

PART II

TECHNICAL SPECIFICATIONS OF BATTERY CELL & Accessories

BATTERY PERTICULER	TECHNICAL REQUIREMENTS	COMPLIANCE should be with Submitted technical bid
Constructional Requirements	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. Protective transparent front covers with each module shall be provided to prevent accidental contact with live module/electrical connections.	
Containers	The container 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 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. The container shall be capable of withstanding the rigors of transport, storage and handling. The containers shall be enclosed in a MS HRCA racks	
Cell Covers	The cell covers shall be made of suitable material compatible with the container material and permanently fixed with the container. It shall be capable to withstand internal pressure without bulging or cracking. It shall also be fire retardant. 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.	

Separators	The separators used in manufacturing of battery cells, shall be of 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.	
Pressure Regulation Valve	Each cell shall be provided with a pressure regulation valve. The valve shall be self-resealable and flame retardant. The valve unit shall be such that it cannot be opened without a proper tool. The valve shall be capable to withstand the internal cell pressure specified by the manufacturer.	
Terminal Posts	Both the +ve and -ve 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 +ve and -ve posts shall be clearly and unambiguously identifiable.	

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 <u>connection</u> of the cells. Copper <u>connections</u> shall be suitably lead coated to withstand corrosion due to sulphuric acid at a very high rate of charge or 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 inter cell <u>connectors</u> shall be protected with heat <u>shrinkable</u> silicon sleeves for reducing the environmental impact including a corrosive environment	
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.	
Bank Battery Stand	All batteries shall be mounted in a suitable metallic stand/frame. The frame shall be properly painted with the acid resistant paint. The suitable insulation shall be provided between stand/frame and floor to avoid the grounding of the frame/stand.	

Capacity Requirements	When the battery is discharged at 10 hour rate, it shall deliver 80% of C (rated capacity, corrected at 27° Celsius) before any of the cells in the battery bank reaches 1.85V/cell. The battery shall be capable of being recharged from the fully exhausted condition (1.75V/cell) <u>within</u> 8 hrs. All the cells in a battery shall be designed for continuous float operation at the specified float voltage throughout the life. Float voltage of each cell in the string shall be within the average float voltage/cell +0.05V band. The capacity (corrected at 27° Celsius) shall also not be less than C and not more than 120% of C before any cell in the battery bank reaches 1.75V/cell. 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 minutes of discharge: 1.98V/cell b) After Six hours of discharge: 1.92V/cell c) After 8 hours of discharge: 1.85V/cell d) After 10 hours of discharge: 1.75V/cell Loss in capacity during storage at an average ambient temperature of 27° Celsius for a period of 6 months shall not be more than 80% and the cell/battery shall achieve 95% of its rated capacity within 3 charge/discharge cycles and full rated capacity <u>within</u> 5 cycles, after the storage period of 6 months. Voltage of each cell in the battery set shall be within +0.05V of the average voltage throughout the storage period. Ampere hour efficiency shall be better than 95% and watt hour efficiency shall be better <i>than 85%</i>.	
Expected Battery Life	The battery shall be capable of giving more than 1200 charge/discharge cycles at 80% Depth of discharge (DOD) at an average temperature of 27° Celsius. DOD (Depth of Discharge) is defined as the ratio of the quantity of electricity (in Ampere-hour) removed from a cell or battery on discharge to its rated capacity.	

Applicable standards	1. IS 15549:2005 2. IEEE 1188 and 1189 3. IEC 60896 -21 & 22:2004, Part –II	
Routine Maintenance of Battery system	For routine maintenance of battery system, the contractor shall supply one set of following tools: A. Torque wrench. B. Tool for opening /closing of pressure regulation valve of battery. C. Hand held AC/DC Clamp meter of Meco MAKE for measurement of resistance, AC/DC voltages, AC/DC Current etc. D. Infrared thermometer of Meco Make for measuring temperature of battery cell.	
Paste Recipe	Battery cell should have patented lead oxide paste recipe, which can offer excellent charge acceptance and low self discharge rate.	
Internal Resistance	Plate design should offers low internal resistance and superior high rate discharge performance	

Testing requirements:

The contractor shall submit type test reports for the battery for the same make, model & rating as offered as per the IEC 60896 or equivalent standards. In the event, the type test reports for exact rating is not available, the bidder shall submit type test reports for higher rating Battery. The testing requirements are defined as per Table below: -

SR.NO	TEST	TYPE TEST	FAT	SAT
1	Verification of marking - Visual observation - Dimensional inspection - Polarity checking			
2	Capacity test			
3	Suitability for floating battery operation			
4	Endurance in discharge/charge cycles			
5	Charge Retention			
6	Short-circuit current and internal resistance			
7	Mechanical Tests -Vibration Test (procedure as per IEC 60068-2-6) - Free fall Test (procedure as per IEC 60068-2-32)			

**Guaranteed technical particular for
480V 200AH Battery Cell [240Nos of battery cell- 02 SET]**

SR. NO	Description	Value	Offered by Bidder
1	Manufacture	AMARARAJA / EXIDE	
2	Type of Battery	Maintenance free-valve regulated lead acid	
3	Model No of Offered Battery		
4	Battery AH Capacity(in AH) at C10, 27	200Ah at 1.75ecv	
4.1	Number of Battery Set	02 Set	
5	Applicable Standards	IS 15549, IEC 60896	
6	Maximum Boost Charging current supported (in % of AH Capacity)	Require Max. 20% of rated ah capacity	
7	Float charging voltages of each cell	2.23-2.25 V/cell at 27°C	
8	Boost charging voltages of each cell	2.30-2.32 V/cell at 27°C	
9	Battery minimum operating life time (in years)	Float service life is 8-10 years at 27°C at least	
10	Manufacture's catalogues enclosed with the bid.		
11	Type tested as per standards defined in the technical specifications for offered battery or same make similar rating.	Type test as per IEC 60896	
12	Country of origin	India	
13	Boost charging current	Min.10% -Max.20% of Ah capacity	
14	Float / Trickle charging current	Min.10% -Max.20% of Ah capacity	
15	Open circuit voltage of cell when completely discharged at 27 deg. C	1.75ecv End cell voltage	
16	AH efficiency	>95%	

17	WH efficiency	>85%	
18	Positive Plates	Grid alloy	
19	Type	Flat pasted	
20	Materials	MFX alloy	
21	Negative Plates	Grid alloy	
22	Type	Flat pasted	
23	Materials	Lead calcium alloy	
24	Containers and cover	Heat sealed	
25	Type	Plastic type	
26	Material	Poly propylene co polymer(PPCP)	
27	Separator		
28	Type	Highly absorbent type	
29	Material	Highly absorbent microporous spun glass matrix	
30	Safety Valve	complied	
31	Type	Self-resealing	
32	Material	EPDM	
33	(i) Housing		
34	(ii) Valve		
35	Terminal connectors, Terminal posts, Nuts & Bolts		
36	Inter cell connector		
37	Size	Specify HxWxD	
38	Material	Copper strips	
39	Terminal post material		
40	Whether 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.		
41	Inter row connector		
42	Size		
43	Material	Copper strips	
44	Nuts & Bolts Material	SS	
45	Flame Arrestors		

46	Battery Racks		
47	Type of Material	MS HRCA racks	
48	Whether anti-acid coating provided.	corrosion resistant powder coating	
49	Front covers		
50	Insulator materials (for racks and cells).	For racks providing rubber sheets for bottom supports	
51	Time for which the battery can withstand short circuit at terminals	Short circuit will be fraction of second	
52	Recommended air charges per hour		
53	Self-discharge per week	<1%/week at 27°C	
54	Capacity Requirements		
55	Whether the capacity of the battery (Corrected at 27 deg. C shall not be Less than C and not more than 120% of C before any cell in the battery bank reach 1.75 V / cell.	At first cycle in between 85%-100% after few subsequent cycling in between 100% to 120%	
56	Capacity of battery at rate of discharge other than 10 hour discharge rates.		
57	C/1	57.10%	
58	C/2	71.70%	
59	C/3	81.10%	
60	C/4	85.80%	
61	C/5	87.40%	
62	C/8	96.60%	
63	C/20	109.90%	
65	Battery voltage when a fully charged battery is put to discharge at C/10 rate		
66	After 6 minutes of discharge	1.98V	
67	After 6 hours of discharge	1.92V	
68	After 8 hours of discharge	1.85V	
69	After 10 hours of discharge	1.75V	
70	Chemical requirements		

71	Oxygen recombination efficiency of cell/battery for charges current C/10 under normal working conditions.	>98%	
72	Self Discharge	Less than 1% per week	
73	Self life without re-charge	Upto 6 months	
74	Operating conditions	-40° C to 60° C	
75	Design Float life	20 Years	
76	Design Cycle life	4000@20%DOD	
		2000@50%DOD	
		1200@80%DOD	
77	Recombination Efficiency	>98%	
78	Positive Plate	SRS Grid Flat Pasted Type	
79	Positive Plate Alloy	Hybrid MFX Alloy with deep discharge and long life characteristics	
80	Negative Plate	SRS Grid Flat Pasted Type	
81	Negative Plate Alloy	Lead Calcium Alloy with Maintenance Free characteristics	
82	Terminals	Lead terminals with copper inserts with a large surface area to provide maximum conductivity	
83	Safety Valve	Self-resealing, pressure regulated, explosion proof	
84	Connectors	Heavy duty leads plated copper connectors	
85	Trays	Acid resistant MS trays, self-stackable type	
86	Color	Coded terminal polarity- For easy terminal identification.	

BOQ for 480V 200AH Battery Cell

B	Bill of Quantity	Qty	Offered by bidder
1	Battery cells (240Nos in each set)	480Nos.	
1.1	Number of Battery Set	02Set	
2	Inter-cell connectors	As per battery set standards	
3	End take-off connectors	As per battery set standards	
4	Lugs for cable (50 sq. mm)	As per battery set standards	
5	Spanner set (Size and Nos)	Insulated, 1 set	
6	Installation, commissioning and O & M manual	2 set	

1. SCOPE

This specification covers the design, manufacture & testing of 2V, 200Ah at the manufacturer's works and supply at site. It also includes Supply, Installation and Commissioning of 2V-200AH battery cell at Jetpur and Jambuva Sub-SLDC. (Specified in ***schedule A*** of tender) and all accessories mentioned in this technical specification.

2. APPLICABLE STANDARDS

Applicable standards as per technical specification IS 15549, IEC 60896.

3. GENERAL REQUIREMENT

The batteries shall be suitable for a long life under continuous float operations. 480V 200AH should have 240Nos of battery cell.

The cell container shall be made material shall have chemical & electrochemical compatibility and shall be acid & heat resistant. The container and cover shall be capable of withstanding the rigorous of transport, storage and handling and shall be free from flaws.

The plates shall be designed for maximum durability during all service Condition including high rate of discharge and rapid fluctuations of load.

Accessories.

The bidder has to supply the battery set as per the technical specification and with necessary accessories. The bidder shall supply the battery with accessories and devices as stated here under:

QAP

Bidder shall submit the Manufacturing Quality Plan showing all the details along with the offer.

4. DRAWINGS AND DATA**4.1 The bidder shall submit along with their offer the following drawings in Hard and soft copy.**

i) Set of GA Drawing for complete battery sets, battery stand and individual battery cell drawing with sectional view. ii) Technical literature/Manuals iii) Performance curves/write-up on working of battery. The Data submitted shall be adequate to evaluate the performance/quality of item offered. iv) The detailed drawing showing the size & qty of steel sections for FRP stands.

4.2 The successful bidder shall submit three sets of following drawings for approval in hard and soft copy.

- i) Set of GA Drawing for complete battery sets, battery stand and individual battery cell. Complete bill of material accessories indicating make, material, quantity, size & type wherever applicable.
- ii) Sectional view showing interior construction of the battery cell. It shall also include the information of C/S area of positive and negative plates, container dimensions, type/grade and quantity of electrolyte.
- iii) The detailed drawing showing the size & quantity of steel sections for FRP standard technical literature/Manuals covering manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate, maintenance instructions and storage conditions of electrolyte and battery cells.

4.3 The successful bidder shall have to supply the 3 sets of the approved drawings/literature and manuals along with each battery set to be supplied.

5. PACKING

Battery shall be supplied in dry and uncharged condition suitably packed, securely in wooden crates. Packing shall be suitable for handling during transit by Rail / Road and secured to avoid any loss or damage during transit.

6. TESTS

The bidder shall submit the complete type test reports as stated hereunder for the offered item along with the offer ***otherwise the offer shall be liable to be rejected.*** These tests must have been conducted in the **NABL** approved

i) TYPE TESTS

- a. Verification of constructional requirements (As per IS 1651).
- b. Verification of marking and packing (As per IS 1651).
- c. Verifications of dimensions (As per IS 1651).
- d. Capacity test (As per IEC 60896 – 11)
- e. Charge Retention Test (As per IEC 60896 – 11)
- f. Endurance in discharge – charge cycles (As per IEC 60896 – 11)
- g. Endurance in overcharge (As per IEC 60896 – 11)
- h. Test of suitability for floating battery operation (As per IEC 60896 – 11)
- i. Short circuit current and internal resistance Test (As per IEC 60896 – 11)
- j. Ampere- hour and watt-hour efficiency tests (As per IS 1651).
- k. Test for voltages during discharge (As per IS 1651).

ii) ACCEPTANCE TESTS

Tests shall be carried out as under at Manufacturer's works: a)

Visual inspection including marking and packing.

- b) Dimensional check.
- c) Capacity test.
- d) Test for voltage during discharge.
- e) Battery Impedance Measurement Test.

Note: - Battery Impedance Measurement Test shall also be the routine test **to be taken at the site** and Signature Value (Battery Impedance) of all the cells shall invariably be submitted **after commissioning the battery set at the site.**

The acceptance test certificates shall be submitted for approval, before dispatch of the battery sets in bound volume. Also one set shall be submitted and sent with battery set.

7. Site Survey: -

Bidder has to arrange site survey at Jetpur and Jambuva Sub-SLDC before supply, installation & commissioning of battery cell. Bidder has to submit the site survey report to SLDCGETCO.

8. COMMISSIONING

The first charging & commissioning of each battery set at Jetpur and Jambuva Sub-SLDC shall be in the scope of the Bid. The successful Bidder/s shall have to carry out first charging & commissioning of each battery set at site. The successful bidder shall arrange for all the necessary equipment, including the variable resistor, tools, tackles, and instruments.

9. Training

Bidder has to arrange training for offered battery cell at Jetpur and Jambuva Sub-SLDC. He has to demonstrate the complete features of battery cell. He has to demonstrate following points

- Maintenance of battery cell by charging and discharging
- Maintenance of battery cell temperature
- Demonstrate of technical specification
- Demonstrate of by passing the damaged battery cell
- Charging current setting for boost charging and discharging.
- Specify the time interval duration for taking C10 TEST
- Use of tools and accessories for maintenance of battery cell
- Methodology of calculation to check the healthiness of battery.

Any other required features and specification should be demonstrated to Jetpur and Jambuva Sub-SLDC. Training should be free of cost.

Scope of Work

1. Scope of the Work/Job includes Supply, Installation, testing and commissioning of 2V-200AH, capacity of VRLA SMF type battery set as per technical specification at Jetpur and Jambuva Sub-SLDC . Bidder has to supply 01 set of 2V-200AH Capacity of VRLA SMF Type battery set at Jetpur location and 01 set of 2V-200AH Capacity of VRLA SMF Type battery set at Jambuva Location.
2. The bidder has to Supply, Installation, and commissioning & testing 2V-200AH capacity of VRLA SMF type battery as per technical specification at Jetpur and Jambuva Sub-SLDC under the instruction of EIC (Engineer in-charge) at respective control centre.
3. The bidder shall deliver and implement the technologies in conjunction with a set of best practices guidelines & industry standards.

4. Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 /17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specifications not older than FIVE (5) years and valid till validity of offer. All type test report submitted with technical bid.
5. Provide the details of specification and features of offered battery cell system along with catalogue.
6. The contractor shall provide his contact no., email address, office address for correspondence during supply & commissioning period to Engineer incharge at Jetpur and Jambuva Sub-SLDC.
7. If supplied battery cells found faulty or damaged then it should be replaced by the bidder without any cost within 7 days within warranty period.
8. The bidder has to submit the original manuals for offered battery cell. Necessary accessories and tools for maintenance should be provided by bidder without any extra cost.
9. Bidder has to explain the complete features, technical details and working of 2V-200AH capacity of VRLA SMF type battery cell to Jetpur and Jambuva Sub-SLDC. Training has to be given by bidder as per the instruction from EIC (Engineer incharge) at Jetpur and Jambuva Sub-SLDC .
10. Acceptance test reports, performance test reports of quoted items should be submitted and it should be not more than 5 years old. Offers without test reports will be rightly rejected.
11. Bidder has to dismantle the existing battery cell and install and commission the new battery cell without damaging the existing infrastructure at Jetpur and Jambuva Sub-SLDC.
12. Loading / Unloading will be in the scope of bidder. No man power will be provided by Jetpur and Jambuva Sub-SLDC .
13. Bidder has to carry tools and necessary equipment for installation of battery set at Jetpur and Jambuva Sub-SLDC .
14. Bidder must have experienced manpower for installation, testing and commissioning of battery cell.

15. Bidder has to carry out Installation, Testing & commissioning of battery cell 2V-200AH capacity of VRLA SMF type battery cell to Jetpur and Jambuva Sub-SLDC, between working hours only which is 9 to 6 PM. Sunday will be official holiday. Works will not be carried out on public holidays.
16. Bidder has to submit the complete network drawings of battery set to SLDC for approval before manufacturing process.
17. Bidder has to arrange pre-installation meeting at SLDC, Gotri for complete discussion of action plan for supply, installation, testing & commissioning of battery cell at Jetpur and Jambuva Sub-SLDC if required bar-chart has to be submitted by bidder.
18. Buy back of old battery cell should be in the scope of bidder and bidder has to make necessary arrangement for loading / unloading of old battery cell and carried out from Jetpur and Jambuva Sub-SLDC .
19. Bidder has to provide necessary tools and accessories as per BOQ.
20. Battery cell will be inspected at manufacturing site and also Local site when dispatched from the factory. Bidder has to ensure the proper dispatched of battery cell to the location provide by the GETCO.
21. If battery cell is having voltage below than the required rating during warranty period then bidder has to replace the same without any extra cost.
22. Bidder has to carry out installation, testing & commissioning of battery set as per the battery set installation standards with experienced man power.
23. Bidder has to carry out installation, testing & commissioning of battery set in the presence of engineer in charge at Jetpur and Jambuva Sub-SLDC .
24. Online load will be taken after commissioning of battery and reading of each battery cell should be taken by bidder and it should not be deviated as per the technical specification of offered battery cell.
25. During online loading on battery, if performance of any battery cell found unsatisfactorily then same has to be replaced by bidder without any extra cost.
26. The OEM/ Bidder should give an undertaking that service & spare support will be provided for at least 5 years, after the specified warranty period on separate commercial terms & conditions.

27.Undertake that the support including spares, patches, upgrades/updates, etc. for the quoted products/software shall be available for next 5 years from the date of successful supply & acceptance of the project.

28.The bidder should not have been blacklisted / banned by any Govt. agency.(Documentary Evidence – Self certification submitted with technical bid)

29.There should be no compatibility issue among the supplied battery cell with existing battery cell.

30.The services to be provided as and when required during warranty period.

31.The bidder should be able to provide support services for the faulty systems/subsystem/software for specified warranty period.

32.Bidder has to take NOC from Jetpur and Jambuva Sub-SLDC for successfully commissioning of battery set with following points should be covered.

- Demonstration of technical specification & features
- Maintenance of battery cell
- Provide the tools and accessories to incharge engineer
- Provide the technical literature to incharge engineer
- Training to technical staff at Jetpur and Jambuva Sub-SLDC
- Battery cell voltage found in order while taking the load
- Test report of battery set submitted

If any of above points are pending during commission period then NOC will not be given to bidder and bidder has to complete all point of scope of work.

SPECIAL INSTRUCTIONS TO BIDDER

Please read following instructions carefully before submitting your bid.

1. All the drawings, i.e. elevation, side view, plan, cross sectional view etc., in AutoCAD format and manuals in PDF format, for offered item shall be submitted. Also the hard copies as per specification shall be submitted.
2. The bidder shall submit Quality Assurance Plan for manufacturing process and Field Quality Plan with the technical bid.

3. The bidder shall have to submit all the required type test reports for the offered item. In case of non-submission of the type test reports with the offer, the bid shall be liable to be rejected.
4. The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.
5. All the points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.
6. The bidder is required to impart training in view of manufacture, assembly, erection, operation and maintenance for offered item, at his works, to the person/s identified by GETCO, in the event of an order, free of cost. The cost of logistics will be bear by GETCO.
7. Please note that the evaluation will be carried out on the strength of content of bid only. No further correspondence will be made.
8. The bidder shall bring out all the technical deviation/s only at the specified annexure.
9. The bidder should indicate manufacturing capacity by submitting latest updated certificate.
10. Bidder has to give undertake for support and service from OEM for maintenance of battery cell as and when required during warranty period.
11. The warranty period of the battery cell must be minimum 2 years from the date of installation and commissioning at the site.