EXIDE INDUSTRIAL

TL/AC
Maintenance Free
VRLA BATTERIES

EXIDE INDUSTRIAL

1. GENERAL INFORMATION

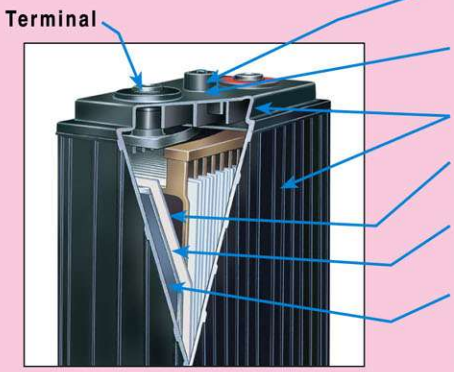
1.1 INFORMATION

Exide Industries Ltd., is the pioneer and the leader in battery technology in India. Once a part of the Chloride Group PLC, UK, Exide is India's largest producer of storage batteries with world-reputed brands. A tie-up with Shin-Kobe of Japan, the makers of world class Hitachi brand VRLA batteries, has given EXIDE the technology edge in global Maintenance free batteries. Other strategic technology agreements with Furukawa, Japan and Oldham, UK has given EXIDE the competitive edge in providing best reliable solution for packaged power in this 21st Century and beyond. EXIDE's eight factories located strategically around the country to provide logistic support for its production over 5 million batteries per annum and its state-of-the-art R&D facility at Calcutta, are real-life symbols of excellence-achieved-through-intensive-application. Recognition of our pursuit of quality was achieved when RWTUV of Germany awarded us the ISO-9001. Technology and quality combine together in Exide's latest series of Maintenance Free batteries, bringing you the best power back-up for Railway applications.

1.2 TECHNOLOGY OVERVIEW

A. Mechanism

Construction



Safety Valve : When the internal pressure increases abnormally, the safety valve opens to release gas from the cell to restore the normal pressure.

Flame Arresting Vent Plug : Provides with the explosion-proof filter constructed of aluminum oxide.

Container & Lid : Made of Polypropylene Co-polymer.

Positive Plate : With lead-calcium-tin alloy grid providing lower corrosion and less self-discharge rates.

Separator : Made of high Absorbent Glass Mat nonwoven with excellent porosity. (AGM type)

Negative Plate : With lead-calcium-tin alloy grid providing lower corrosion and less self-discharge rates.

Electrolyte : Dilute sulphuric acid without any impurity.

Recombination Principle

The charge and discharge reaction of the lead acid battery can be expressed by the following equation :

Anode		Electrolyte		Cathode	Discharge / Charge	Anode		Electrolyte		Cathode
PbO_2	+	$2H_2SO_4$	+	Pb	⟷	$PbSO_4$	+	$2H_2O$	+	$PbSO_4$
Lead dioxide		Sulphuric acid		Spongy lead		Lead sulphate		Water		Lead sulphate

In a conventional flooded battery, towards the end of charge major part of the energy supplied by charging is dissipated by electrolysing the water in the electrolyte generating Oxygen at the positive plate and Hydrogen at negative plate. These gases are lost in a flooded system through the vent holes causing steady depletion of water and therefore requiring periodic topping up.

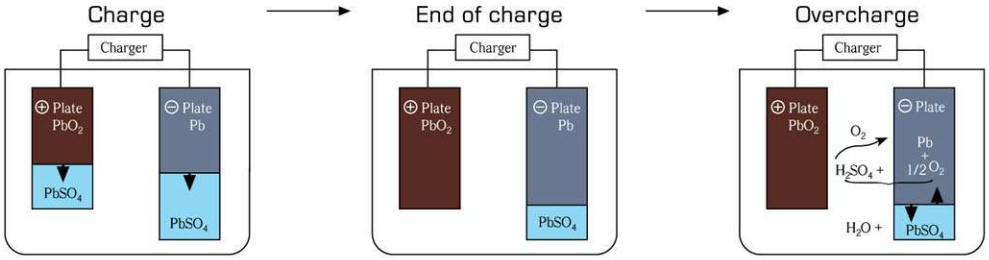
In a VRLA system the design is such that negative plates are never fully charged even when the positive plate is fully charged and hence almost no Hydrogen gas generates from the negative plate although Oxygen is generated from positive plate. This Oxygen gas generated at the positive plate migrates towards the negative plate and reacts with the freshly formed spongy lead and turns into lead monoxide. The lead monoxide in turn reacts with the Sulphuric Acid to turn into lead Sulphate resulting in the negative plate to be partially discharged.

To summarise the Oxygen evolved at the positive plate is absorbed by the negative plate without being released to the outside. The negative plate being always in a state of partial discharge never generate Hydrogen. This completely prevents loss of water.

This recombination principle may be expressed as :

Negative plate (charged)		O2 gas generated from the positive plate	Negative plate		Electrolyte	Negative plate (discharged)		for Electrolyte
Pb	+	$1/2\ O_2$	$\longrightarrow$ (PbO)	$\longrightarrow$ (PbO)	+ H_2SO_4	$\longrightarrow$ $PbSO_4$	+	(H_2O)
Spongy lead		Oxygen gas	Lead monoxide		Sulphuric acid	Lead sulphate		Water

This recombination principle is illustrated in Figure.



B. Advantages of Maintenance free batteries :

The inherent advantages of the Sealed Maintenance Free "Valve Regulated Lead-Acid" (VRLA) batteries are :

- They are supplied to the customer, ready to use (acid filling and charging being done in the factory).
- VRLA batteries do not require any topping up.
- They are compact, easily transportable and can be used in any orientation without leakage or spillage of electrolyte.
- Under normal conditions, they emit no corrosive fumes or gases.

C. EXIDE's Maintenance-free batteries for Railway applications :

EXIDE's maintenance free range of VRLA batteries for Railway applications come in 2V single cells assembled in modular racks. These racks are mounted horizontally and can be stacked one above the other. These batteries come in factory filled charged and ready to use condition.

These special railway application batteries are designed differently from conventional lead-acid batteries in order to provide maintenance free operation envisaging Indian Railway's extreme hazardous operating conditions. In normal use these batteries will not release Hydrogen & Oxygen gases, will not release acid mist and will not spill acid. Thus these batteries are inherently safer than conventional lead acid batteries.

The VRLA batteries manufactured and supplied by Exide Industries Ltd. conform to RDSO's specification: RDSO/PE/SPEC/D/TL/0009-2008 (Rev1) with amendment No.1 latest amendment (for sealed maintenance free lead acid batteries for Trainlighting and airconditioning coaches).

2. QUALITY ASSURANCE PLAN

- The battery shall be manufactured as per the quality procedure laid down so as to meet the requirement of the specification.
- The routine tests shall form the part of the QA procedure and records maintained.
- Necessary plant, machinery and test instrument properly calibrated, shall be available to ensure compliance to the approved QAP.

3. MARKING

- The following information shall be indelibly marked on outside of each battery / cell.
  - i. Manufacturer's name.
  - ii. Month & year of manufacturing.
  - iii. Rating at 10 hours discharge rate

4. PACKING

- Battery cells shall be packed in wooden pallets / crates.
- Batteries shall be wrapped in polythene first and tightened suitably.
- Thermocole sheet of proper thickness shall be put at the bottom as well as in all 4 sides of the packing cases.

5. GUIDELINES FOR UNLOADING – HORIZONTAL STACK MODULE

- The battery modules are packed using wooden crates together with protective thermocole cushioning at the bottom & sides. The modules are placed in the horizontal position in the truck.
- The design of the packing permits handling by forklift truck. It is strongly recommended to use forklift for unloading of the battery cases.
- If the above equipments are not available, the batteries can be unloaded manually with care by sliding on a ramp. The ramp from the lorry to the ground can be formed by using MS channel with suitable inclination for smooth & slow movement.
- Batteries should be moved to & from the storage yard in the horizontal position only.
- Never handle more than one packed module at a time.

6. UNPACKING & STORAGE

6.1 UNPACKING

Each 8V and 10V modules for MET1100 are packed in two tiers and supplied to the customer. It is advisable to unpack all the units and accessories of each set before commencing to erect and not unpack and erect module by module. Each module is complete with cell retaining fixtures and sets of fasteners necessary for fitment while in horizontal two tier stacking.

6.2 HANDLING

All units should be handled carefully to avoid any damage. All the items should be carefully checked against the accompanying packing list/invoice to ascertain if any are missing and see whether any are damaged or broken. Should any replacement be required EXIDE should be notified at the earliest on receipt of material in writing.

The design of the modular tray permits handling by a fork-lift, portable crane or by a hoist sling. But special care needs to be taken to make sure that the equipment used can safely handle the module weight.

6.3 CARE OF MATERIAL

Carefully clean off dust and packing material deposits from each of the units and accessories. Wipe down the cells with a clean soft cloth damped with clean water. If necessary, a small amount mild detergent may be added to the clean water to remove any greasy film.

Kindly note that scouring powder and solvent should not be used for cleaning the box or lids as scratching and damage to the surface of the plastic could occur.

6.4 STORAGE

All VRLA batteries for Railway applications are delivered factory filled and charged and the month and year of manufacture is indicated on the unit itself.

Do not locate batteries in places exposed to direct sun-light, rain, dust etc. Such exposures will cause damage to plastic components and will reduce battery life drastically. If the battery is not to be installed at the time of receipt, it is recommended that it be stored indoors at a temperature of 15°C to 32°C in clean, dry location.

6.5 FRESHENING CHARGE

It is strongly recommended that these batteries should not be stored for more than 6 months without a freshening charge. In typical Indian conditions, a freshening charge should be given preferably every 3 months of storage which would be ideal from the view point of performance and life of the battery. The freshening charge is to be given at the recommended float voltage in table 1 for a period of 24 hrs. For optimum charge efficiency the current output of the charger should be limited to 165A.

For exact float voltage, refer to Table 1.

Table 1 :

Ambient Temperature	Recommended Float Voltage	Limit Current [A]
15-24 deg. Centigrade	2.25 ± 0.01 vpc	165 A
25-34 deg. Centigrade	2.23 ± 0.01 vpc	165 A
35-40 deg. Centigrade	2.20 ± 0.01 vpc	165 A

C is the nominal capacity of the cell.

Table 2 : Storage Temperature & Recommended Freshening Charge Interval

Storage Temperature	Recommended Freshening Charge Interval
Below 20°C	Every 12 months
20 to 35°C	Every 6 months
Over 35°C	Storage to be avoided

7. ERECTION & CONNECTION

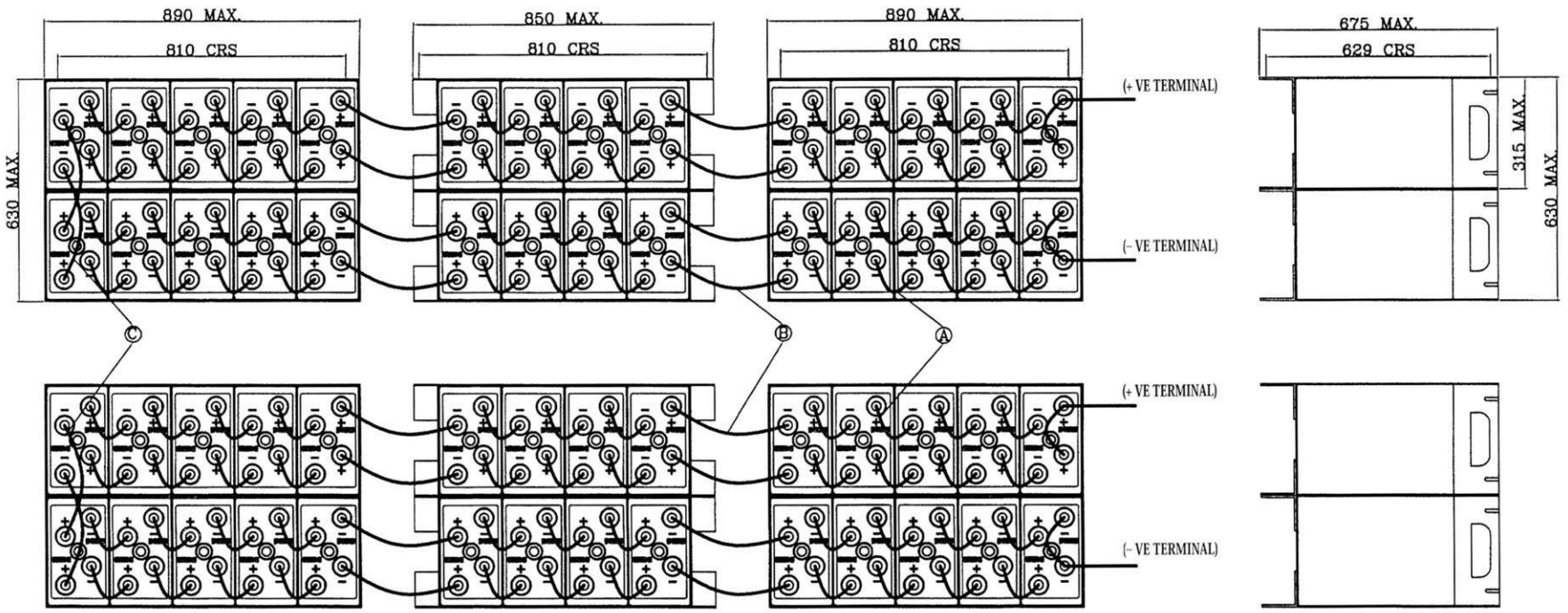
7.1 Cradle loading

The cradle where the battery system is to be installed should have the capability of withstanding the weight of the battery as well as any auxilliary equipment. The total battery weight will depend on the cell size, no. of cells, as well module configuration involved.

7.2 Assembly

a. MET1100

After unpacking, 4 nos. (2 X 8V) and 8 nos. (2 X 10V) modules are to be taken together for assembly. The system and the schematic connection layout is shown in the next page.



SCHEMATIC CONNECTION LAYOUT FOR 56MET1100

Notes :

1. Each Pocket consists of one Cell of 2V-1100AH.
2. Cradle 1 & 2 consists of 28 nos. Cells each of 2V 1100 AH and shall be connected in series to obtain 110V - 1100AH system.
3. 5 Cell per Module : 8 nos.
4. 4 Cell per Module : 4 nos.
5. Cable type 'A' (SBL 1412) : 92 nos.
6. Cable type 'B' (SBL 1413) : 16 nos.
7. Cable type 'C' (SBL 1414) : 4 nos.

System Details

1.	Cell Type	:	MET 2V - 1100AH
2.	NO. of Cells	:	56
3.	System Weight	:	4350 KGS (W±10%)

7.3 Connections

For the purpose of connection we use very high quality insulated copper cables with varying lengths according to their location of use. The connectors used are of three types for MET1100 :

A. Inter Cell Connecting Cable (SBL 1412)

B. Inter Block Connecting Cable (SBL 1413)

C. Inter Tier Connecting Cable (SBL 1414)

8. COMMISSIONING

As the batteries supplied are factory filled and charged, the commissioning procedure is not as elaborate as for a conventional lead-acid battery. Depending on the period for which the battery was stored (as indicated in Table 2) a commissioning charge may be required before the battery is put into actual operation.

It is recommended that the charger be of current limited constant potential type with a characteristic to give an applied charge voltage between minimum 2.20 vpc and 2.40 vpc maximum in ambient temperature range of 0-40°C. The current output should be limited to 165A Commissioning should be carried out as follows, without any other load being connected to the charger.

[a] Connect charger positive lead to battery positive terminal, charger negative lead to battery negative terminal and switch on the charger.

[b] Continue charging until the current flowing into the battery has fallen to a minimum and stabilises so as to remain constant over 3 consecutive hourly readings. Alternatively, if it is not possible to measure the current, charge at the recommended voltage for 72 Hrs. After this activity, battery is ready to be put into service.

9. OPERATION

9.1 Charger Requirements

Current limited constant potential chargers are only recommended having the following minimum features :

a] Over voltage protection : charger trip at 2.40 vpc.

b] Under voltage protection : automatic disconnection at 1.75 vpc.

c] Battery charging current shall be limited to 165A

d] Voltage ripple to be less than 3% rms

e] Current ripple to be less than 5% rms

9.2 Normal Charging

Apply voltage level for normal recharge for all normal charging conditions and particularly where the battery is kept fully charged in parallel with the charger and load circuit. In order to achieve optimum service life, it is recommended that the float voltage per cell is applied as per figures given in the table (No. 3) for recommended float voltage.

Table 3 : Charging Parameters for 110V batteries bank.

Ambient Temperature	Recommended Float Voltage	Charging current Limit
15-24°C	127 ± 0.5V	165A
25-34°C	126 ± 0.5V	165A
35-40°C	125 ± 0.5V	165A

It is recommended that the applied voltage does not drop below the minimum values indicated in the table.

Further, this level of applied voltage is recommended for normal recharging of a battery following a discharge.

For recharging under this conditions typically it will require an excess of 24 Hrs. continuous recharge to restore full capacity of a battery which has previously been discharged to the extent of its 10 Hr. capacity.

9.3 Equalising Charge

Under normal operating conditions equalised charge is not required. It is a special charge given to a battery when non-uniformity in voltage has developed between cells. It is given to restore all the cells to an uniform fully charged condition.

A terminal charge or an equalising charge should be given when the following conditions prevail.

i) Individual cell voltages in the battery bank normally vary between a factor of ±0.05V. When periodic records are found to show an erratic deviation on either side of the impressed system voltage, an equalising charge needs to be given.

ii) The equalising charge is also often used as the quick recharge mode. However, it needs to be mentioned that using this charge regime should not exceed once a month and frequent usage of this mode in the long run will effect the life of the battery. It is given to restore all cells to fully charged condition.

The recommended equalising charge should be for a period of 8 hrs. at 2.35 vpc.(131.5V)

10. TECHNICAL SPECIFICATIONS

A. Cell/Monobloc Specification

Battery Type	Nominal Voltage (V)	Rated Capacity (Ah)			Dimensions (mm)			Weight (in kgs.) ±5%
		10 hr. 1.75 vpc	5 hr. 1.75 vpc	3 hr. 1.70 vpc	L ±3	W ±3	H ±5	
MET 1100	2.0	1100	913	792	303	172	506	67.0

B. Module Specification

Module Type	Nominal Voltage (V)	Dimensions (mm)			Weight (in kgs.) ±5%
		L	W	H	
4 cells/MET1100	8.0	846^{+4}_{-0}	670^{+5}_{-1}	314.2±1	47
5 cells/MET1100	10.0	887±3	670^{+5}_{-1}	314.2±1	52

11. INSPECTIONS AND PRECAUTIONS

11.1 Records

A complete recorded history of the battery operation is most desirable and helpful in obtaining satisfactory performance. Accurate records will also show when corrective action may be required to eliminate possible charging, maintenance or environmental problems.

The following surveillance data must be taken and permanently recorded for review by supervisory personnel so that any necessary remedial action is taken.

a) Upon completion of the freshening charge and with the battery on float charge at the proper voltage for a week, observe and record the following data :

i) Individual cell voltage

ii) Battery terminal voltage

iii) Ambient temperature

Then the readings i) & ii) to be compared to see if the variation is within ±0.05. If not then a further equalising charge may be applied or if needed the specific cell housing the erratic terminal voltage is to be replaced.

b) Every 3 months, a complete set of readings as specified in paragraph (a) above must be recorded.

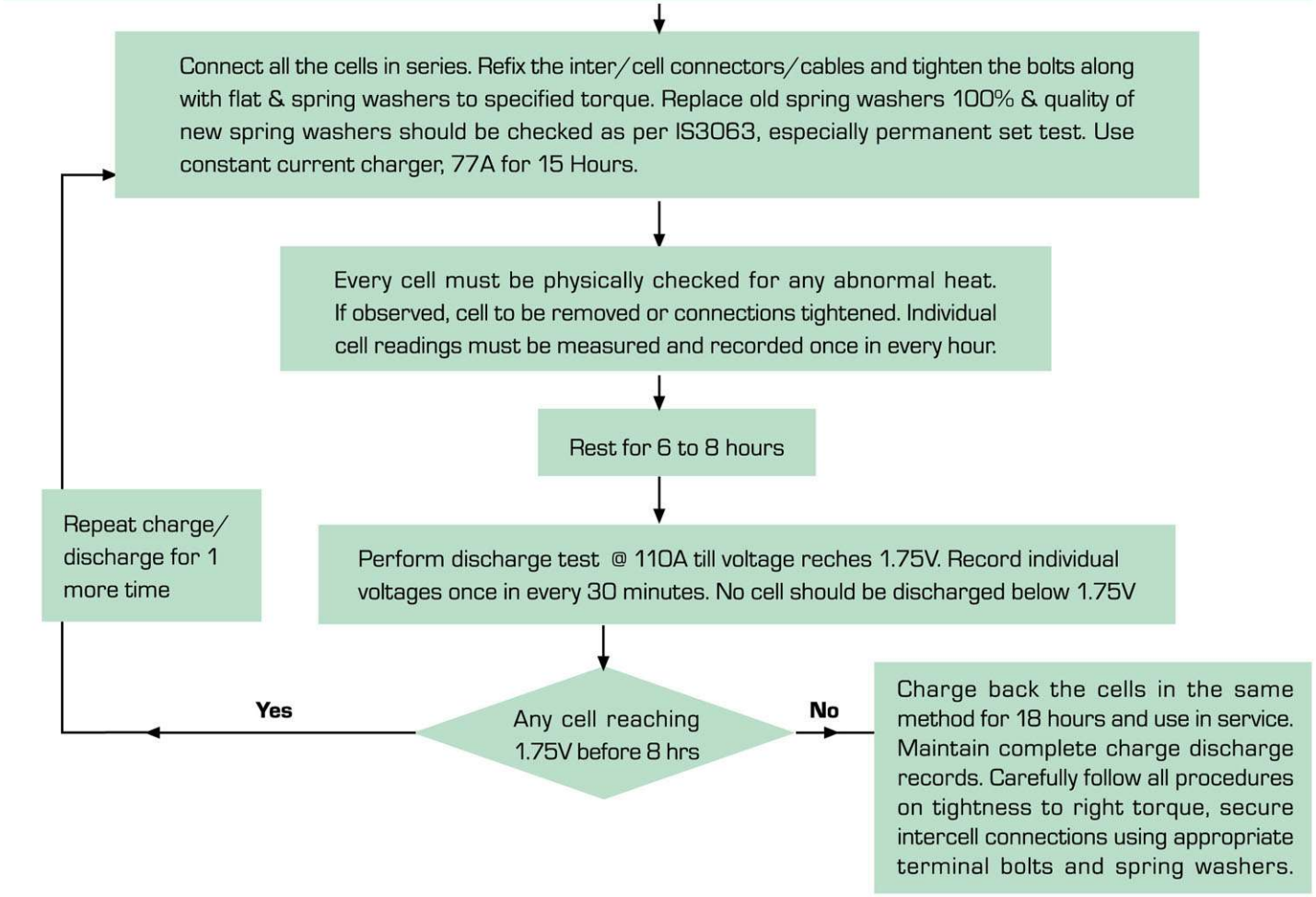
c) Whenever the battery is given an equalizing charge, an additional set of readings should be taken and recorded as specified in paragraph (a).

The suggested frequency of record taking is the absolute minimum to protect warranty. For system protection and to suit local conditions or requirements, more frequent observations may be desirable.

Annual inspection at depots / POH Wokshops

On arrival of coach, perform following checks in the battery

1. Remove all cell terminal bolts/washers/connectors etc., (use insulated tools only). Do not short circuit terminals while removing intercell connectors.
2. Remove stacking bolts (module to cradle) and remove cells/module individually and carefully.
3. Clean cell terminals/cable lug ends with brass wire brush to remove any sulphation.



Note :

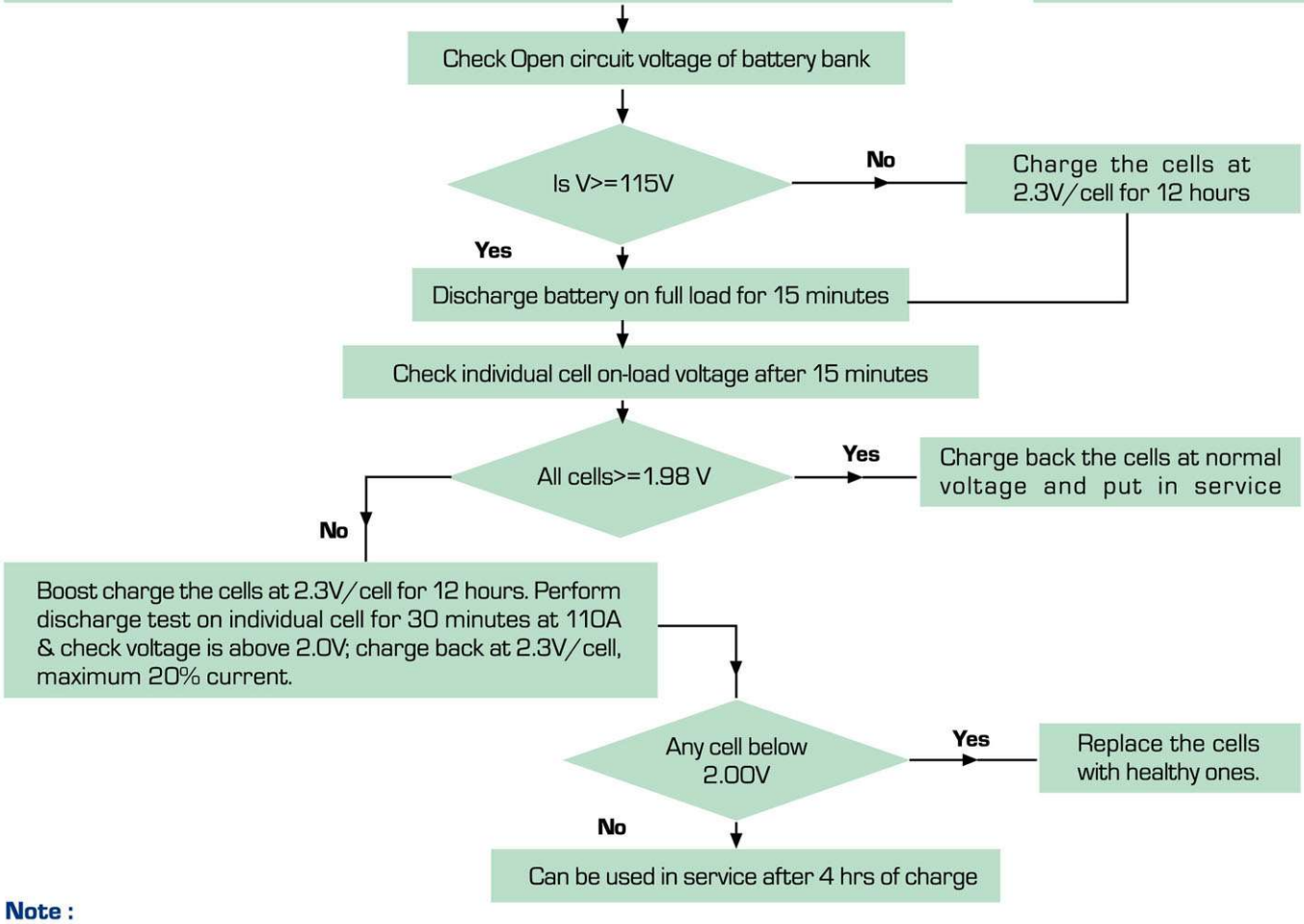
1. Do not add DM water
2. Coach alternator settings should be thoroughly checked for voltage/current; Mail/exp: 127 +/- 0.5V & Superfast: 126 +/-0.5V
3. While fitting back the cell ensure
   a) All cable connections are tightened to 12.3 Nm
   b) Appropriate bolts along with spring washers to be used
   c) Charge/discharge record must be maintained
4. Petroleum jelly shall be applied over lug ends, terminals
5. If module removed place back and fix them securely to the coach with stacking bolts
6. Never mix cells of different make in charging/testing.
7. All new VRLA cells should be given boost charge if cells are lying in the depot/ workshop for more than 6 months from the date of manufacturing.
8. All Charge/discharge activites to be done with the cells in the horizontal orientation only

Periodic inspection at Yards/maintenance depots (Quarterly)

On arrival of coach, check following in the battery

1. Spring washers, if not available, provide
2. Terminal tightness to 12.3 Nm
3. Clean terminal post & cable lug with brass brush or fine emery to remove Sulphation (remove & refix cable if required) & apply petroleum jelly
4. Check for bye-passing, if found, replace them with healthy ones
5. Check for crack/burst in cover/container. If noticed, replace cell immediately
6. Check cable condition. If damaged due to overheating or otherwise, replace

Check for delayed arrival of train due to heavy detention en-route. In such cases, the entire coach battery bank must be charged before putting it on service.



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Minimum Infrastructure requirement at Maintenance sheeds & POH depots

SL.No	Infrastructure requirement	At Maintenance Depots	At POH Workshops
1.	Constant current charger for full bank of 56 cells (80A, 168V) with Integrated discharge unit (150A)	Not Required	Required
2.	Constant voltage current limited charger for 6 cells in steps of 1 cell (i.e., 14.1V / 220 Amps)*	Required	Required
3.	Drive to test alternator / RRU	Required	Required
4.	Infra-red temperature sensor	Required	Required
5.	Torque wrenches with suitable sockets (range upto 12.3 Nm)	Required	Required
6.	Adequate charging / pre-collong points with 70 sq.mm copper cable	Required	Required
7.	Clamp-on meters (AC/DC range 1000 Amps) & Digital multimeters	Required	Required
8.	Trolleys for proper handling of cells	Required	Required
9.	Forklift with adequate capacity	Not Required	Required
10.	Constant voltage current limited charger for 56 cells range of 131.6V / 220 Amps charger & discharge capacity of 110 Amps.	Required	Required

Note : The charger/discharger should be capable of the following:

a) Charger Voltage / Current ripple factor : Less than2%

b) Charger Voltage regulation : +/-2%

Charge profile : The current setting of 20% (i.e., 220 Amps should flow into the battery until the voltage has reached the set point, i.e., 131.6v. After reaching this set voltage, the current shall drop. If the current starts dropping prior to te voltage reaching set point (i.e., 2.3V per cell), the cell will never get adequately charged.

Discharge Profile : The set discharge current i.e., 110 Amps should never fall even if the individual cell voltages may drop. Else, this will give an erratic inference.

SL.No	Parameters for check	Frequency of check	Consequences if not checked
1.	Appropriate usage of bolts, spring washers, adequate tightness, cleaning up of terminal & checking cable for damage	Once in every trip	Inadequate contact can create excessive heat & can cause the cell to fail prematurely. Usage of improperly connected cell / damaged cell can pull down the other cells on performance
2.	The charge parameters have to be clearly understood & checked.	The infrastructure at depots should be thoroughly checked on installation & periodically to be validated	An improperly or inadequately charged VRLA cell can cause the entire bank to fail prematurely. The charging should be carefully carried out through a proper charger & proper records need to be maintained
3.	The Charge profile of the constant voltage chargers should be such that, unless the set voltage is reached, the current should not fall below 20% level; Otherwise, the charging of the battery will be inadequate. On the other hand, we might think that the cells have got charged as the voltage would have reached	The infrastructure at depots should be thoroughly checked on installation & periodically to be validated.	Inappropriate charger can cause the partially-charged cell to fail enroute.
4.	Whenever external discharge is taken, it should be done only at C-10 current, i.e., 110 Amps for 1100 Ah battery. Whenever coach load is applied on the battery, full load shall be applied since the discharge test duration in this case will be limited.	During every coach discharge & external discharge	Inapproriate charger can cause the partially-charged cell to fail enroute.
5.	The charge & discharge records should be relegiously maintained so that meaningful inferences can be draw based on the recorded data. Unfortunately, there is no other method in case of VRLA batteries to know the state-of-health. All the concerned people should be adequately trained on testing & record writing & maintenance of records	During every testing either in coach or externally	Incorrect date can lead to incorrect decisions & poor tracking of past history

Note : Incase of VRLA cells, if the "potentially weak" cells are identified on time & actions taken as per RDSO SMI, the possibility of more cells getting weak can be avoided. Hence, it is important to take appropriate actions w.r.t mechanical (all care for connection), electrical (proper charger ensuring adequate charge) & record maintenance.

11.2 Precautions

A.	Do's
1.	Read the Manual carefully before use.
2.	When the battery is not in use, store it in a cool place. Charge the battery at least every six months, preferably at every three months.
3.	Keep sparks, flames, lighted cigarettes away from battery.
4.	After discharge, recharge the battery as soon as possible.
5.	Erection to be complete at one go.
6.	Clean the batteries as and when dust accumulates.
7.	Note down individual cell voltage readings once every three months.
8.	The terminal bolt connections to be torqued to 12.3 Nm.
9.	In Every POH of the battery set of new spring washers are to be used along with the fasteners.

B.	Dont's
1.	Never place the battery near or in fire.
2.	Never short-circuit the terminals.
3.	Never disassemble or reassemble the battery.
4.	Do not connect or disconnect any cell without switching off circuit.
5.	Never use any scouring powder or any solvent to clean battery surface.
6.	Do not ever discharge a battery below 1.7 vpc.
7.	Do not unpack, erect or assemble part by part.
8.	Do not tamper with safety valves.
9.	Do not add water or acid.
10.	Do not store the batteries in places exposed to direct sunlight, rain, dust etc.
11.	Do not mix the batteries of different capacities or makes.
12.	Do not mix normal conventional / Low maintenance batteries with sealed maintenance VRLA batteries.

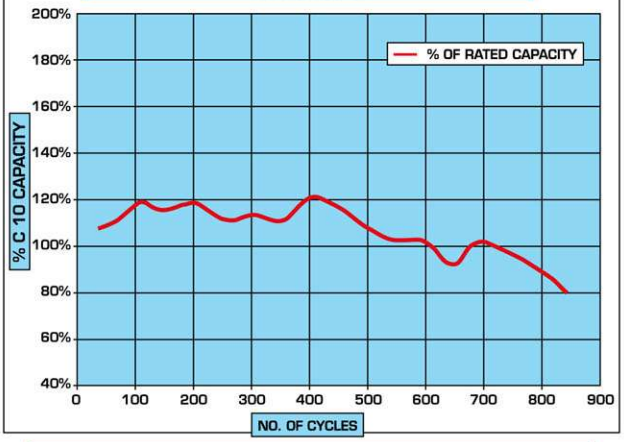
12. CELL REPLACEMENT PROCEDURE

1. Remove the intercell cable connections of the cell to be replaced. Proper care to be taken to avoid any short-circuiting during the process.
2. Remove the cell retaining fixture from the sides for MET1100 module.
3. For MET1100 cells attach cables to the terminals with the help M8 bolts and pull out the cell.
4. After removing the cell from the module insert the new cell and push it in. The new cell has to be checked for correct polarity.
5. Refix the cell retaining fixture of the module from the front.
6. Carefully refix the intercell connectors with M8 bolts, flat washers and spring washer avoiding any short-circuit during the process.

ACCELERATED FLOAT LIFE OF MET VRLA BATTERIES

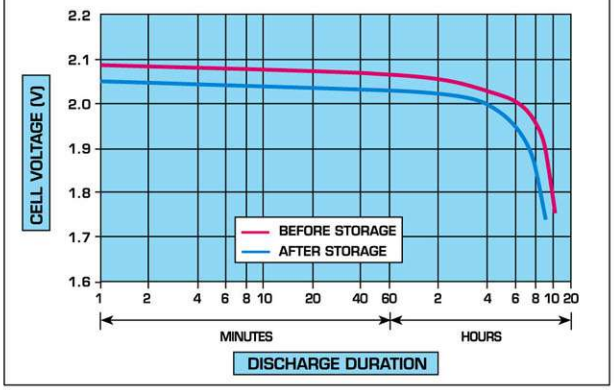
TESTING CONDITIONS :
CHARGE : 50° C, 2.20 vpc DISCHARGE : 25°C, 0.166 C

CYCLE LIFE OF MET VRLA BATTERIES



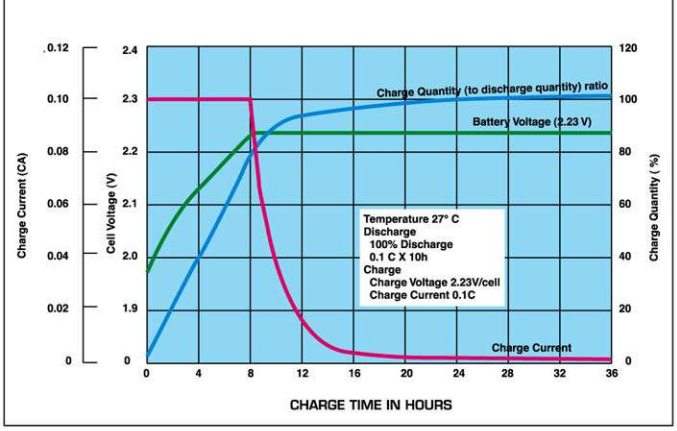
TESTING CONDITIONS :
TEMP. 40°C TYPE : 120 Ah. DEPTH OF DISCHARGE 80% (C 5 RATE)

CHARGE RETENTION CHARACTERISTICS OF MET VRLA BATTERIES

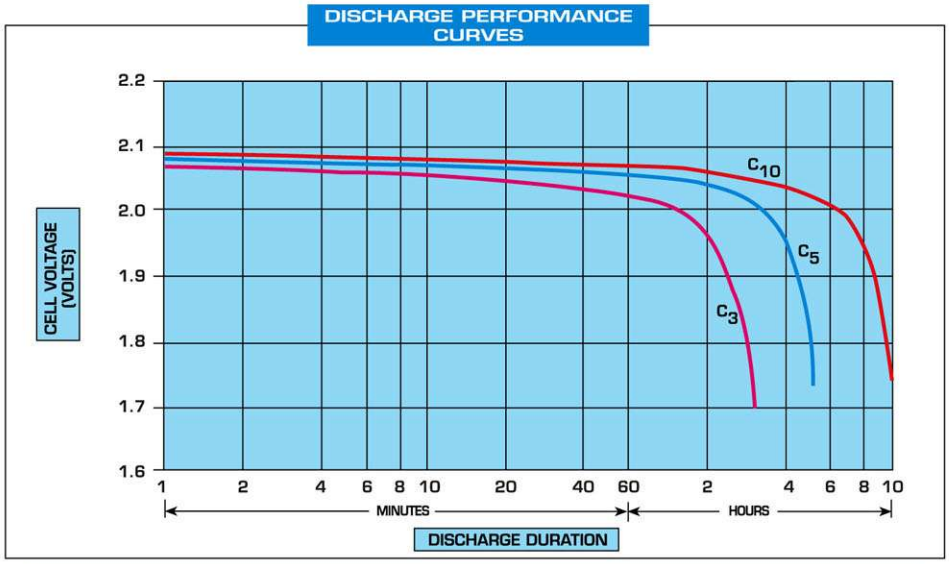


TESTING CONDITIONS :
STORAGE TIME 6 MONTHS STORAGE TEMP. 25°C DISCHARGE 0.1 C

CHARGE CHARACTERISTICS



DISCHARGE PERFORMANCE CURVES



DISCHARGE DURATION :
DISCHARGE CURVE FOR VRLA BATTERY — C_3 — C_5 — C_{10}

Exide Industries Ltd., Hosur

IMPORTANT NOTICE FOR CUSTOMERS

1. Lead acid batteries contain Lead & Sulphuric Acid which are highly toxic and extremely hazardous for health and environment.
2. Lead poisoning affects the Central Nervous System causing irreversible retardation and subsequent death.
3. Unauthorised smelters tend to pollute the air and ground water with these toxic substances during smelting.
4. To safeguard Society, the Government of India has notified as under :-

   "It shall be the responsibility of the consumer to ensure that used batteries are not disposated of in the manner other than depositing with the dealer, manufacturer, re-conditioner or the designated collection centres".
5. Hence, please do not discard the battery in a trash bin or give / sell to a non-authorised person.
6. It is mandatory for our authorised dealers to accept a used battery and to provide corresponding rebate on purchase of new battery.
7. Please note that violation of these guidelines may lead to legal action / prosecution by Government Authorities.

EXIDE INDUSTRIAL

For more information please contact us:

For Emergency Service requirements, please Contact at 18004255151

Registered Office : Exide Industries Ltd., Exide House, 59E, Chowringhee Road, Kolkata - 700 020, Ph. : (033) 2283 2120/33/36/50/51/71/2238/39, Fax : (033) 2283 2632/2283 2637 **Corporate Marketing Office :** Exide Industries Limited, 6A, Hatibagan Road, Entally, Padmapukur, Kolkata-700014, Ph. : (033) 2284 3137, 2286 1860, 2286 6158/6159, Fax : (033) 2286 6186, 2286 7455, **Factory Address : Hosur :** Survey No. 246, Chinchurakanapalli Village, Sevaganapally Panchayat, Hosur Taluk, Dharmapuri Dist., Tamil Nadu - 635 103 Ph. : (04344) 258251/258253, Fax : (04344) 258255, **R&D Address :** 217, Nazrul Islam Avenue, Kolkata - 700 059, Ph. : (033) 2500 5458/5225/5660, Fax : (33) 2500 5545.

Regional & Branch Offices :

New Delhi : 'Exide House', 3E/1 Jhandewalan Extension, Link Road, New Delhi - 110055, Ph. : (011) 2362 7095/96/97/98, Fax : (011) 2355 5703, **Mumbai :** "RAHEJAS', 5th Floor, 8C Main Avenue. V.P. Road, Santacruz (West), Mumbai - 400 054, Ph: (022) 2646 5283/84, 2646 5041, Fax : (022) 2646 5042, **Chennai :** Exide Industries Limited, New No. 824/2, 3rd Floor, Before Hyndai Showroom, Anna Salai, Nandanam, Chennai - 600 035, Ph. : 4907 5100-115, Fax : (044) 4907 5126, **Kolkata :** 6A Hatibagan Road, Entally, Kolkata - 700014, Ph. : (033) 2284 3137/3169, 2246 4563, Fax : (033) 2289 7455, **NORTH : Lucknow :** Exide Industries Limited. KH-626, Behsa, Transport Nagar Opp. PAC Batallion, Kanpur Road, Lucknow - 226012, Ph. : (0522) 404 1896, 404 1899, Fax : (0522) 301 3458, **Chandigarh :** Exide Industries Limited, Exide House, Plot No 24/4 Industrial Area Phase II, Chandigarh - 160002, Ph. : (0172) 5000014, Fax : (0172) 265 4395, **Ghaziabad :** Exide Industries Limited. 195A, Bhonja G T Road, Ghaziabad - 201 001, Ph. : (0120) 411 7952, **Jalandhar :** Exide Industries Limited. Village Hazara, Opp. Vista Resorts, Hoshiarpur Road, Jalandhar - 144025, Ph. :(0181) 5009305, 5009321, Fax : (0181) 245 9571, **Jaipur :** Exide Industries Limited, 65A, Suraj Nagar (W), Sodala, Ajmer Road, Jaipur - 302 006, Ph. : (0141) 2293704/218004/22118007, Fax : (0141) 2369744, **Jammu & Kashmir :** Exide Industries Limited, Gupta Trading Co., Shop No. 194/6, Transport Nagar, Jammu & Kashmir, Ph.: (0191) 476377/476577, **Rohtak : (Haryana) :** Exide Industries Limited, 115, IDC Hisar Road, Rohtak (Haryana), Ph. : (011) 9899026127, **SOUTH : Bangalore :** Exide Industries Limited, Exide House, KSSP Complex, Ware House No. 8, 12th Rm, Hosur Road, Bangalore - 560068, Ph. : (080)-4081 0808, Fax : (080) 2357 8672, **Cochin :** Exide Industries Limited, Devi Building, NH 47, Bye-Pass, Ohakkaraporambu, Labour Colony Road, Thammanan PO, Cochin - 682032, Ph. : (0484) 414 9351, 414 9352, **Secunderabad :** Exide Industries Limited, Plot No.98, 106 & 107, Tadbund Cross Road, Opp. IBP Petrol Bunk, Secunderabad - 500009, Ph. : (040) 5363 6833, **Coimbatore :** Exide industries Limited, No. 29, Race Course Road, Opp. Masonic Hospital, Coimbatore - 641016, Ph. : (0422) 222 1646, Fax : (0422) 211296, **WEST : Mumbai :** Apeejay Chambers, 5, Wallace Street, Fort, Mumbai - 400 001, Ph. : (022) 2207 2188/2189/7918, Fax : (022) 2207 8631, **Ahmedabad :** Exide Industries Limited, 201 Shivalik Arcade, 100 Ft, Anand Nagar Road, Near Prahaladnahar GardenAhmedabad - 3800015, Ph. : (079) 6510 8206, Fax (079) 2676 9932, **Nagpur :** Exide Industries Limited, Exide House, 92, Temple Road, Behind Nvcc, Civil Lines, Nagpur - 440001, Ph. : (0712) 253 9972 , 253 9973, Fax : (0712) 253 8348, **Indore :** Exide Industries Limited, Life Care International, 37-38, Lasudia Mori, Dewas Naka, Indore - 452001, Ph. : 07316542293, Fax : (0731) 249 3395, **Baroda :** Exide Industries Limited, A21, Gulab Vatika Duplex, Near Rajvee Tower, Tandalja Road, Baroda - 390007, Telefax : (0265) 235 4240, **Pune :** Exide Industries Limited, 1116, 'Paramhans' Shukrawar Peth, Sathe Colony, Pune - 411002Ph. : (020) 3230 4043, Fax : (020) 2443 0094, **EAST : Cuttack :** Exide Industries Limited, Cuttack, C/o - B.Verma & Sons AT / PO :- Bhanpur, Gopalpur, Cuttack - 753 011, Ph. : (0671) 234 8833, 268 6151, Fax : (0674) 243 5947 (PP), **Jamshedpur :** Exide Industries Limited, Station Road, Jugsalai, Near Ghora Chowk, Beside Reliance Fresh Stores, Jamshedpur - 831006, Ph. : (0657) 229 0784/229 0222, Fax : (0657) 229 0894, **Guwahati :** Exide Industries Limited, C/O Al & C. Co., G.S. Road, Near Car Ghar, Ganeshguri, Dispur, Guwahati - 781005, Ph. : (0361) 234 2500/234, Fax : (0361) 234 5097, **Patna :** Exide Industries Limited, Indrapastha Apartment, Flat No. 101, (Commercial Block) Boring Canal Road, Patna - 800 001, Ph. : (0612) 257 0415/06126458102, Fax : (0612) 223 1569.

Vist us at http://www.exide4u.com

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