SUPPLY CHAIN MANAGEMENT

THIRUVANANTHAPURAM

SPECIFICATION

110V, 200 AH PLANTE TYPE LEAD-ACID STATIONARY BATTERIES

APPLICABLE TO KSEBL	**Rev#0**	DOC. NO.: **SCM-SPEC/XT/110V,200AH Plante type Batteries**
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Technical Specification and Evaluation Committee for Transmission Material

(i) Document Approval & Control Status

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Date	09/04/2021	23/04/2021	03/05/2021
Signature	Sd/-	Sd/-	Sd/-

(ii) Amendments and History

Sec. #	*Rev. #*	*Date*	*History of Change*

1. PURPOSE:

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **110V, 200AH Plante Type Lead-Acid Stationary Batteries** in a professional manner

2. SCOPE:

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL. Public, KSERC etc regarding the current specifications and historical changes adopted in specifications of **110V, 200AH Plante Type Lead-Acid Stationary Batteries** used in field by KSEBL

3. RESPONSIBILITY:

The Executive Engineer (T), Office of Chief Engineer, Supply Chain Management shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions

4. PROCEDURE FOR REVISION:

Modifications if any, in the technical specification will be incorporated as **Revisions.** Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev. No.0.1, 0.2 etc.**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev. No.1.0, 2.0 etc.**

All the details of regarding the revisions (both minor and major) will be incorporated in **"(ii)-Amendments and history"** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer (SCM).** Those who notice any discrepancy or have any suggestion regarding revision, may bring the matter to the attention of Chief Engineer (SCM) in writing or through e-mail id:**cescm@kseb.in**

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TECHNICAL SPECIFICATION FOR 110V, 200 AH PLANTE TYPE LEAD-ACID STATIONARY BATTERIES

1.0) Scope:-

1.1) This specification covers design, manufacture, assembly of components, testing at manufacture's works, packing, supply and delivery to site, Plante' type lead-acid stationary batteries and associated accessories for indoor installation.

1.2) Supervision of erection and commissioning of the battery bank shall have to be undertaken on mutual acceptance of the terms and conditions for the same, if required

2.0) Applicable standards (latest revision):-

2.01)

IS-1885	:	Electrical vocabulary, secondary cells and batteries.
IS-1652	:	Lead acid batteries with Plante' positive plates
IS-1069	:	Water for storage batteries.
IS-266	:	Sulphuric acid for storage batteries
IS-8320	:	General requirements for methods of tests for lead-acid storage batteries.
IS-1146	:	Specification for rubber and plastics container for lead-acid storage batteries.
IS-6071	:	Synthetic separator for lead-acid batteries.
BS-6290 (part.2)	:	High Performance Plante' cells.
IEEE-485	:	IEEE Recommended practice for sizing of large lead-acid storage batteries for generating stations and substations.
IEEE-484	:	Recommended practice for design and installation of storage batteries.
IEC-896-1	:	Stationary lead-acid batteries.

3.0) Design and Constructional Features of Battery:-

3.1) **Type**:- The battery shall be lead-acid Plante' type.

3.2) **Positive Plates**:- The positive plates shall be of Plante' lamelar type. Plates shall be made of 99.99% pure lead and shall be free from any kind of manufacturing defects. It shall be electro-chemically formed and shall be capable of operating under normal working conditions

without buckling or cracking. Welding together of smaller size lead castings/ plates to form larger sizes will not be acceptable. It should be genuine Plante' type of plate only and not so called equivalent type.

3.3) **Negative Plates**:- The negative plates shall be of flat pasted type. It should have adequate mechanical strength and should be so designed that active material is maintained in intimate contact with the grid under normal working conditions throughout the life of the battery.

3.4) **Separators**:- The separators should be of sintered PVC providing a complete diaphragm between the plates. It should be acid resistant, chemically inert and should have excellent oxidation resistance and high degree of porosity to ensure minimum internal resistance. It should not exhibit any tendency to swell or shrink at temperature encountered during operation.

3.5) **Containers**:- The container should be moulded from transparent styrene acrylonitrile (SAN) giving excellent clarity, outstanding chemical resistance, rigidity and toughness with very high insulating qualities which eliminate the need for separate cell insulators. It should have adequate Mechanical strength to prevent bulging, cracking etc during the life span of battery when operating under expected temperature range and due to action of static and dynamic loads and the action of electrolyte. Transparent SAN container enables the electrolyte level and the cell condition to be monitored at a glance.

3.6) **Cell Lids**:- It should be moulded from opaque SAN and sealed to the container. It should be easily removable if the need arises.

3.7) **Microporous Ceramic Vent Plugs**:- The vent plugs should be specially designed incorporating a microporous ceramic filter which effectively returns all acid spray to the cell, but allow free exit of oxygen and hydrogen which is generated at the end of boost charging. On removal, the plugs shall permit drawing of the electrolyte sample for servicing and of checking of the electrolyte level.

3.8) **Connectors**:- Connectors should be adequately designed to carry maximum duty cycle as specified and shall offer minimum impedence. 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 connectors shall be considered. Connectors shall be of lead plated copper. The lead coating shall be adequate and tenacious. Minimum thickness of lead coating shall be 25 microns. 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.

3.9) **Electrolyte**:- The electrolyte shall be battery grade sulphuric acid conforming to latest edition of relevant IS:266. Required quantity of electrolyte for the initial filling with 10% extra quantity shall be supplied in no-returnable non-degradable acid resistant strong plastic containers.

3.10) **Water**:- Water used in preparation of electrolyte and also to bring the level of electrolyte to the correct height during the course of operation or testing shall conform to the latest edition of IS:1069.

3.11) **Terminal Post**:- Positive and negative terminal posts of the cells shall be clearly and unmistakably identifiable. Terminal posts shall be designed to accommodate external bolted connections conveniently and positively. The bottom hole shall be used to terminate inter-cell connection. The top hole shall be left for terminal connections. All metal parts of the terminals shall be lead or lead coated type. Bolts, heads and nuts, except seal nuts, shall be hexagonal and shall be lead covered. Terminal posts shall be adequately fixed to prevent its turning or twisting when the connectors are being fixed or removed. 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.

3.12) **Battery Racks**:- The battery racks shall be constructed from good quality CP teak wood. These battery racks shall be painted by the supplier with two coats of acid/alkali resistant paint of

approved make. The racks are single tier/two tier construction depending on the final layout based on space availability.

3.13) **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.

Following marking however, shall be provided.

a) Manufacturer's type and trade name.

b) Electrolyte level (Min. & Max.) in case of transparent container.

c) Type of container and standard AH capacity as per IS.

d) Polarity marking as per relevant IS.

e) Month and year of manufacture.

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.

3.14) **Accessories**:- Each battery set shall be complete with all accessories and devices including the following.

1)	Hydrometer	-	1No.
2)	Digital Multimeter	-	1No.
3)	Mercury Glass Chemical Thermometer	-	1No.
4)	Wall mounting plastic holder for one hydrometer and one thermometer	-	1 No.
5)	Spanner for cells	-	1 set of 2 Nos.
6)	10 oz syringe	-	1 No.
7)	Plastic funnel 6" dia	-	1 No.

8) Rubber siphon ½" dia. - 1 No.

9) Rubber apron - 1 No.

10). Rubber gloves - 1 pair

11) Acid resisting plastic jug 2 liter capacity - 2 Nos.

12) Rubber boots knee height - 1 pair

3.15) **Type Test:-**

a) Verification of constructional requirements.

b) Verification of marking.

c) Verification of dimensions

d) Test for Capacity – Test for Voltage during discharge.

e) Ampere-hour and Watt-hour efficiency tests.

f) Test for loss of Capacity on storage

g) Endurance test.

h) Loss of water test.

I) Test for suitability for floating battery operation.

j) Internal resistance and Short Circuit test.

3.16) **Acceptance Test:-**

a) Verification of marking

b) Verification of dimensions

c) Test for capacity

d) Test for voltage during discharge.

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARSFOR 110V, 200 AH PLANTE TYPE LEAD-ACID STATIONARY BATTERIES

Sl. No.		**200 AH**
1)	Type of Cell	
2)	Nominal Voltage per cell	
3)	Manufacturer's Name	
4)	Standards to which battery is manufactured	
5)	IS Nomenclature	
6)	Number of cells in the battery bank	
7)	Nominal Voltage of Battery	
8)	Declared capacity at 27^{O}C upto 1.85 ecv	
a)	Initial	
b)	Rated	
c)	End of life	
9)	Rated capacity at minimum ambient temperature	

10)	Rated capacity at maximum ambient temperature	
11)	Capacity in AH at various end cell voltage and duration of discharge	
a)	5 minutes	
b)	15 minutes	
c)	30 minutes	
d)	45 minutes	
e)	1 hour	
f)	2 hour	
g)	3 hour	
h)	4 hour	
i)	5 hour	
j)	6 hour	
k)	7 hour	
l)	8 hour	

m)	9 hour	
n)	10 hour	
11)	Maximum momentary current for 1 min till 1.60 e.c.v	
12)	Expected life of battery under normal operation & maintenance conditions	
13)	Internal Resistance of cell (IR)	
14)	Total Resistance of Battery	
15)	Loss in capacity in 21 hours due to self discharge	
16)	Recommended Charging rate for	
a)	Float Charging	
i)	Limit current	
ii)	Voltage	
b)	Boost charging	
i)	Starting Current	
ii)	Finishing Current	

iii)	Voltage	
17)	Trickle Charging Rate	
i)	Minimum	
ii)	Maximum	
18)	Equalising charge	
a)	Voltage	
b)	Current	
c)	Duration	
d)	Interval between successive equalizing charge	
19)	Recommended Specific gravity at 27^{O} C	
a)	For first filling	
b)	At full charge	
c)	When Battery is discharged at 10 hours rate	
20)	Permissible max. temperature of Electrolyte	

i)	During Initial Charging	
ii)	During Normal Operation	
21)	Overall dimensions	
a)	Each Cell L x W x H (tolerance of +/- 2mm in each case)	
b)	Complete Battery	
c)	Distance between cell centres	
d)	Quantity of Electrolyte per Cell	
e)	Quantity of Electrolyte for battery (Including 10% extra)	
22)	Weight (+/- 5%)	
	Each Cell	
a)	Without acid	
b)	With acid	
c)	Complete Battery without acid	

d)	With acid	
23)	Material and type of Plates	
i)	Positive Plates	
a)	Material	
b)	Height of Positive Plate	
c)	Thickness of Positive Plate	
d)	Area of Positive Plate	
e)	No. of Positive Plates per cell	
f)	Whether positive plates of individual cells are interchangeable	
ii)	Negative plates	
a)	Material	
b)	Height of negative Plate	
c)	Thickness of negative Plate	

d)	Area of negative plate	
e)	No. of negative Plates per cell	
f)	Whether negative plates of individual cells are interchangeable	
24)	Material and type of Separators	
a)	Material	
b)	Thickness of separator	
c)	Clearance between bottom of the plate and the bottom of container	
e)	Clearance between top of the plates and top of container	
f)	Whether explosion vents are offered	
g)	Type of Vent and Filling Plugs	
25)	Container	
a)	Thickness of Container (mm)	
b)	Material of Container (mm)	

26)	Cover	
a)	Type of cover	
b)	Material of cover	
27)	Connections	
a)	Material of Inter-Cell Connectors	
b)	Thickness of Inter-Cell Connectors (mm)	
c)	Method of connection	
d)	Inter-row, Inter-tier connectors and end take-offs furnished?	
e)	Connection hardware with 5% extra furnished?	
f)	Material of bolt, Nut and Washer for Inter-Cell and Cable Connections	
g)	Cell insulators provided	
28)	Racks	
a)	Number of racks per battery	

b)	Number of cells per rack	
c)	Type of rack	
d)	Material of rack	
e)	Dimensions of the racks	
29)	Racks provided with	
a)	Numbering tags for cells	
b)	Insulator	
30)	Insulator with 5% extra furnished for	
a)	Cell	
b)	Stand	
31)	Ventilation requirements	
a)	Cubic content of battery rooms	

b)	Gas generation per single cell per hour	
c)	No. of air exchanges required per hour	
d)	Standard maintenance accessories provided	
f)	Gasification Voltage per Cell (Yes/No)	
32)	Characteristic Curves (furnish curve numbers and attach separate sheet)	
i)	Charge Hours Vs volts during Boost mode	
ii)	Discharge hours Vs AH in percent of 10 Hrs Discharge rate (Capacities at various discharge rates)	
iii)	Capacity Vs Ambient temperature	

iv)	Discharge Rate Vs minimum Discharge Voltage	
33)	Recommended Max. period of cell storage before the first Charge (After Installation and filling of Electrolyte)	
34)	Recommended Storage life of battery (dry shelf life)	
35)	does the battery meet the required duty cycle curve	