



**DELHI METRO RAIL CORPORATION LIMITED**

***DMRC ELECTRICAL STANDARDS &  
DESIGN WING (DESDW)***

**SPECIFICATION NO.  
DMES-E/0009/ DMRC-E-E&M-TUBULAR-01**

**SPECIFICATIONS FOR SUPPLY, INSTALLATION,  
TESTING & COMMISSIONING OF TUBULAR  
BATTERIES**

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**DELHI METRO RAIL CORPORATION LTD.  
7<sup>th</sup> Floor, B-Wing, Metro Bhawan, Fire Brigade Lane,  
Barakhamba Road, New Delhi –110 001.**



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1. Detailed Description and Application in DMRC

1.1 This specification covers the design, manufacture, testing at manufacturer's works, packing, supply and delivery to site of Tubular type lead-acid stationary batteries in Monobloc container and associated accessories for indoor installation. Supervision of erection and commissioning of the battery bank shall have to be undertaken on mutual acceptance as per the terms and conditions for the same, if required.

2. Governing Specifications

2.1 The tubular batteries shall comply with the governing specification, as given in the table below:

TUBULAR BATTERIES	
Stationary lead acid batteries (with tubular positive plates) in monobloc containers	IS- 13369-1992 or latest
Water for storage batteries	IS-1069 or latest
Sulphuric acid for storage batteries	IS-266 or latest
Specification for rubber and plastics container for lead Acid storage batteries	IS-1146 or latest
Synthetic separator for lead acid batteries	IS-6071 or latest

3. Requirements

All the requirements shall be as per IS 13369. Any additional or specific requirements are as follows:

3.1 Constructional Requirements

3.1.1 Type: The battery shall be lead acid Tubular type in Monobloc container. The cells of the batteries shall be similar in type and shape. The batteries should preferably be of 12 volts.

3.1.2 Cell Lids:

It should be easily removable, if the need arises. The material shall conform to IS-1146.

3.1.3 Connectors and fasteners (Flexible):

Connectors should be adequately designed to carry maximum duty cycle as specified and shall offer minimum resistance. While considering the terminal voltage of the cell at the time of Testing for discharge, the voltage drop due to inter-row and inter-cell



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connectors shall be considered. Connectors shall be adequately designed to withstand various stresses due to temperature changes, attack of acid and dynamic forces that could occur during the operation of the battery. Fasteners should be made of suitable material such as copper, brass, stainless steel or any to prevent corrosion.

**3.1.4 Electrolyte:**

Required quantity of electrolyte for the initial filling with 10% extra quantity shall be supplied in non-degradable acid resistant strong plastic containers.

**3.1.5 Terminal Post:**

All metal parts of the terminals shall be of lead coated type. Bolts, heads and nuts, except seal nuts, shall be lead coated. The junction between terminal posts and cover and between the cover and container shall be adequately sealed to prevent any seepage of the electrolyte. All terminals shall be provided with insulated covers.

**3.1.6 Ampere – Hour Rating:**

The rating assigned to the cell or battery shall be the capacity expressed in ampere hours (after correction to 25 degree C) stated by the manufacturer, to be obtainable when the cell or battery is discharge at the 10 hour rate to the end voltage of 1.80 volts per cell.

Expected life of battery under	10 Years
Normal operation & maintenance	
Condition	

**3.1.7 Temperature Correction:**

The capacity of the cell shall be corrected to 25°C using the proper temperature correction factor pertaining to the type of the cell and the rate of discharge. The temperature correction should be made using factors supplied by the manufacturer but shall generally conform to some national or international standard for the similar type of cell.

**3.1.8 Design margin:**

The design margin for the battery shall be 10%.

**3.1.9 Ageing factor:**

An ageing factor of 25% shall be considered.



#### 4. **Additional Requirements**

##### 4.1 **Service condition:-**

The battery is required to work at ambient temperatures up to 45 degree C.

##### 4.2 **Battery rack:**

The battery racks shall be constructed from good quality of high strength good quality mild steel sections. These battery racks shall be painted with two coats of acid/ alkali resistant paint of approved make. The racks shall be of Single tier/ two tier construction depending on the final layout based on space availability.

##### 4.3 **Marking:**

Each cell shall be marked to meet the requirements of relevant Indian standards. In addition, each cell shall be legibly numbered serially to identify the cell during manufacture, testing, installation and operation of battery to identify after having assembled into battery bank in battery racks.

The marking shall be provided as per IS 13369. A set of loose stickers shall be provided to mark the cells position in the assembled battery bank at site so that a cell removed for maintenance can be put back in original position.

4.4 The bidder should Provide onsite replacement warranty for 60 months including Free Preventive & corrective Maintenance for the warranty period.

#### 5. **Safety**

##### 5.1 **Battery Protection and charge controller**

5.1.1 The battery bank shall be protected from internal fault by a circuit breaker. The battery circuit breaker installed at the battery room should be complete with a metal enclosure conforming to an Ingress Protection Classification of IP 54.

5.1.2 The UPS shall be automatically disconnected from the battery bank when the discharge limits of volts per cell are reached, or when signaled by other control functions.

5.1.3 Temperature monitoring equipment shall be incorporated in the UPS system to optimize the charger voltage as a function of battery room temperature, to generate alarm in case of room temperature exceeding the preset permissible temperature and to predict the battery backup time.

6. **System efficiency:** Shall be as per IS 13369.



**7. Reliability**

The service life of batteries shall be 8-10 years. The manufacturer shall submit details of maintenance required by batteries to ensure long service life.

**8. Special condition**

A representative from the side of battery manufacturer should be present during commissioning of UPS and battery bank so as to ensure that the DC link voltage set by the UPS manufacturer is as per the requirement of battery bank. The battery manufacturer shall also certify that whether commissioning done at site is satisfactory.

**9. Testing**

9.1 The manufacturer of the batteries must have type test certificates, from an accredited third party, for all the tests specified IS 13369 and shall not be more than five years old.

9.2 In case, these are not available, manufacturer will be required to get these tests executed from an accredited third party.

9.3 The factory acceptance tests shall be done in accordance with IS 13369. The equipment shall be dispatched after testing in presence of authorized representative of purchaser.

9.4 The manufacture representative shall be available at the time of commissioning of batteries at site. The manufacture shall issue a certificate to the affect that the batteries have been installed and commissioned as per his approved scheme for the purpose.