

**SECTION-III****TECHNICAL SPECIFICATION FOR 110V- 120 AH MAINTENANCE FREE BATTERY SETS AGAINST TN-2372****1.0 SCOPE:**

The specification covers design, manufacture/ fabrication shop test and offer for inspection, testing and checking before delivery of lead acid maintenance free battery sets along with accessories duly packed suitable for indoor installation at various Grid Sub Station in Jaipur Discom. These equipments are to be completed in every respect, details to the functions designated and to the entire satisfaction of the purchaser.

It is required that the supplier in accepting the contract agrees to furnish all apparatus, appliances and material whether specifically mentioned or not but which may be found necessary to complete to perform and testing any of the herein specified equipment(s) for compliance with the requirements implied without extra charges. The erection/ maintenance tools and specific tools if any will also form part of supply.

Consideration may be given by the purchaser to alternatives which the supplier considers advisable by reason of his own manufacturing requirements and experience, provided descriptive matter is submitted pointing out the recommended device or arrangements equal to or superior to that required by the accompanying specification with full justification.

**2. CLIMATIC CONDITIONS:**

i	Peak ambient temperature in shade	50 Degree C
ii	Maximum average ambient temperature in a 24 hours period in shade.	40 Degree C
iii	Maximum yearly weighted average ambient temperature	35 Degree C
iv	Maximum temperature attainable by an object exposed to sun.	60 degree C
v.	Maximum relative humidity.	100%
vi	v) Average number of thunder storm days per annum.	40
vii	Average number of rainy days per annum.	100
viii	Average annual rainfall	10-100 cm
ix	Number of months of tropical monsoon conditions	4 months
x	Maximum wind pressure.	100 Kg/Sq.m
xi	Altitudes	Not exceeding 1000 mtrs.

### **3.0 STANDARDS:**

All material and equipments used for battery set shall comply in all respect with the requirements of the latest edition of the relevant Standards. The tenderer shall quote for sealed maintenance free batteries complying to relevant standard of BS-6290 (Part-IV) 1997 and IEC 896-2/BSEN6089.2, IEEE-1188/1189. Equipment meeting the requirements of any other authoritative standards which ensures a quality equal to or better than that as per the standards mentioned above, shall also be acceptable. Where the equipment conforms to any other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the tender.

### **4.0 PRINCIPAL PARAMETERS:**

The Battery sets to be supplied by the supplier shall meet the requirement of BS-6290(Part-IV)1997 and IEC 896-2 / BSEN6089.2, IEEE-1188/1189 with latest edition or equivalent and shall be suitable for continuous operation for the climatic conditions specified in the specification. The batteries shall be suitable for float quick charging. The floating voltage shall be regulated to within 1% of the normal voltage when the required load is discharged by the battery.

Battery sets shall be maintenance free, sealed type in thermoplastic containers with minimum expected life of 15 years. The batteries shall include battery mounting racks and other equipment required to provide a complete operational battery sub system. Battery sets shall be capable of operating at a peak ambient temperature of 50 Deg.C. without degradation of performance and deterioration of expected life. The average ambient temperature shall be 35 Deg.C.. The offered battery shall be compact and shall require no regular maintenance. All safety equipment required for installation shall be provided by the manufacturer.

Depending upon the situation, the batteries may be required to provide a back-up for 8, 24 or 48 hours. The Bidder shall furnish detail battery sizing calculations along with all arrangements and supporting structures, for each type of DC supply units being proposed, along with the bid. In all cases the battery is normally not allowed to discharge beyond 80% of rated capacity of the battery at 10 hours rate of discharge.

The manufacturer supplying the cells/batteries as per this document shall be responsible to replace/repair free of charge, the battery/cell becoming faulty, owing to defective workmanship or material as per the provisions of the bid document.

All electrical and mechanical equipments shall be designed and manufactured so that no damage will result in transportation, installation and operation of the equipment under the climatic conditions to which it will be subjected.

#### **4.1. SPARES:**

The tenderer shall also state in his tender the spares required for normal operation for a period of 5 years. Each spare shall be individually packed and marked both the part number (where applicable) as well as the description of item. Item-wise prices of spares be listed in the tender. The quantity of spare parts recommended for procurement for 5 years of normal operation shall be stated in the tender.

### **5.0 MATERIAL AND CONSTRUCTION:**

#### **5.1 GENERAL :**

The storage batteries should be fabricated with Flat pasted type positive plates and Flat pasted type negative plates as per relevant Standards and shall be assembled in hard containers of durable and robust construction.

The design of battery shall be as per field proven practices. Partial plating of cells is not permitted. Paralleling of cells externally for enhancement of capacity is not permitted. The cells shall be so designed to be suitable for Horizontal Stacking.

#### **5.2 CONTAINERS :**

The containers material shall have chemical and electro-chemical compatibility and shall be acid resistant. The material shall meet all the requirements of VRLA batteries and be consistent with the life of battery. The container shall be fire retardant and shall have an Oxygen Index of at least 28%. The porosity of the container shall be such as not to allow any gases to escape except from the regulation valve. The tensile strength of the material of the container shall be such as to handle the internal cell pressure of the cells in the worst working condition. Cell shall not show any deformity or bulge on the sides under all working conditions. The container shall be capable of withstanding the rigours of transport, storage and handling. The containers shall be enclosed in a steel tray.

#### **5.3 CELL COVERS:**

The cell covers shall be made of suitable material compatible with the container material and permanently sealed with the container. It shall be capable to

withstand internal pressure without bulging or cracking. It shall also be fire retardant and shall comply with the provisions set forth in clause of 5.2 above. Fixing of Pressure Regulation Valve & terminal posts in the cover shall be such that the seepage of electrolyte, gas escapes and entry of electro-static spark are prevented.

#### 5.4 PRESSURE REGULATION VALVE :

Each cell shall be provided with a pressure regulation valve. The valve shall be self re-sealable and flame retardant. The valve unit shall be such that it can not be opened without a proper tool. The valve shall be capable to withstand the internal cell pressure specified by the manufacturer.

#### 5.5 TERMINAL POSTS :

Both the positive and negative terminals of the cells shall be capable of proper termination and shall ensure its consistency with the life of the battery. The surface of the terminal post extending above the cell cover including bolt hole shall be coated with an acid resistant and corrosion retarding material. Terminal posts or any other metal part which is in contact with the electrolyte shall be made of the same alloy as that of the plates or of a proven material that does not have any harmful effect on cell performance. Both positive and negative posts shall be clearly and unambiguously identifiable. All exposed metal parts(connectors, terminals etc) shall be protected with heat shrinkable silicon sleeves for reducing the environmental impact including a corrosive environment.

#### 5.6 CONNECTORS,NUTS & BOLTS,HEAT SHRINKABLE SLEEVES

Where it is not possible to bolt the cell terminals directly to assemble a battery, separate non-corroding lead or copper connectors of suitable size shall be provided to enable connections of the cells. Copper connections shall be suitably lead coated to withstand corrosion due to sulphuric acid at a very high rate of charge or discharge. The area of cross-section of the connectors shall be rated at 2 Amp/sq.mm minimum at 6 hour rate of discharge. Nuts and bolts for connecting the cells shall be made of copper, brass or stainless steel. Copper or brass nuts and bolts shall be effectively lead coated to prevent corrosion. Stainless steel bolts and nuts can be used without lead coating.

All exposed metal parts (connectors, terminals etc.) shall be protected with heat shrinkable silicon sleeves for reducing the environmental impact including a corrosive environment.

### 5.7 FLAME ARRESTORS :

Each cell shall be equipped with a Flame Arrestor to defuse the Hydrogen gas escaped during charge and discharge. Material of the flame arrestor shall not affect the performance of the cell.

### 5.8 SEPARATORS:

The separators used shall be glass mat or synthetic material having high acid absorption capability, resistant to sulphuric acid and good insulating properties. The design of separators shall ensure that there is no misalignment during normal operation and handling.

### 5.9 STAND/SUPPORTING RACK:

Necessary stands/supporting racks for fixing and installing the batteries shall be supplied with cell insulators and stand insulators. These racks/stands shall be so designed that cells are placed within easy reach at convenient height to facilitate easy maintenance. Minimum number of screw should be used primarily for anchoring. The joining of the frames should not leaves crevices and ensure proper and tight fit. Necessary screws etc. should be supplied such that the racks can be fitted without any extra material. Racks shall be constructed so as to permit free access to the floor directly beneath, thus cleaning of both cells and floor is quick and simple task. Racks shall be duly painted with two (2) coats of acid resistance paint and supplied in assembled state with marking .A small quantity of loose paint shall be supplied to enable the purchaser to restore at site for any finish which may got damage during transport. One set of battery testing equipment shall be supplied for each battery sets according to BS-6290 (Part-IV-1997) & IEC-896-2/BSEN 6089.2, IEEE-1188/1189.

5.10 The 110V 120 AH battery shall be suitable for float charge working with 12 Amps load. The battery voltage shall not vary beyond 1% of the nominal voltage under float charge conditions and while discharging at 10 Hrs. Rating. The battery will be used for feeding light load in the control room when AC supply fails. The battery should be capable of float/quick charge when AC supply is restored.

### 5.11 ACCESSORIES:

Each battery set shall be supplied complete with all necessary accessories viz. Stand, inter- cell connections, cell insulators, stand insulators, cell No. plates with fixing pins, thermometer, cell testing Voltmeter (3-0-3V) complete with leads, spanners, rubber syringes, rubber gloves and apron etc.

## 6.0 RATINGS:

The rating of battery cells shall be 10 hrs. rating corrected to 27 deg.C as defined under Clause No. 4.1 of IS:1651/1991. The Ampere-hour rating for 110V battery banks shall be 120 AH. Each cell will be of 2 volts. Thus the battery bank for 110 V shall consist of 55 cells respectively.

### 6.1 DESIGNATION:

The cell shall be designated by symbol as per relevant Standards.

### 6.2 MARKING:

The following information shall be indelibly and durably marked on the outside of the cell.

- a) Nominal voltage.
- b) Manufacturer's type and trade name.
- c) AH capacity at 10 hour rate.
- d) Voltage for float operation at 20 deg.C.with tolerance of ( ) 1%.
- e) Month & Year of manufacture.
- f) Country of origin.

The cells and batteries may also be marked with the ISI certification mark, if any.

### 6.3 CAPACITY REQUIREMENT AND DIMENSIONS :

When the battery is discharged at 10 hour rate, it shall deliver 80% of C (rated capacity, corrected at 27 Deg Celsius) before any of the cells in the battery bank reaches 1.85 V/cell. The capacity (corrected at 27 Deg.Celcius) shall also not be less than 70% of C and not more than 120% of C before any cell in the battery bank reaches 1.75 V/cell.

The battery shall be capable of being recharged from the fully exhausted condition (1.75V/cell) at the specified float voltage. The battery design shall permit the charging of the battery at 2.45V/cell (when two cells shorted). All the cells in a battery shall be designed for continuous float operation at the specified float voltage throughout the life.

The battery voltage shall not be less than the following values, when a fully charged battery is put to discharge at C/10 rate.

- (a) After Six minute of discharge : 1.98V
- (b) After Six hours of discharge : 1.92V
- (c) After 8 hours of discharge : 1.85V
- (d) After 10 hours of discharge : 1.75V

The bidder shall provide the Tables & Graphs showing relation of the closed circuit voltage, impedance and the residual capacity of each cell in the battery, when it is discharged to the end voltage of 1.75V/cell at C/10 and C/8 rate of discharge. A table and graph showing the relation between the impedance and residual capacity of each cell shall also be provided by the bidder.

#### 6.4 EXPECTED BATTERY LIFE:

The battery for float applications shall be capable of giving more than 1200 DOD (upto 80%) cycles at an average temperature of 35 Deg.C Celsius. DOD (Depth of Discharge) is defined as the ratio of the quantity of electricity (in Amphere-hour) removed from a cell or battery on discharge to its rated capacity.

#### 6.5 CHEMICAL REQUIREMENTS:

Oxygen recombination efficiency of cell/battery shall be higher than 95% for charge current C/10 under normal working conditions. The cell pressure shall be sufficient for 99% gas recombination when working at C/10 rate of charge and ambient temperature of 27Deg. Celsius. Under normal operating conditions grid corrosion shall not be more than 0.05 mm/year.

Throughout its life, in the operating condition of C/10 rate of charge and C/8 rate of discharge in average ambient temperature of 35 Deg. Celcius, shedding of active material shall not lead to short circuit. The growth of positive plate shall be less than 8% of the total plate area throughout the specified life.

While operating in the normal operating conditions, the cell or battery shall not lead to dry out, throughout the life of the battery. Manufacturer shall supply the necessary data to support the requirement. The battery shall not exhibit thermal runaway while working in the average ambient temperature of 35 Deg.C, operating range of 0 to 50 Deg.C and at a charge rate of C/10 and discharge rate of C/8.

## **7.0 TESTS :**

### 7.1 Type tests:

The following tests shall constitute the type tests as per BS 6290(Part-IV)/1997, IEC:896-2/BSEN6089.2, IEEE-/1189 (latest amended):

- a) Capacity Test.
- b) Mechanical Test
- c) Short Circuit Test
- d) Ripple voltage Test.
- e) Charge retention test.
- f) Endurance test.
- g) Suitability for float operation.

The above tests shall be performed on the basic cell constituting the 110V-120 AH Battery set.

The following shall be carried out as acceptance tests :

- a) Verification of dimensions and marking and polarity test.
- b) Capacity test.
- c) Ampere-hour and Watt-hour efficiency test.

### 7.2 TYPE TEST CRITERIA :

The bidder shall furnish valid & authenticated type test certificates as mentioned at clause No. 7.1 of Scheduled-III of the Specification from a Govt./ a Govt. approved/ a Govt. recognized/ NABL Accredited Lab. / ILAC i.e. International Laboratory Accreditation Corporation (in case of foreign Laboratory) or the certificate of type test conducted at manufacturers' works duly witnessed by representative of any Electricity Board/ Nigam/ Govt. agency/ PGCIL/ NTPC of similar or higher rating of battery sets. Such type test certificates should not be older than seven years as on the date of bid opening. For this purpose, date of conducting type test will be considered.

The bidder shall furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt./ a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC accredited (in case of foreign laboratory).

The type test certificates shall be furnished either in original or copy duly attested by notary.

The bids of only those bidders shall be considered to be meeting the type test criteria who furnishes complete type test certificate with the bid as per above provision.

However, in the following cases, the bid of the bidder may be considered meeting the type test criteria if the bidder furnishes an undertaking stating that valid type test certificate from a Govt./ Govt. approved/ Govt. recognized/ NABL Accredited / ILAC Accredited laboratory or carried out at works of manufacturer duly witnessed by any Govt. agency including (PGCIL/ NTPC/ RVPN/JVVNL) of similar or higher rating and design of tendered material/ equipment shall be furnished before commencement of supplies (without asking any delivery extension) along with bank guarantee with the technical bid from a Nationalized/ Scheduled bank in prescribed proforma at Annexure-II(A) or DD/ Pay order amounting to Rs.5.0 lacs. The B.G. should be valid for minimum period of 9 months from the date of tender opening:

- i) Where one or more type test(s) is/ are older than 7 years.
- (ii) Where some changes in respect of type test procedure of existing type tests have been introduced in the relevant standard.

In case, the bidder fails to furnish the type test certificate before commencement of supplies, their bank guarantee/ DD/ Pay order will be invoked/ forfeited and their performance will be adjudged poor.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying such type tests. These test charges shall not be taken into consideration for bid evaluation.

### 7.3 TEST AT SITE :

The purchaser reserves the right to conduct all the test on the Battery set after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

### 7.4 GUARANTEED TECHNICAL PARTICULARS:

The guaranteed technical particulars for battery sets as per Schedule-V attached, shall be furnished along with the tender.

## **8.0 INSPECTION**

All the tests and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of

purchase. The bidder shall afford the inspection officer(s) representing the purchaser all facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before despatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testing of the bought out items.

## **9. QUALITY ASSURANCE PLAN :**

9.1. The tenderer shall invariably furnish following information along with his offer, failing which his offer shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

(i) Statement giving list of important raw materials names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of tenderer's representative, copies of test certificates.

(ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

(iii) List of manufacturing facilities available.

(iv) Level of automation achieved and list of areas where manual processing exists.

(v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

(vi) Special features provided in the equipment to make it maintenance free.

(vii) List of testing equipment available with the tenderer for final testing of equipment specified and test plant limitation. If any, vis-a-vis the type,

special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

9.2 The successful tenderer shall within 30 days of placement of order, submit following information to the purchasers.

(i) List of raw material as well as bought out accessories, and the names of raw material as well bought out accessories, and the names of sub suppliers selected from those furnished along with offer.

(ii) Type test certificates of the raw material and bought out accessories.

(iii) Quality Assurance Plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchaser's hold points shall be discussed between the purchaser and supplier, before the QAP is finalised.

9.3 The successful tenderer shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing of the fully assembled equipment.

## **10. DOCUMENTATION:**

The bidder shall submit the detailed drawings indicating the dimensions for battery sets including stands. The successful tenderer shall within 2 weeks of placement of order submit three sets of final version of all the drawings for purchaser's approval. The purchaser shall communicate his comments/ approval on the drawings to the supplier within four weeks. The supplier shall if necessary modify the drawings and resubmit the three copies of modified drawings for purchaser's approval within two weeks from the date of purchaser's comments.

The manufacturing of equipments shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of purchaser.

The approval of drawing by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revision of applicable standards, rules and code of practices. The equipment shall conform in all respect to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall

have the power to reject any work of materials which in his judgment is not in full accordance therewith.

## **11. PACKING & FORWARDING**

11.1 The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

11.2 Each consignment shall be accompanied by a detailed packing list containing the following information:

- a) Name of the consignment
- b) Details of consignment
- c) Destination
- d) Total weight of consignment
- e) Signs showing upper/lower side of the crate.
- f) Handling and unpacking instructions.
- g) Bill of material indicating contents of each package.

11.3 The supplier shall ensure that the packing list and bill of material are approved by the purchaser before despatch.

### **11.4 INSTRUCTIONS MANUAL:**

The manufacturer shall supply three copies of instructions manual for initial charging (if required)/ treatment, and routine maintenance during service, with each and every battery set. The following information shall be provided on the instruction cards.

- a) Designation of cell or battery.
- b) Ampere hour capacity.
- c) Nominal voltage.
- d) Manufacturer's instructions for charging.
- e) Voltage for float operation at 20 deg.c. with tolerance ( ) 1 %.
- f) Maintenance instructions.
- g) Environmental & safety provisions required.

## **12.0 GUARANTEE PERIOD OF BATTERY SETS :**

The guarantee period of each Battery Set along with all accessories shall be for the period of 3 (three) years from the date of receipt of complete set of equipment(s) along with all accessories for one complete set.

The supplier shall attend the complaint within 15 days from the date of receipt of complaint and in case complaint is not rectified within 15 days period, penalty @ 0.5% (half percent) per week or part thereof shall be levied upon the supplier till complaint is attended and Battery set is again kept in Circuit. This penalty will be in addition to the penalty leviable due to Delay in Delivery of material as per GCC clause No. 1.24.

## **13. QUANTITY :**

The quantity of 120 AH Capacity Battery Sets to be purchased is approximately **100 Nos.** The quantity as indicated above is approximate and may be increased or decreased to any extent at the time of finalization of this tender enquiry.

## **14. DELIVERY SCHEDULE:**

The bidders are required to indicate the delivery period in the schedule attached herewith. The commencement period shall include the approval of drawings. The commencement period should not be more than 60 days from the date of issue of purchase order and monthly delivery shall be quoted irrespective of offered/ ordered quantity. Only monthly penalty shall be calculated.

## **15.0 TERMS OF PAYMENT:-**

- a) 85% (Eighty Five percent) payment of each consignment with taxes & duties shall be payable in absence of complete type test reports.
- b) Balance 15% payment shall be released on submission of complete type test reports. In case of failure of any of the type test reports, the balance 15% payment shall be forfeited for the used material and remaining unused material will be lifted back by the supplier.

**However, the above provision will be applicable only for the old manufacturers who have supplied similar item to any of the State Electricity Board/ Utility and the same have been type tested as per provisions of relevant ISS.**