

BATTERY SUPPLY SYSTEM

PART 1 – GENERAL

1.01 WORK DESCRIPTION

- A. This section specifies the engineering, supply, delivery to site, installation, testing, commissioning and maintenance of Battery Supply System as described in the Content.
- B. The Battery Supply System shall consist of rectifier/battery charger, batteries, protective devices and accessories as specified herein that will automatically maintain the continuity of DC electrical power within specified tolerances, without interruption, upon failure or deterioration of the normal power supply. Continuity of DC electric power to the load shall be maintained during the power failure period with the supplied by the batteries, for the duration as specified or until restoration of the normal power supply as required to meet the Civil Defence code requirement.
- C. The Battery Supply System shall be manufactured in a modular way so as to enable the power of the Battery Supply System installed to be easily increased on the site by paralleling more than one module to meet the new operating requirements and the desired reliability. In this connection, transformation of a unitary module into a multi-module configuration shall be able to be carried out directly on site without returning the equipment to the factory for modification and with a minimum installation down time.
- D. Single module system shall have the rectifier / charger and all the necessary monitoring and control functions contained in a single metallic cabinet. Multi-module system shall have separate cabinet containing the rectifier / charger and the necessary monitoring and control functions for each module, and with a separate dedicated cabinet to house the system control and monitoring functions.
- E. All equipment except portable equipment shall be firmly held in place. Fastenings and supports shall be adequate to support their loads with a minimum safety factor of three (3) times.

1.02 STANDARDS

- A. The complete Battery Supply System shall be engineering and constructed in accordance with the latest revision of the appropriate standards of BS/IEC/ IS.
- B. The manufacturing of the cable shall also conform to the requirements of all relevant local codes, as applicable, together with the additional requirements referred to in this Specification and Drawings, whichever is the more stringent and acceptable to the Engineer
- C. In the adoption of standards and requirements, the Contractor shall take the following precedence:
 1. Engineer's decision;
 2. Local codes of practice;
 3. Drawings;
 4. Specification;
 5. International standards and requirements.

1.3 QUALITY ASSURANCE

- A. Battery Supply System ratings shall be the final effective values after the application of all appropriate derating factors. These ratings shall be adjusted to suit local conditions, viz. maximum room temperature, etc.
- B. All battery shall be heavy duty type of minimum life span of 5 years.

1.04 SUBMISSION

- A. All technical submissions shall be approved by the Engineer prior to the respective stages of construction.
- B. As a minimum requirement, the submission shall include the following:
 - 1. Equipment submission with manufacturer's data;
 - 2. Shop Drawings sharing the co-coordinated installation detail and control block diagram
 - 3. Builder's works requirement;
 - 4. Battery arrangement and manufacturer confirmation on "zero" gas emission by battery to meet Civil Defense code without separate room ventilation requirement.

PART 2 – PRODUCT

2.01 BATTERY UNITS

- A. Each Battery Supply System shall be provided with a charger and battery unit.
- B. The battery shall have sufficient capability to perform the function with safety factor of 1.2. When sizing the AH capacity of the battery, the effect of ageing shall be taken into consideration.
- C. The AH capacity of the battery supplied shall be greater than the calculated AH requirement, but shall not be less than 20 AH. Every if the calculated AH requirement is less than 20 AH; the battery must still be rated at 20 AH.
- D. The charger shall have sufficient capacity to restore a depleted battery to 80% full capacity in less than 8 hours.
- E. Each battery unit shall consist of nickel-cadmium cells. The nickel cadmium cell shall comply with requirements specified in IEC 623. The nominal capacity in ampere-hours shall be the capacity for five-hour discharge (C_5). The cell shall be of a type suitable for medium rate or high rate discharge (i.e. rate of discharge = $3 C_5$ to $7 C_5$) Cells of low rate of discharge is not acceptable.
- F. The compartment housing the electrical and electronic components shall be the top compartment and shall be fully segregated from the bottom compartment which shall contain the cells. Both compartments shall be well ventilated. If the cells are arranged in two or more rows, the rows shall be constructed in steps such as the maximum and minimum electrolyte level markings of each cell shall be visible looking from the front. At least 300 mm clearance from the top of the cells of the top row shall be provided to facilitate maintenance.
- G. The charger shall be manufactured to provide a well regulated DC supply to the load while float-charging or quick-charging the battery. The charger shall be the constant potential current limiting fully automatic type. The charger shall automatically switch to float-charge after the battery is restored to 80% of its nominal capacity under quick-charge. Quick-charge shall be "ON" automatically after an emergency discharge and the duration of quick-charge shall be less than 8 hours.
- H. The float charge voltage shall be adjusted to give minimum electrolyte/water consumption and long maintenance interval. The float charge voltage shall not vary by more than $\pm 2\%$ of the set value irrespective of AC input voltage variation of $\pm 10\%$ and of load variations from 0% to 100%. The rms ripple voltage across the battery shall not exceed 1% of the nominal output voltage.
- I. The charger shall be protected against low battery voltage and short circuit at the output by employing current limiting feature. It shall also be protected against reverse battery voltage. High speed fuses shall be used for protection on DC output, transformer secondary, rectified or Thyristor stack.

- J. The charger shall be manufactured to operate continuously at a temperature of 50°C. To ensure long service life for the charger, all semi-conducting devices (e.g. diodes, SCR, transistors, integrated circuits) shall be of military grade.
- K. The following instruments and control shall be provided on the charges:
1. Mains on/off input circuit breaker with "Mains On: neon or LED indicator".
 2. Boost selector switch.
 3. On/Off push button for quick checking of the condition/capacity (good/bad indication) of the battery. When the push button is depressed the battery shall be allowed to discharge through a resistor for duration of three seconds. If the voltage drop is negligible for that duration the battery shall be considered as in Good condition.
 4. Voltmeter to measure charger/battery output.
 5. Ammeter to measure charger output.
 6. Earth fault alarm indication.
 7. Under voltage alarm indication.
 8. Charger failure alarm indication.
 9. Low electrolyte level alarm indication.
 10. Terminals for outgoing DC bus wires to the switchboard and for incoming AC supply.
 11. All visual alarm indication shall be of the LED type with its function clearly indicated. The use of embossing tape for labelling is not acceptable.
- L. The following items shall be supplied:
1. Hydrometer and thermometer.
 2. Special tools and fittings required to assemble the battery.
 3. Two litres of distilled water and battery filler.
 4. A tin of petroleum jelly.

2.02 A.C/D.C CONTROL PANEL

- A. A main A.C. panel shall be provided for the control of all the A.C circuits.
- B. The panel shall be suitably rated for the size of the Battery Supply System.
- C. The panel shall be an ON-OFF switch with fuse protection with suitable terminals for an incoming supply lead and outgoing bus wires to the Battery Supply System.
- D. The A.C control panel may be accommodated in the same cabinet of the Battery Supply System.
- E. Suitable rating MCBs and terminals for an incoming supply lead and outgoing bus wires to the Battery Supply System switchboard shall be provided.
- F. The AC control panel may be accommodated in the same cabinet as the controls for the battery charger. All outgoing circuits e.g. DC control circuits, motor charging circuit, etc. shall be protected by miniature circuit breakers. A spare outgoing AC sub-circuit controlled by MCB shall be incorporated in the battery charger unit.
- G. The function of each MCB shall be clearly indicated and the labelling shall be riveted to the enclosure. A spare outgoing DC circuit shall be provided at each battery charger unit and the labelling of its function to be carried out by the Contractor.

2.03 CONNECTING CABLES

- A. Connecting cables between the load and battery unit shall be neatly run on cable trays supplied by the Contractors.
- B. The connecting cables between the load and battery unit shall be at least 4 mm in size and shall be run in a ring configuration. Physically, the cables for entry and exit of the same loop should not be the same. All wiring and termination of connecting cables shall be carried out by the Contractor. Conductors used for AC and DC circuits shall not be mixed in the same multi-conductor cable.

PART 3 – EXECUTION

- A. The contractor shall provide properly qualified installation and commissioning personnel and a sufficient number of properly qualified erectors to carry out the work. The erection commissioning personnel and erector shall be subject to Engineer's approval. The contractor shall, upon the request of the Engineer, remove any erection and commissioning personnel or erector who, in the Engineer's opinion, is incompetent or has been conducting himself improperly and shall replace the commissioning personnel or erector so removed with another acceptable to the Engineer.
- B. The erection and commissioning personnel shall represent the contractor on the site and directions given to him shall be deemed to be given to the contractor. It is the contractor's responsibility to provide efficient and continuous supervision of the work at site.

END OF SECTION