A. Shop Drawings

1. Submit 3 copies of shop drawings for approval.
2. Shop drawings shall be complete, as to be as-built drawings, not general outline drawings used for sales and guide layouts.
3. Submit a complete wiring diagram for the generator set, drawn on a single standard size sheet, showing the following:
    a) All components of:
        i) Engine starting control
        ii) Engine alarm
        iii) Generator control
        iv) Battery
        v) Battery charger
        vi) Earthing
        vii) Transfer switch control relays.
    b) Interior wiring, terminals and interconnecting wiring.
    c) Certified dimensions and weights.
    d) Clear indication of all connections to remove equipment including details of working interface with B.A.S. system for alarm monitoring.
4. Submit a composite wiring diagram of the entire emergency transfer system showing all wiring between the engine starting panel, engine generator set and the automatic transfer switches.

5. Wiring diagrams shall clearly show:
    a) Main current conductors, in heavy lines.
    b) Control conductors, with colour and/or number coding.
    c) Location of relays and apparatus.
    d) Description of function, type and catalogue, of all components.
6. Alternator Control Panel
7. Submit a schematic line diagram showing:
    a) Interlocks
    b) Protection
    b) Instruments

B. Service Facilities

1. Indicate the nearest location from which service facilities and spare parts may be obtained after the guarantee period.

C. Test Reports

1. Submit certified copies of data obtained during factory test of the engine generator test.

D. Operation and Maintenance Data

1. Submit certified copies of data obtained during factory tests of the engine generator test.
    a) Manuals for generator set.
    b) Detailed instruction books.
    c) Operator's manuals.
    d) Maintenance schedules.
    e) Part catalogues.

2. Submit 3 copies of the following:
    a) Complete instruction covering the operation of the engine generator set and associated equipment.
    b) A manual covering engine operation and maintenance.

3. Fix one copy of the composite wiring diagram of the emergency transfer system inside the transfer switch compartment door and another in the generator control panel.

4. Fix as-built print each generator set, frames behind non-glare plexiglass, on a wall near the generator control room.

E. Spare Parts

1. Provide the spare parts for 2 years operation and maintenance, properly preserved and packed in a suitable steel box with a lock and two keys marked "Spare Parts: Engine Generator Unit".

F. Product Delivery, Storage and Handling

1. All generator equipment-using eyes, yokes and skids provided by the manufacturer.

2. Do not store equipment assemblies exposed to weather.

3. Physically protected all generator equipment against damage from work of other trades.

4. Cover all generator equipment with suitable material to avoid damage to finish.

PART 2 - PRODUCTS

2.01 EMERGENCY GENERATOR SET

A. The set shall be of rugged reliable design and built for long trouble free service under the worst specified climatic conditions and made by an approved reputable manufacturer.

B. The rated output shall be (as indicated on drawings) at 0.8 PF 240/415 Volts, 3 phase and 50 Hz. The rated output shall mean the net full continuous derated output in Palestine at ambient temperature up to 45 Degree C, at relative humidity 50%. The set shall also be capable of 110% load for one hour under these conditions at the rated speed without undue heating of the engine or alternator and without mechanical or electrical troubles. A manufacturer's deration calculation shall be enclosed along with the tender documentation.

C. Diesel Engine

1. The diesel engine shall be of the stationary heavy duty and EU stage II emissions compliant, turbo charged compression/ignition, multi cylinder 4 stroke operation. The steel base frame shall be provided with spring type vibration isolators. The engine shall be able to deliver full load in the shortest possible time after start. The engine speed shall not exceed 1500 r. p. m.

The engine construction shall be in such a way as to allow for dismantling of any engine component for inspection or repair without undue complication i.e. without dismantling of other non-defective parts. The crank-case shall be provided with inspection windows.

2. Starting System

The diesel engine shall be equipped with starting system detailed hereunder and as per Engineer's approval.

a) Battery Starting System

i) The engine shall be started by a 24V, D.C. starting motor automatically engaging with engine flywheel and positively dis-engaging on engine starting. The engine starting control equipment shall be arranged to disconnect the battery charger to prevent it from being over-loaded during starting. The starter motor shall be of adequate power of its duty

ii) Batteries for starting shall be of the nickel cadmium type, 24V, and heavy-duty diesel starting type and of sufficient capacity to provide continuous cranking of 1.5-minute duration without recharging. Batteries should have sufficient capacity to provide three successive starts.

iii) The batteries shall be filled with electrolyte an installed on proper racks with cables and clamp. A hydrometer shall be supplied with the batteries.

iv) The battery charger shall be static type enclosed in an adequately ventilated sheet steel case and incorporated within the control panel with its associated instruments and controls mounted on front of panel.

v) The charger shall be complete with all necessary relays, cutouts, controls, switches and instruments for automatic charging of batteries. The charger shall automatically control the charging rate to suit stare of battery thus charging at high rate following a period of use of battery and, when battery nearly fully charged, reverting to trickle charging automatically.

vi) An ammeter and voltmeter in the control panel shall indicate the state of the battery and its charging rate.

3. Cooling System

a) Radiator: Built-in type sufficient capacity to dissipate the total joules per hour rejected by the engine cooling system at 110% full load.

b) Blower fan: To have sufficient pressure to circulate required quantity of air for engine cooling. The fan shall be provided with a suitable guard. D/G room inside temperature should not exceed 56 Degree C.

c) Jacket water heaters: To be provided on engine to facilitate quick under low ambient conditions.

d) The cooling system shall be capable of keeping the temperature of cooling water at safe limits at all conditions of load required in the Specifications. Maximum temperature of cooling water after 10 hours of Continues running at full load at worst Palestinian climatic conditions shall not exceed the maximum temperature limits of the diesel engine.

e) The cooling system shall include an engine shaft driven circulating water pump. The water jacket of the engine cylinder shall be so constructed that the water in the jacket can be drained completely.

f) The radiator-finned tubes shall have a common inlet and common outlet headers.

g) A drain valve and a filling valve shall be provided to the radiator for flushing and quick filling.

h) The radiator shall be equipped with suitable rated immersion heater with integral thermostatic controls in order to prevent freezing when standing idle during cold climatic. Cooling water piping, complete with all necessary supports, control valves, flanges and fittings, thermometers, pressure gauges, relays etc.., shall be supplied and installed to form a complete engine water cooling line. Piping shall be as of B.S. 1387.

i) The pump discharge valve shall preferably be a globe valve; the other valves shall be Sluice gate valve.

4. Fuel System

a) The set shall be suitable for running on diesel oil as described below:

Specific gravity at 60F distillation	: 0.834
(P. P.123/40)	
IBM	:219 C
10%	: 250 C

SO%	: 276 C
90%	: 314 C
F.E.P.	: 342 C
Flash Point PME	: 189 C
Sulphur	: 1.1 %
Calorific value	B.T.U./lbs gross
Carbon residue	: 19750
0.01/wt diesel index	: 62
Viscosity redwood seconds at 100F	: 34

b) **Daily Fuel Tank**

An integral day tank located under the Generator set shall maintain fuel supply to the engine. The fuel tank shall be of sufficient capacity for continuous run if 8 hours at full load, and shall be fitted with strainers (see filter), control cocks, drain cock, piping to the engine and a level indicator with alarm contacts, vents and all other necessary fuel lines and fittings.

c) **Storage Tank**

The Contractor shall supply and install stand mounted diesel oil storage tank with a capacity of 2000 liters as per.

The storage tank shall be complete with pipes, fittings, feed lines, vents etc. The tank shall be of the approved type located inside the diesel generator room. The tank construction and method of installation shall comply with BS 2594/1955 or approved equal.

d) **Tank Gauges**

Provide as required a gauge to indicate level of fuel in the tank. Mounted on gauges shall also be a high/low level alarm switch. The switches and gauges shall be designed for a 240 Volt single phase, 50 Hz systems. Locate indicating gauges as deemed necessary.

e) **Fuel Oil Piping & Fuel Filling System:**

i) The generator shall be equipment with a factory assembled automatic fuel filling system consists of required control, low/high level switches and gear fuel pump.

ii) Provide all diesel fuel oil piping from storage tank to day tank fill lines, water tight fill boxes, vents, vent caps, tank foot valves, and accessories.

Provide swing check valves and gate valves at pump inlets. Provide approved anti-siphon valve at high points of suction lines. Provide whatever additional valves that may be required by local regulations.

iii) All piping shall be provided with ground joint unions at piece of apparatus to facilitate connecting and disconnecting.

iv) All piping, unless otherwise specified, shall be schedule 40 standard weight black wrought iron pipe.

v) Steel vent pipelines shall run from the fuel oil storage tanks, carried to the proper height within building construction and terminating with vent fittings. Fitting as required.

5. Lubricating System

a) The lubricating oil system shall be forced fed type. The details of the system shall be included in the offer. The shaft bearing lubricating shall be directly fed from the lubricating oil pump and not through the main bearings.

b) The lubricating oil shall be of a type readily available internationally.

c) The lubrication system shall be positive displacement type. By-pass arrangement should be provided in case of filter clogging.

d) A heat-exchanger shall be provided for cooling the lubricating oil and this shall be of long-life type i.e. the system shall not require constant cleaning or other maintenance work. A valve for taking oil sample shall be provided. The coolant for the above shall be jacket water of the engine. That is, the cooling system of the engine and the lube-oil heat-exchanger cooling system shall work in parallel or in series. If the lube-oil pressure reaches low value, the engine shall be shut down automatically and also immediately should give audible alarm together with visual at important points at the engine-monitor panel.

e) Suitable manual-pumping arrangement for easy draining of the whole quantity of lube-oil into a drum shall be provided.

6. Exhaust System

a) Exhaust pipes shall be of Schedule 40 black for easy steel and of adequate size to ensure that back pressure does not exceed the value specified by the manufacturer.

b) The exhaust pipe shall be connected through airtight flexible coupling to the engine.

c) Exhaust pipes shall be adequately lagged with 75 mm thick (minimum) rock wool covered with aluminum sheaths so that to take care of exhaust gas temperature in pipes exceeding 500 Deg. C. When exhaust pipes pass through walls or roof a suitable weatherproof sleeve or thimble shall be provided to isolate exhaust pipe from the building. A silencer of heavy-duty residential type shall be provided in the exhaust system and it shall also be lagged. Civil contractor will carry out the operation of casting the sleeves in the concrete, if required.

d) Exhaust pipes and silencers shall be supported from the ceiling by special vibration isolating hangers and the pipe shall be slanted away from the engine and a condensate trap fitted at the lowest points. Approved rain caps shall be installed at the discharge end of the exhaust pipes on the roof.

e) Suitable flexible expansion joints shall be provided along the pipe run to take care expansion requirements.

7. Filters

Cleanable/replaceable elements should be provided.

a. Fuel Oil System

The system shall have the following filters fitted before the fuel injection pumps:

A fuel filter system of ample capacity to prevent all particles of 3 microns size or smaller shall be provided

b. Lubricating Oil System

i) This system should have full flow filters of sufficient capacity.

ii) Tenderers shall give full particulars of the filters used. It shall be mentioned in if filter elements are cleanable for replaceable, in which case, the working hours after which the element and the lubricating oil is to be replaced should be stated.

c. Intake and Exhaust System

Air is inducted to the engine manifold through.

i) Pre-cleaner

ii) Large capacity air cleaner.

Both filters are required due to severity of dust suspensions in the air.

The engine exhaust line shall be fitted with flexible fitting efficient silencer to give efficient silencing with minimum back pressure and terminated outside the engine room.

8. Ventilation

The following ventilation works are required for the diesel engine generator room.

a) Metal louvers with metal cleanable filters shall be provided for outside air intake into the engine room. Filters shall be permanent heavy-duty metal cleanable type minimum 2" thickness. Filters to be sized to perform their duty with a face velocity not more than 350 fpm when engine is running. Filters to be installed n an appropriate arrangement on the room walls. Total filter area shall consider air for engine intakes and radiators cooling. Filters with handles and latches shall be provided.

9. Governing System

a) The engine shall run steadily at any load within its rating at its rated speed, and the changes in speed due to change in load shall comply with BSS 5514/77 for Class A1 or with ISO 3067.

b) The governor should be of the electronic type to comply with BS 5514/77 Class A1.

10. Coupling and Common Bed

a) The engine and the alternator shall be suitably coupled directly without interposing gear arrangement.

b) The common bed shall be provided with suitable damping devices for fixing to the floor.

c) The engine vibration shall be the minimum possible and shall comply with the relevant BS. The vibratory force induced as the engine passed through resonance revolutions during starting and stopping period shall not cause any damage to the whole system.

11. Engine Monitor Panel

a) Each engine shall be provided with a monitor panel adequately isolated from vibration, which shall contain facility to monitor the following:

i) Engine speed.

ii) Temperature.

iii) Engine operation hour counter.

iv) Other required items.

b) The engine shall be able to operate manually from the monitor panel. Manual speed control facility shall be provided.

D. Alternator and Exciter

1. The alternator shall be able to withstand the stresses caused by the sudden application of the loads.

a) Type	Self-excited, self ventilated, air-cooled, splash-proof, synchronous alternator.
b) Output	As indicated on the drawings, at Jordan rating.
c) Voltage	415V
d) Frequency	50 Hz.
e) No. of poles	4
f) No. of phases	3, (neutral to be brought out).
g) Power factor	80% lagging.
h) Commercial efficiency	not less than 90% (including excitation and field losses).
i) Voltage regulation	Automatic and static.

2. Class "F" insulation shall be applied to stator, rotor and exciter windings.

3. The alternator shall be suitable for continuous running duty type S1, BS 2613 (latest edition).

4. Distortion of no-load voltage waveform at alternator terminals shall be within 5% from the sinusoidal waveform.

5. Voltage adjustable range of the output voltage by adjusting the exciter shall be not less than 3% of rated voltage at rated load and not less than + -5% of rated under no-load conditions. This adjustment shall be able to be performed from panel mounted handle or knob.

6. The voltage of the alternator shall be automatically controlled by electronic static circuits.

7. The alternator shall not be switched on the load until terminal voltage has reached at least 90% of the nominal value. It is essential that the voltage regulation equipment shall have sufficient fast response time so that the alternator is ready to accept load in the shortest possible time.

8. The voltage regulator shall be designed to maintain the alternator terminal voltage constant within + -1% of the nominal value from no load to full load within normal variations of engine speed with change in load.

9. The exciter shall be brushless, self-excited, rotor mounted type. The rectifying elements shall be silicone.

10. The unit shall be suitably protected so that when there is a sudden variation of load, the sudden increase of field current in the rotor shall be curtailed and thus the speed build up of the engine and the voltage build up of generator shall vary proportionately.

11. Terminals with cable end boxes shall be provided respectively for the alternator and exciter.

12. The cooling air for alternator and exciter shall be drawn through openings at the non-drive end and exhausted sideways at the driving end.

13. The alternator shall be fitted with air-condensation heater to keep the winding in good, dry and safe condition. The air-condensation heater shall be automatically cut-of when the machine is running. Necessary on-off switches shall be provided on the control panel and the operation status of the heater shall be indicated.

14. Temperature Rise

    Alternator components shall be sound electrically and mechanically in continuous operation lasting over 24 hours at the rated output.

15. Insulation Resistance

Insulation resistance of the machine at strategic points shall be provided with the offer submitted with the shop drawings.

16. Dielectric Strength

The dielectric strength, the voltage of testing and test procedure at various points of the machine shall be submitted with the shop drawings.

17. Vibration

Vibration at the fixed components of the alternator under excited no-load operation shall be as per relevant BS.

18. Terminal Symbol

a) Terminal symbols for the alternator shall be in accordance with BS 822 requirements.

b) The alternator shall be provided with protection against over speed, over voltage, over current, short circuit, reverse power, earth fault and any other found necessary.

The neutral points of alternators shall be solid by connecting to earth.

19. Panel Wiring

a) All wiring of battery charger, exciter and control panel shall be P.V.C. tropical grade of adequate current carrying capacity to prevent over-heating under worst climatic conditions.

b) All wiring shall conform to the relevant BS and at least 50% derated with minimum size of 2.5 sq. mm. or its equivalent.

20. Terminal Board

a) Terminal boards shall have pairs of terminals for Incoming and Outgoing wires and not more than two wires shall be connected to any one terminal.

b) Insulating barriers shall be provided between adjacent connectors. Labels for wiring designation marks shall be provided on the fixed portion of the terminal boards as well as wires. No live metal shall be exposed at the back of the terminal boards.

c) Terminal boards having pressure type terminal lusts or equivalent shall be used so that no terminal clamp is necessary. 10% spare terminals shall be provided for each terminal board assembly.

2.02 CONTROL BOARD

A. Cabinet

1. Sheet steel construction, totally enclosed, dust protected and vermin-proof.
2. A hinged, lockable door shall give access to control and instruments.
3. "Live" parts shall be secured to prevent inadvertent contact with them.
4. Controls for diesel engine, alternator, exciter, meters and alarm device shall be positioned to give ample space for removing and installing components.

B. Instrument in Control Board

1. The generator set shall be provided with a microprocessor-based control system, which is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
2. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
3. The control shall have J1939 port and a Modbus communication port.
4. The control shall be provided with a remote announciator installed in building to show the status and alarms of the generator set, the announciator shall provide the minimum following alarm :

    - Fail to start shutdown
    - Low Oil pressure shutdown
    - High engine Temp.
    - Under speed / over speed
    - Loss of engine speed detection
    - Low/ high Battery voltage
    - Under volts/ over volts
    - Under freq / over freq
    - Over current

5. The control shall be UL508 listed, CSA282-M1989 certified, and meet IEC8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std 801.2, 801.3., and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE587 for voltage surge resistance.
6. The generator set mounted control shall include the following features and functions:

    a) Three position control switch labeled RUN/OFF/AUTO.

    In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

    b) Red "mushroom-head" push-button EMERGENCY STOP switch.

    Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.

    c) Push-button RESET switch.

    The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

    d) Push-button PANEL LAMP switch

Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

e) Generator Set AC Output Metering:

The generator set shall be provided with a metering set including the following features and functions:

2.5-inch, 90-degree scale analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. These meters shall be provided with a phase select switch and an indicating lamp for upper and lower scale on the meters. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.

Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.

f) Generator Set Alarm and Status Message Display:

The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions.

The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:

Low oil pressure (alarm)
Low oil pressure (shutdown)
Oil pressure sender failure (alarm)
Low coolant temperature (alarm)
High coolant temperature (alarm)
High coolant temperature (shutdown)
Engine temperature sender failure (alarm)
Low coolant level (alarm or shutdown--selectable)
Fail to crank (shutdown)
Over crank (shutdown)
Over speed (shutdown)
Low dc voltage (alarm)
High dc voltage (alarm)
Weak battery (alarm)
Low fuel-day tank (alarm)
High ac voltage (shutdown)
Low ac voltage (shutdown)
Under frequency (shutdown)
Over current (warning)
Over current (shutdown)
Short circuit (shutdown)
Ground fault (alarm)(optional--when required by code or specified)

Over load (alarm)
Emergency stop (shutdown)
In addition, provisions shall be made for indication of two customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

g) Engine Status Monitoring:

The following information shall be available from a digital status panel on the generator set control:

i) Engine oil pressure (psi or kPA)

ii) Engine coolant temperature (degrees F or C) Both left and right bank temperature shall be indicated on V-block engines.

iii) Engine oil temperature (degrees F or C)

iv) Engine speed (rpm)

v) Number of hours of operation (hours)

vi) Number of start attempts

vii) Battery voltage (DC volts)

v) The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

vi) **Control Functions**:

The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and number of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.

The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.

The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.

The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature, which is capable of discriminating between, failed sender or wiring components, and an actual failure conditions.

The control system shall include all interfaces necessary for proper operation with the paralleling equipment provided under this contract. The generator set supplier shall be responsible for complete compliance to all specification requirements for both the generator set and the paralleling equipment.

vii) **Alternator Control Functions**:

The generator set shall include an automatic voltage regulation system, which is matched, and prototype tested with the governing system provided. It shall be immune from mal-operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of [58-59] HZ. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alpha-numeric LED readout to indicate setting level. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.

Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.

Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition when total load on the generator set exceeds the generator set rating for in excess of 5 seconds.

Controls shall include a load-shed control; to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.

An AC over/under voltage monitoring system, which responds only to true RMS voltage conditions, shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a "weak battery" alarm shall be initiated.

When required by National Electrical Code or indicated on project drawings, the control system shall include a ground fault-monitoring relay. The relay shall be adjustable from 100-1200 amps, and include adjustable time delay of 0-1.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay which will function correctly in system as installed.

vii) **Control Interfaces for Remote Monitoring**:

All control and interconnection points from the generator set to remote components shall be brought to a separate connection box. No field connections shall be made in the control

enclosure or in the AC power output enclosure. Provide the following features in the control system:

Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.

One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.

A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.

A fused 20-amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

2.03 SOUND ATTENUATION HOUSING (ORIGINAL)

A. Construction: Provide an overall housing with removable side panels and a hinged, pad lockable meter panel door. Unitized construction between the stud and the acoustical enclosure. The maximum sound level measured one meter from the enclosure in free field conditions under full load shall not exceed 72 dBA.

B. Painting: Prime all exposed metal parts with a suitable rust inhibitor applied to the clean bare metal.

C. Acoustical Treatment: Intake and exhaust silencers shall be provided at the ends of the skid.

2.04 COMMISSIONING

A. Simulated Power Failure Test

Engine - generator shall be made ready for automatic operation and started by means of the test transfer switch on the automatic transfer switch. Unit shall run for the duration of all time delays and then automatically shut-down. This test shall be made with unit operating, and twice with unit simulated for a starting failure.

B. Testing of the Set

1. Engine

a) The engine shall be tested at sire before and after erection to BS 649 and amendments or equivalent including items, which are said to be subject to mutual agreement. The test shall include inspection, after testing the following parts:

b) Subsequent running test of eight hours shall be carried out of the set.

c) The engine shall be subjected to vigorous performance tests at sire under the worst environmental conditions prevailing here to the satisfaction of the Engineer and the main items shall include:

i) Output characteristics.

ii) Temperature rise.

iii) Checking of valve clearance, fuel pump setting, governor setting, pipeline connections, exhaust piping, and flexible connections.

iv) Checking the base and set are level in all directions, checking alignment of engine and generator and vibration isolators location and proper installation.

i) Checking or proper operation of engine safety devices.

ii) Checking of fuel pipelines, fuel pumps, tank level gauges and level control switches operation.

2. Alternator and Exciter

a) The alternator and exciter shall be tested to BS 5000 P.99 amendments thereof.

b) Tests at sire before erection and after erection prior to handing over shall be carried out to the satisfaction of the Engineer. The main items of tests deemed necessary by the Engineer shall be carried out at the expense of the Contractor. The performance test shall be for 24 hours under the worst climatic conditions prevailing in Jordan.

c) The Contractor shall be fully responsible to provide all the necessary facilities for the test at his own expense.

2.05 SYSTEM RESPONSIBILITY

A. The generating set, switchboard and automatic transfer switches shall be interconnected according to building load requirements and to manufacturer's recommendations, to prevent the emergency generating system from stalling or faltering due to momentary overloads beyond system rating, from distribution faults, motor starting loads.

B. Provide suitable filling point, fuel pump (manual), other accessories complete as required for system completion.

2.06 TRAINING FOR OPERATION AND MAINTENANCE PERSONNEL

A. The Contractor shall train a number of persons who will be selected by the Engineer for the operation and maintenance of all the works within the contract before these works are handed over to the Engineer.

B. The training has to be carried out by qualified staff of the Contractor for each specified service and shall be maintained for a one-month period following on the Certificate of Completion.

2.07 PERIOD OF MAINTENANCE

A. During the maintenance period of 2 years the Sub-Contractor shall repair and replace directly, at his own expense, any of the plant, material or work performed or furnished under the respective works in the contract which may develop under the conditions provided for by the contract and under proper use in the works or that portion thereof taken over by the Engineer.

B. The Sub-Contractor shall obtain and submit to the Engineer all guarantees or certificates or warranty available from the manufacturers, but only as supplementary to the Sub-Contractor's own liabilities under the contract and in no way invalidate them.

C. The D/G Sub-Contractor shall be fully responsible for the satisfactory operation of the D/G installation during the Maintenance and Guarantee Period. He shall carry out necessary inspection, preventive maintenance and testing to keep the set ready all the time. The set shall function satisfactorily during power failures. The D/G Sub-Contractor shall carry out routine testing of the installation once in every two weeks throughout the maintenance and Guarantee Period. The testing shall be carried in presence of Engineer. The Sub-Contractor shall himself provide all electrical and mechanical spare parts, grease, lubricating oils, touch-up paints etc... Required for the maintenance of the D/G installation. The power shall be responsible only for providing diesel oil as and when required. The D/G Sub-Contractor shall prepare log-books listed full details of maintenance work and each log-book entry shall be countersigned by the Engineer.

2.08 PROVISIONS FOR BUILDING CONTROL & MANAGEMENT SYSTEM

The Following signal facilities shall be available on the system for interfacing **w**ith the building control and management system:

- ATS mode
- Common fault
- High coolant temperature
- Low oil Pressure
- Cranking failure
- Low level daily fuel tank
- Low level underground storage fuel tank

2.09 AUTOMATIC TRANSFER SWITCH / ATS/.

The panel for the diesel generator set) shall include:

1. 2 x 4 pole contactors AC1 category, complete with mechanical and electrical interlock and of suitable rating.

2. Phase failure, phase rotation, overvoltage and under voltage unit protection unit with built in adjustable time delay of 0-10Sec.

3. Set of timers for:
   a) delay gen. Loading
   b) delay return of supply.
   c) Delay gen. Start.
   d) Gen. Cool down time.

4. Set of relays for complete automatic transfer function.

5. Three attempts generator start unit, (if not included in the generator control system).

6. Full engine protection to include low oil pressure, high oil temperature, high temperature, low coolant level, engine over speed, engine under speed, low battery charge. (if not included in the generator control system).

7. Electric jacket water heater with built in thermostat to keep coolant at a constant temperature of at least 50 C.

8. Fully automatic battery charge 15A with automatic trickle/Boost switching.

9. One selector switch with OFF, MAINS, AUTO, TRANSFER position for A.T.S. functions.

10. One set of indication lamps for mains and generator supply and on-load.

11. Complete set of wiring, power and control terminals, labels and documentation for above items.

12. European enclosure made from 2mm sheet metal, wall mounted size 2000x1200x400mm W.D.H. floor standing, complete with front door locks and insulation protection degree to IP55.

PART 3 - EXECUTION

3.1 INSTALLATION

A. **GENERAL**

1. The engine and generator shall be properly aligned and mounted on a common steel base through resilient mountings to prevent vibrations. The whole set shall be fixed on the concrete slabs through suitable number of adjustable spring type vibration isolators. Foundation and other builder's work shall be as recommended by the manufacturer and approved by the Engineer.
2. Except as may be described in this Section or shown on the drawings carry out installation strictly in accordance with the manufacturer's recommendation.

B. Control Boards

1. Run all outgoing cables from the generator to the control boards in the floor trench as indicated on the Drawings.

3.02 PAINT WORK

A. Paint work of each set shall be of the highest quality to withstand the worst weather conditions specified. All steel works such as tanks, pipes, frames, louvers, ladders, platforms, etc… Shall be given two undercoats of anti-rust paint and two enamel finishing.

3.03 SITE QUALITY CONTROL

A. Final Testing

1. The Engine manufacturer’s qualified representative in the presence of the Engineer shall carry out testing at full load after completion of installation.
2. If the above cannot be done then testing shall be done at the manufacturer/supplier's premises at full load in the presence of the Engineer. All arrangement and costs incurred by such a test shall be responsibility of the Sub-Contractor.

3.04 DETAILS OF PROPOSED EQUIPMENTS FOR D/G SET

To be filled and signed by Tenderer and submitted with the offer with supportive engineering catalogues, otherwise the offer may not be considered:

A Generating set

Generating set Assembler's Name and Address : ----------

Diesel Engine Manufacturer's Name and Address : ----------

Type of Engine & Model No. : ----------

No. Offered Output : ----------

B.H.P. at N.T.P. : ----------

Derating Factor : ----------

No. Of Cylinders : ----------

Engine Cycle : ----------

Revolutions - R.P.M : ----------

Bore x Stroke (mm x mm) : ----------

Mean Effective Pressure (kg/cm2) : ----------

Fuel Consumption

At full load g/k W.H. : ----------

At half load g/k W.H. : ----------

Lub. Oil temp. at full rated output : ----------

Design working range of cooling under Specific conditions : ----------

Jacket water temp..Deg.C : ----------

Max. Outlet cooling water. temp. From engine at full rated output when air temp.inlet to radiator is 120 Deg.F` : ----------

Safety control setting of cooling water outlet temperature Deg.C. : ----------

Type of Governor : ----------

Weight : ----------

Engine (Kg) : ----------

Alternator (Kg) : ----------

Complete set (Engine + Alternator + Common bed) (Kg) : ----------

Dimensions

Overall length of set (ft) : ----------

Overall width of set (ft) : ----------

Overall height of set (ft) : ----------

B. Cooling Water System

i. Radiator : ----------

Manufacturer's Name and Address : ----------

Location of Radiator : ----------

Tube material : ----------

Fin or fin core mat : ----------

Cooling water outlet temp. Deg.F from radiator at full rated output & worst conditions of 120 Deg.F. air to radiator : ----------

Whether guard screen provided or not ? : ----------

ii Radiator Fan

No. of fans : ----------

Fans size in dia. mm. : ----------

Revolutional speed (r.p.m). : ----------

Air capacity - c.f.m. : ----------

B.H.P. consumed : ----------

iii Circulating Cooling

Water Pump : ----------

Make & Model No. : ----------

Type : ----------

Capacity USG/M : ----------

Head in feet and Permissible r.p.m : ----------

B.H.P. consumed : ----------

Method of drive : ----------

C. Fuel Daily Service Tanks

Dimensions -

Height- cms. : ----------

Width - cms. : ----------

	Depth - cms.	: ----------
	Storage capacity gallons	: ----------
	Material	: ----------

D. Alternator

	Manufacturer's Name & Address.	: ----------
	Model No.	: ----------
	Rated voltage	: ----------
	Rated frequency-Hz.	: ----------
	Power factor	: ----------
	Rated output in KVA at N.T.P.	: ----------
	Rated output in KVA under Jordan conditions (55 Deg.C ambient temperature)	: ----------
	Rated current amp.	: ----------
	Efficiency - %	: ----------
	Speed - r.p.m.	: ----------
	Type (brush or brushless)	: ----------
	Class of insulation	: ----------
	Maximum temp. rise (Deg.C)	: ----------

E. Exciter

	Manufacturer's Name & Address	: ----------
	A.C. generator of self excited & rotating rectifier	: ----------
	Max. temp. rise Deg.C	: ----------
	Enclosure	: ----------
	Class of insulation	: ----------
	Type of rectifying elements of rectifier	: ----------

F. A.T.S.

1	Manufacturer's Name and Address	: ----------
	Model No.	: ----------
2	Dimensions	: ----------
	Height (cms)	: ----------

	Width (cms)	: ----------
	Depth (cms)	: ----------
3	Approx.- Weight (kgs)	: ----------

G. Type of Automatic Voltage

	Regulator	: ----------

H. Starting Battery

	Manufacturer's Name & Address	: ----------
	Type	: ----------
	Terminal voltage when floating V.DC.	: ----------
	Normal capacity	: ----------
	No. Offered	: ----------

J. Battery Charger

	Voltage	: ----------
	No. of Phases	: ----------
	Consumption power at rated output KVA	: ----------

K. Output : ----------

	Voltage	: ----------
	Rated current amp.	: ----------

L. Instruments

	Ammeter to read the amp. Of each phase provided	YES/NO
	Frequency meter provided	YES/NO
	A/C voltmeter provided	YES/NO
	Automatic voltage regulator of the self regulating type provided	YES/NO
	Tachometer scaled in RPM with combined running hour counter provided	YES/NO
	Visual & audible alarm system for oil pressure provided	YES/NO
	Visual & audible alarm systems for high cooling water temp.	YES/NO

provided.

Visual & audible alarm system for over-speed trip provided.	YES/NO
Pyrometer with sensing elements and selector switch provided	YES/NO
Jacket cooling water inlet thermometer provided.	YES/NO
Lubricating oil outlet thermometer provided	YES/NO
Other standard gauges, thermometers, etc. provided or not. State What?	YES/NO

*** END OF SECTION ***

Item No.	DESCRIPTION	UNIT	Quantity	Unit Cost
1	**ELECTRICAL WORKS** Preamble: Cost of electrical Supply and installations shall include the following: - Electrical works including all required materials, accessories, labor, all as required according to drawings, specifications and bill of quantities. - Cutting, and pining including all making good. - Forming, or cutting holes, chases, channels etc. In reinforced concrete structure, block works or existing walls. - Plugging and screwing. - Preparation of all required workshop drawings and as built drawings as specified. - Testing electrical Supply and installations as specified including providing and personal necessary for testing, providing written certificates for testing results. - Preparation of all electrical works. - Removing all unneeded electrical Supply and installations (if any) and keeping in good condition in coordination with the engineer. - All outlets, switches, cables, wires should be labeled (numbers & tags)	Service/Unit	1	
2	**Generator 60KVA** Supply, install, test and commission, 60KVA Stand-by Diesel Generator set with control panel including all equipment and accessories, as specified in the specifications. The Generator shall be equipped with automatic fuel filling system, fuel gear pump, exhaust SUPER Silencer, battery charger, jacket heater, built in fuel tank, factory made weather and sound proof canopy, remote annunciator all controls and tools set, all cabling within the canopy, The unit price shall also includes main fuel tank with all required piping, fittings and accessories needed for automatic full filling to complete the work as per specifications and supervision engineer.Gen Set capacity 60KVA with Original Canopy. Type Asqsa, Perkins, cucruva or equivalent	Unit	1	
TOTAL				

المجموع الكلي بالأرقام: _____

المجموع الكلي بالكلمات: _____

اسم المورد/الشركة: _____

العنوان: _____

مدة التسليم من تاريخ أمر المباشرة: _____

رقم الهاتف: _____

رقم الفاكس _____

اسم الشخص المخول بالتوقيع: _____

ختم الشركة وتوقيع الشخص المخول: _____