

SOTR FOR REQUIREMENTS FOR 6 KW EMERGENCY DG

1. General Requirements

S NO.	DESCRIPTION	QTY.
A	D. G. SET- Capable of developing 6 kW under extreme tropical conditions, 230 V, 1 phase, 50 HZ, 3000 rpm Diesel Generator Set (with common base frame) suitable for installation on board Naval Ship.	1 Set
B	ANTI – VIBRATION MOUNTS (Shock Mounts) of type, Make and Design approved IHQ MoD(N) for the subject Emergency D. G. Set.	1Set
C	ELECTRICAL CONTROL PANEL Suitable for the Emergency DG Set . Control panel should incorporate necessary control & protections for starting & stopping of Generator set along with instrumentation. The panel will be free standing, Bhd. / Floor mounted type. The Panel will Generally Comprise the following <ol style="list-style-type: none"> 1. AC voltmeter of suitable range 2. AC ammeter of suitable range. 3. Frequency meter of Reed type 4. Push Button for ON & OFF. 5. Indicating lamp for Set ON. 6. Switches and Fuses. 7. Cable Gland. 8. Anti-vibration Mounts of type, Make and Design approved by IHQ MoD(N) for the subject Electrical Control Panel. 9. Crimping lugs/sockets for cables. 10. AVR. 11. Battery trickle Charging Arrangement. Charger should be suitable for 230V input supply. 12. Hour-meter electrical type. 13. Any other items as is considered necessary by the supplier/ manufacturer. 	1 No.
D	ACCESSORIES: A tentative list of Auxiliaries to be supplied along with Emergency Diesel generator set are as follows: <ol style="list-style-type: none"> 1. 12 V electric starting equipment complete with starter & motor. 2. Fuel Filter. 3. Heavy Duty Filter. 4. Hour meter electrical type 5. Silencer with spark arrester. 6. Protection for High Cylinder head temperature. 7. Fuel cut-off solenoid. 8. Battery of adequate capacity with enclosure for starter. 9. Anti-condensation Heaters operating on 230V, 1 Ph, 50 Hz supply to be fitted inside the Generator to prevent condensation when generator is not working , control of which is to be fitted on the control panel, Switch indication lamp & fuses etc. 10. Mild steel fuel tank suitable for 10 hrs continuous run. 11. Base plate mild steel fabricated for mounting the DG set. 12. Any other items as is considered necessary by the supplier such as Dummy Load. 	

2. Engine Details

1)	Type	4-Stroke, Non-reversible, direct injection, naturally aspirated, air cooled. The engine to have turning gear arrangement.
2)	No. Of cylinder, Bore, Stroke, Piston displacement	To be indicated by the supplier.
3)	Fuel	Fuel oil - LSHSD (NATO F 75/F76)
4)	Rated Engine Power	To be specified by supplier.
5)	Governed Engine Speed	To be specified by supplier.
6)	Cooling	Air cooled
7)	Direction of rotation	Counter Clockwise seen from flywheel.
8)	Idle Speed Range	To be specified by supplier.
9)	Rated Engine Torque	To be specified by supplier.
10)	Starting	Battery starting (two sets) & Hand starting. Heavy duty Electric batteries of adequate Ah with battery charger storage box to be provided. For back up starting necessary batteries along with accessories will be supplied.
11)	Governor	Hydro Mechanical governor with remote speed control
12)	Engine to be provided with following Accessories	Flexible coupling
		Flywheel to suit flexible coupling
		Flywheel housing (SAE)
		Exhaust manifold (dry type)
		Vibration damper
		Air Cleaner (dry type)
		Fuel Pump
		Governor, mechanical, variable speed
		Fuel filter
		Splash lubrication system
		Front engine support
		Safety control (with alarm) – i. Low lub oil pressure / ii. Indication for cause of trip
		Silencer with spark arrestor
		Check valve in fuel lines
		Fuel hoses
		Flexible connections
Starter Switch		
Lubricating Oil Pressure gauge Lubricating Oil Temperature gauge		

13)	Instrument panel mounted on engine consisting of	Tacho hour meter (mechanical-engine mounted)
		Lubricating Oil pressure gauge
		Lubricating Oil temperature gauge (electrical)
		Tacho meter (electrical)
14)	Silencer with spark arrester	Minimum 35 db
15)	Tool Kit	1 set
16)	Operation	Local / starting & stopping.

3. Diesel Engine Systems

The diesel engine shall consist of the following systems:-

- (a) **Fuel Oil System** The Fuel oil system shall mainly consists of:
- Fuel pumps
 - Fuel filter
 - Necessary Flexible hoses & other accessories.
- (b) **Lube Oil System** The lube oil system should mainly consists of:
- Oil filter & dip stick
- (c) **Cooling System** The cooling system should mainly consist of:
- Air cleaner (element type)
- (d) **Starting System** The starting system should mainly consists of :
- i) **Hand starting**
 - ii) **BATTERY STARTING (two sets):**
 - 12V Battery
 - Heavy duty Electric batteries of adequate Ah with battery charger storage box to be provided.
 - For back up starting necessary batteries along with accessories will be supplied.
- (e) **Air Intake And Exhaust System** The air intake & exhaust gas system should mainly consists of:
- Air cleaners.
 - Air intake manifold
 - Exhaust manifold with supports.
 - Expansion bellows & 35 db silencer with spark arresters
 - Flexible exhaust fitting, stainless steel with DIN connections & packing
 - Counter flanges, gaskets, bolts & nuts
- (f) **Instrument Panel** Engine mounted with
- Oil pressure gauge.
 - Fuel pressure gauge.
 - Service meter.
 - Tachometer.
- (g) **Miscellaneous** Engine & Generator to include the following: -
- Air pressure regulators

4. Technical specification of Generators :

The generators are to be manufactured to the following specifications:

(a)	Prime Mover	Diesel Engine.
(b)	No of poles	2 pole
(c)	Rating	7.5 kVA at 0.8 p.f. (6.00 kW)
(d)	Rated Voltage	230 Volts.
(e)	Phase	1 phase.
(f)	Frequency	50 Hz.
(g)	Power Factor	0.8 pf. Lag.
(h)	Voltage Regulation	± 2.5% at 0.8 P. F.
(i)	Duty	Continuous (Type S1)
(j)	Enclosure	IP 55
(k)	Class of insulation	Class " F " for Starter & Motor
(l)	Direction of rotation	Clockwise looking from driving end
(m)	Governing Specification	IS 4722
(n)	Efficiency of Generator	95% for all Loads from 50 to 100 %

5. Type test on Electrical Equipment :

The equipment is to undergo type testing if not tested before. All tests required are to be carried out as per JSS-55555 and a report submitted to naval Inspection Agencies. Type tests shall be carried out on electrical equipment as per table below:

Sr. No.	TEST	SPECIFICATION	TEST CONDITION /SEVERITY
1	Vibration	JSS 55555 - Test 28	5 – 33 Hz
2	High Temperature	JSS 55555 - Test 17	55 deg C for 16 Hrs. Procedure 5, Test Condition 'G'
3	Damp heat	JSS 55555 - Test 10	40 deg C – 95 deg C RH for 16 Hrs
4	Drip proof	JSS 55555 - Test 11	Vertical Water drip 1 m height for 15 min
5	Mould growth	JSS 55555 - Test 21	29 ° C 90 % RH mould growth chamber for 28 days
6	Bump	JSS 55555 - Test 5	1000 bumps – 40 G, 6 m/sec
7	Shock / Impact	JSS 55555 - Test 24	As per laid down Specifications
8	Inclination/ Tilt	CL 0563 Sec 19	
9	Ship Motion		
10	EMI/EMC	MIL-STD 461 E	

6. Tilt test :

As per environmental conditions The equipment is to be run for one hour with 20 ° tilt in each direction. All parameters are to be checked after 1 HOUR.

7. Factory Acceptance Test (FAT)

It includes the Preliminary Test followed by the Proving Run.

Preliminary Test: Equipment is to be run at full load for 6 hrs at various power settings and following parameters checked.

- (a) Winding resistance.
- (b) Temperature rise.
- (c) Insulation resistance.
- (d) Voltage range.
- (e) Operation of protective devices.
- (f) Self-induced noise and vibration production test.
- (g) Short-circuit.
- (h) Efficiency
- (i) All other technical parameters.

Proving Run The equipment is to be run continuously for 24 Hrs. and all parameters recorded hourly. All parameters need to be recorded every hour. Noise and Vibration readings to be recorded. Capacity test and starting test on motor is to be carried out. Subsequently, the equipment is to be thoroughly examined as after the endurance run. System tests are to be carried out in the presence of inspecting authority.

Overall tests to establish the dynamic performance and servo stability of the control system are to be carried out at the manufacturers works. A complete test schedule is to be provided by the manufacturer well in advance of the Tests.

8.Noise Requirement

The measurement & acceptance criteria should be as per type 2 of the "MIL-STD-740-2".

The maximum acceptable vibration levels measured as acceleration dB ref 1e-5m/s², As per MIL-STD-740-2.