

**“ENCLOSER TO PRQD/000987/10-11, Dt.16-6-2010”**  
**HINDUSTAN SHIPYARD LIMITED: : VISAKHAPATNAM**  
**TECHNICAL SPECIFICATION FOR SUPPLY OF TROLLEY MOUNTED 1000 Kw LOAD BANK.**  
**(WATER LOAD RHEOSTAT)**

**Scope:**

The tenderer shall quote for supply of one number Trolley mounted load bank (Water load rheostat) as per the technical details given below.

**Guarantee:**

The supplied equipment, including accessories if supplied shall be guaranteed for a minimum period of 12 months from the date of commissioning. The equipment shall be repaired/replaced at HSL site within a reasonable period free of cost during the guarantee period against any defect/poor performance noticed.

**Drawings/Certificates:**

Five sets of as fitted drawings, Operation and Maintenance manuals with component details, wiring diagram and spares details shall be supplied along with the equipment. Detailed drawing shall be enclosed to the technical offer. Shop trial reports / Test certificates shall be supplied with the equipment.

**General:**

Supplier shall be fully responsible for the design, workmanship and performance of the equipment supplied. All the material used shall be of reputed make, other than specified.

The equipment shall be offered for pre-dispatch inspection by officer of HSL at manufacturer's premises. Supplier shall make their own arrangement for making necessary testing facility at their works/premises for conducting performance trials during pre-dispatch inspection.

The successful tenderer shall submit detailed construction drawing for approval by HSL, before starting actual construction of the load bank.

**Purpose:**

The load bank is intended for using continuously circulating sea water as electrolyte for testing power output of diesel Alternators/Gas turbine alternator. The rheostat shall provide a continuous three phase 415 volts A.C. load of 1000 Kw maximum variable from 100 Kw onwards and allow 10% over load for one hour, without causing the water to boil away. Variation of load shall be possible smoothly. All precautions shall be taken to prevent flashing between electrodes and ionization of the electrolyte due to high current densities involved. The rheostat shall be suitable for outdoor use, by providing rain canopy. All safety measures shall be incorporated for operation and to prevent corrosion.

**Construction:**

**Tank construction:**

The load bank tank shall be made of 8 mm thick solid FRP cylindrical shape tank. To ensure mechanical strength, 5 mm thick M.S. bands of suitable width shall be provided outside the tank at 500 mm intervals (approx.) and these bands shall be connected with suitable vertical M.S. angles at not less than four places. To support the cylindrical shape tank both the verticals and circular rings shall be

embedded/covered with FRP lining over and above 8 mm thick FRP tank for mechanical protection. The tank shall be mounted on a sturdy trolley, fabricated on steel channel frame. The trolley shall be provided with 4 nos. 12 inch dia hard rubber tyres wheels, in these one set of wheels shall have slew arrangement with tow bar for easy mobilization of the equipment. Jacking provision shall be arranged for the trolley to prevent it resting on the wheels at the test location. The tank shall be fitted with suitable turbulence reducer at the bottom at the entry of the sea water. The tank shall have suitable flanged connections at the bottom for entry of cool sea water and at the top for discharge of hot sea water. Suitable drain pipe shall be fitted to the tank. The tank shall be fitted with suitable float switch to detect and indicate minimum electrolyte level, thermostat to sense electrolyte temperature and indicate in case of set temperature limit is exceeded. Overall height of the rheostat assembly shall not exceed 3 to 4 meters. The capacity of the tank shall be such that it shall be possible to run the rheostat continuously for five minutes without any flow of circulating water and without the water in the tank exceeding 80° C in temperature.

### **Electrodes:**

The three electrodes of Cupra nickel tubes of suitable size shall be supported on a suitable M.S. frame through insulators and configured in Delta formation. The three electrodes shall be exactly identical in shape and area, and spaced symmetrically to ensure perfectly balanced load on the three phases. The electrode assembly shall be lowered and raised by means of M.S. fabricated arm sliding on a vertical post fixed on the trolley platform, for controlling the dissipation from 100 Kw to 1000 Kw. All-round cage shall be provided on the trolley to ensure safety.

### **Motorized drive:**

The M.S. fabricated arm carrying the electrodes shall be raised and lowered by means of motorized winch gear box and clutch arrangement with limit switches. The motor shall be of suitable capacity and totally enclosed fan cooled type operated on 415 volts +/- 10%, 3 phase, 50 Hz, A.C. supply with IP 55 protection. The entire range of variation of electrodes up – down movement shall be achieved by a lead screw and nut mechanism driven by the motor. The speed of the mechanism shall be 30cm/minute. Sheet steel clad control panel with water tight protection shall be mounted on the trolley in such a position to operate easily. Wiring between the control panel and the motor shall be arranged by the supplier and the wiring shall be mechanically protected and shall be water tight.

A separate portable control station (suitable for operation from Ship's engine room) shall be supplied for remote controlling. This may be in tough plastic housing or die cast aluminum or painted sheet steel box. The stations shall contain "raise" and "lower", On & Off push buttons, supply availability indicator lamp. The remote control unit shall be wired and terminated to a multi pin plug and a suitable plug socket shall be provided on the trolley control panel for plugging the remote control unit.

A manual crank arrangement shall be provided for emergency operation through worm gear to ensure slow immersion of the electrodes. Braking arrangement shall be provided so that the electrodes can be held at any desired position.

**Main cable connections:** The current take of connections shall be made at the top of the electrodes by flexible leads of adequate length and terminated on copper bus

bars (through load braking contactors) fixed on the trolley on proper insulator supports, to enable external cables to be connected conveniently. Each bus shall be fitted with 8 nos studs with nuts, washers and spring washers to connect 8 nos. single core 120 Sq. mm cable (Copper conductor) for each phase.

**Circulating water pumps:** One number centrifugal pump set of suitable capacity driven by electric motor shall be fitted on the trolley platform to suck sea water from a depth of 6 Mtrs. and to deliver into the tank of the load bank to ensure continuous renewal of sea water in to the tank. Flexible hose pipe connection on the suction side of pump along with foot valve shall be provided.

The drive motor shall be of TEFC construction, class "F" insulation and suitable for use on 415 volts +/- 10%, 3 phase, 50 Hz, A.C. supply with IP 55 protection.

Suitable DOL starter for both the motors shall be provided.

Suitable outlet pipe with control valve to discharge hot sea water from the tank shall be provided. It should be possible to maintain constant sea water level in the tank by throttling the valve so that the quantity of inlet water just compensates the outlet water.

Two separate and distinct terminals shall be provided on the platform to earth the entire set up.

**Circuit Braking facility:**

A three pole motorized circuit breaker with shunt trip, and with remote push button station for connecting/disconnecting the load from MSB shall be arranged, suitable for continuously carrying and braking of 1000 Kw resistance load 415 volts +/- 10%, 3 phase, 50 Hz., shall be fitted on the trolley platform. Incoming leads of the contactors/MCB shall be connected to the electrodes by flexible cables, while the out going terminals shall be connected to the bus bar from where external connections would be taken. The contactor/MCB shall be housed in a suitable ventilated housing. Control circuit voltage of the contactor/MCB shall be 230 volts, 50 Hz. A.C. supply, which shall be derived by providing suitable transformers. Suitable over load and Short circuit tripping arrangement, Voltmeter and Ammeters in each phase with necessary CTs shall be provided in the control panel circuit of main contactor/MCB.

**Testing:**

The load bank shall be tested on full load at HSL and the supplier shall depute their engineer at their cost to demonstrate for the satisfactory operation of the load bank with all auxiliary equipment. If any modifications are found necessary to be made, basing on the performance, the supplier shall incorporate such changes in good time without claiming any extra cost.

**Principal items:**

- 1 no. Electrolyte tank to contain suitable solution of electrolyte, mounted on trolley.
- 1 set Cupra nickel moving electrodes.
- 1 no. Servo motor drive system for operation of electrodes movement with limit switches.
- 1 no. Motorized Isolating mechanism with remote control system.
- 1 no. Control panel mounted on the trolley with safety protections, meters etc.