EXIDE

INDUSTRIAL

TL BATTERIES

COMPARATIVE ANALYSIS OF 6V 120AH (PP) AND 6V 120AH (HR)

Technical & Performance attributes	6V 120Ah (HR)	6V 120Ah (PP)	Advantage in favour of PP
• Impact resistance	Drop Ball Test as per IS1146 specifies a 1kg ball to be dropped from a height of 250mm minimum. The max thickness offered by our container to withstand the impact is 11.0mm	Drop Ball Test as per IS1146 specifies a 1kg ball to be dropped from a height of 175mm minimum. The max thickness offered by our container to withstand the impact is 3.0mm	Low thickness and low weight PP Container withstand equivalent impact as our existing HR Container. **Thus Drop Ball Test Result indicate far superior impact resistance**
• Resistance to high ambient temperature	Poor	Far superior	Softening of Bituminous Sealing compound may lead to leakage problem. In case of PP, no such problem exists as a result of heat sealing of cell box and lid.
• Inter-cell connection	Through external connectors by manual burning process.	Extrusion fusion intercell welding.	Intercell welding reduces the possibility of **shortcircuit failure** and there is no scope of dirt, dust accumulation on connectors.
• Acid Fume Permeability	High	Low	Inherent characteristics of PP container and lid coupled with heat sealing will reduce **acid fume permeability substantially : Less pollution hazards**.
• Electrolyte volume (in cc/Ah)	**33 cc/Ah**	**42 cc/Ah**	This will augment substantially its **low maintenance characteristics**.
• Weight per monobloc	**Around 46 kgs.**	**Around 41 kgs**. Overall weight reduction of the system by around 90 kg. per set of battery.	Improved Rs/Tonne-Km leading to **substantial saving in favour of Railways** and adding to passenger comfort.
• Fire Hazards	Possible	Negligible	V2 Grade Flame retardant PP material ensures safety in dynamic condition reducing **fire hazards**.
• Aesthetics & Cosmetics	Acceptable	Much superior	Hermetically sealed 3LMX 120P battery is very neat & clean without any external connection and messy bitumen sealing.

Introduction

For over 75 years Exide have specialised in the design and manufacture of batteries for use in railway service in India and have also exported such batteries to various countries in the world. Exide offer a comprehensive range of high quality batteries tailored to suit every requirement on Indian railways.

Over the years, Exide Industries have also continuously brought to the customer the fruits of the latest technological advances and research, by incorporating in their batteries, after extensive tests, improvements in design features, more corrosion-resistant grid alloys, the polyester gauntlet tubular positive plate, tougher and better cell containers and lids and superior microporous separators.

Exide offer train lighting cells in tubular design, which have proven themselves in service on the Indian Railways over several decades. The cells are designed for rugged service and need minimum of attention. If the simple instructions given are followed, the cells and batteries should give several years of satisfactory service.

ACID QUANTITIES, CHARGING CURRENTS AND NORMAL CAPACITIES

Type of Battery	Approx. quantity of filling-in-acid (Sp. Gr. 1.190) at 27°C	First charge current Constant Current DC	Normal charge current Constant Current DC	10-h capacity (Sp-Gr : 1.210)
	Litres	Amps.	Amps.	Ah
3LM X 120P	15	14 - 2.35 vpc 7 up to 2.75 vpc	12	120

All specific gravities are corrected to 27°C

1. FIRST CHARGE

(a) Remove the filling plugs and fill the cells with pure sulphuric acid previously diluted to the specific gravity given in the table below, until the red band on the float stem matches with the green band or maximum level indicating mark on the float guide.

The dummy plugs fitted to vent and float guide opening should be removed and discarded. Replace them with the ceramic vent plugs and covered float guides with floats which are sent with the batteries packed in a separate wooden case to avoid damage in transit.

Types	**3LMX120P**
Specific gravity for filling in new cells at 27°C	1.190
Specific gravity of electrolyte at end of charge at 27°C	1.210 to 1.220
Maximum permissible Temperature of electrolyte during charge	54°C

All specific gravities are corrected to 27°C

(b) Allow battery to stand for 12 hours

(c) Restore electrolyte to original level by adding acid of the same specific gravity as before. It is recommended that the battery be charged at the "First charge current" for the duration as given in the table. The charge may be given continuously or in cycles of not less than 12 hours charge, and not more than 12 hours rest, until it is completed. The number of hours of actual charging required is not necessarily affected by the interruptions. Min Ah input 540 Ah. must be given to the battery.

(d) Indication of Completion of Charge

The charge should be continued at the appropriate rate until : —

(i) Gases are freely evolved in every cell.

(ii) The voltage across the battery and the specific gravity of the electrolyte in every cell remain constant over three (3) successive hourly readings.

(e) On completion of the charge, the specific gravity of the electrolyte in each cell should not exceed the specific gravity given in the table on the page 5. If it does, withdraw some electrolyte from the cell and replace with distilled water, charge for another hour and check again.

(f) Adjust level of electrolyte to bring the float upto the level where its topred band coincides with the top greenmark of the float guide. If the level is low, add acid at the end of charge, specific gravity being given in the table on the page 5.

(g) If the period from the first charge of the battery to the installation exceeds one month it should be put on Bench charge and should be recharged every month until put into service.

(h) The temperature of the electrolyte should be taken frequently during the charge. Should it reach 54°C the charging rate must be lowered or the charge suspended. If this is necessary the total charge in ampere-hours must not be less than the current in amperes referred to in the table on page 5 multiplied by the respective initial charging time.

2. CHARGING DURING SERVICE

The battery should be kept approximately fully charged by adjusting the generator output to suit the service conditions. The output should preferably be such that the specific gravity of the electrolyte is ordinarily within the limits of 1.215±0.005

Too little charging is indicated by the specific gravity being frequently below 1.200. In this case, the charging current or the period of charging should be increased.

Too much charging is indicated by the specific gravity being generally above 1.220 and by unusually frequent topping-up being required. In this case, the charging current or the period of charging should be slightly decreased.

Should the specific gravity of the electrolyte fall to 1.170 or less, the battery should be given a "Bench Charge", at constant current.

3. TEMPERATURE

It is not advisable for the temperature of the electrolyte at any period of the charge or discharge to exceed 54°C. If this temperature is exceeded the life of the battery will tend to be shortened.

4. TEMPERATURE CORRECTION

All specific gravity readings should be corrected to 27°C. For each 10° above 27°C add 7 points (.007) to hydrometer reading.

For each 10° below 27°C subtract 7 points (.007) from hydrometer reading.

5. HOW TO ASCERTAIN STATE OF DISCHARGE

(a) **By Specific Gravity**. As the battery is discharged, the specific gravity of the electrolyte falls, the amount of fall being proportional to the amount of discharge taken from the battery. This is indicated in the following table :

Condition of Cells	3LMX 120P
Fully charged at 27°C	1.210
Half discharged at 27°C	1.175
Fully discharged at 27°C	1.140

All specific gravities are corrected to 27°C

It should be noted that the above values are indicative and refer particularly to discharge at the 10-hr. rate. For quicker discharge (i.e. at higher discharge currents) the final specific gravity will be higher and, in this case, it is necessary to limit the discharge by the voltage.

(b) **By voltage**. The cells may be discharged with safety until their voltages, measured when the current is passing, drops to 1.8 volts per cell, when discharged at the 10-hour rate, and to 1.75 volts per cell at the 5-hour and to 1.70 volts per cell at the 3-hour rate.

Voltage readings taken on open circuit, i.e., when neither charge nor discharge current is passing through the cells, are, under most conditions, valueless. If the voltage on open circuit is low, then the cell is in a poor condition.

6. TOPPING-UP

Add nothing but approved water conforming to IS : 1069 to the cells and do this enough to keep the red band on the float matching with the green band on the float guide. Top-up when the red band on the float commences to fall below the green mark on the float guide. Continue adding water till the red band matches with the green band on the float guide. Store the water in clean lead or non-metallic vessels. However, because of the low antimony alloy and adequate electrolyte volume, the topping-up operation has been reduced to a minimum.

NEVER USE METAL VESSELS DURING TOPPING-UP because of the dangers of short-circuiting the terminal posts and of introducing impurities.

7. IF TROUBLE IS EXPERIENCED

(a) Examine all connections and contacts and ensure that they are clean and tight.

(b) Take readings of specific gravity of the electrolyte in each of the cells; if they are uniformly low, the battery requires a "Bench-Charge".

(c) If the specific gravity of the electrolyte in one or two of the cells is much lower than the others, the cell box might be leaking or there may be an internal short-circuit. If the loss of specific gravity is serious, take the affected unit out of circuit.

(d) If, after an extended charge, all the cells are quickly exhausted the trouble is probably in some other portion of the electrical equipment and should be promptly located and corrected

8. BENCH CHARGE

The only limitation of the charging rate, at any period of the charge are the gassing of the cells and the temperature of the electrolyte. A value which is considered to be satisfactory is the "Normal Charge Current", given on page 3.

When the voltage reaches 2.35 volts per cell, at 12 Amps the current should then be reduced to the finishing rate charging current value of 7.0 Amp (6% of the Battery Ah)

The charge should be continued until the voltage and specific gravity of the electrolyte in each cell remain constant over three successive hourly readings. The top of charge voltage at the end of charge should be in the region of 2.65 to 2.75 volts per cell.

9. BATTERY OUT OF COMMISSION

If the use of the battery is to be entirely discontinued for a long period—say 2 to 6 months—give a "Bench Charge" and remove the main leads from the positive and negative terminals of the battery. Give a further bench charge every month.

Keep the electrolyte level within the limits indicated by the float, adding battery grade water just before a freshening charge. Before putting the battery into commission again, give it an extended charge until the specific gravity of the electrolyte has ceased to rise over a period of 3 hours.

If it is impossible to give a bench charge every month or, if the battery is to be out of commission for more than 6 months, apply to the manufacturers for detailed instructions regarding procedure.

10. ACID : MIXING OF ELECTROLYTE

When mixing strong acid and water, always add acid to water, never water to acid. The acid should be poured on the water, slowly and with great caution partly because considerable heat is generated when strong acid and water are mixed together but more particularly to avoid splashing as acid burns are both painful and dangerous. During mixing, the liquid should be well stirred with a wooden paddle or glass rod; this should be removed from the acid when the mixing is completed.

TO MAKE 10 VOLUMES OF DILUTE ELECTROLYTE

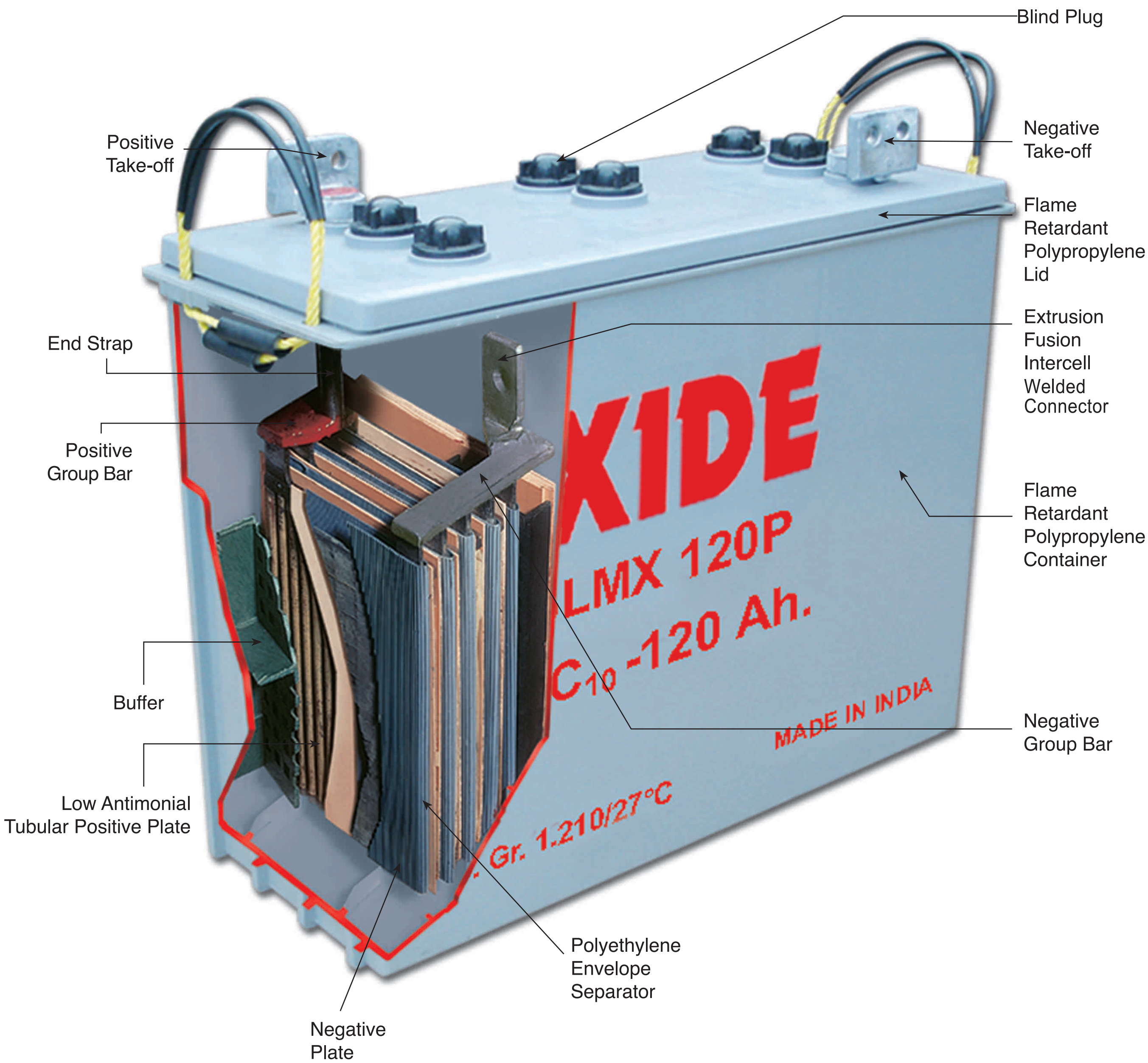
Specific Gravity after mixing	Take Volume of water	Add Volume of 1.840 Sp. Gr. Acid
1.200	8.67	1.87
1.240	8.16	2.36
1.260	8.33	2.50

All specific gravities are corrected to 27°C

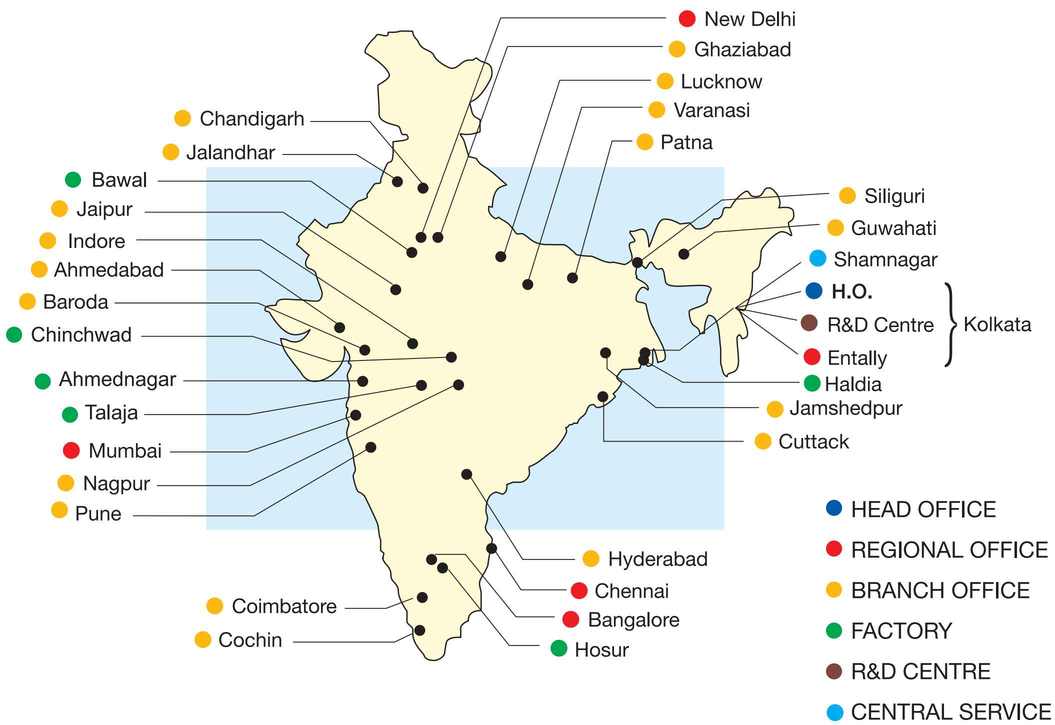
Schedule of Design Particulars

Item	Characteristic	Unit	3LMX120P
1.	Make	–	Exide
2.	Type of unit		Low Maintenance Tubular Cell
3.	Manufacturer's Nomenclature	–	3LMX120P
4.	Overall dimensions Length Width Height (upto Terminal top)	 mm mm mm	 445±10 178±5 380±5
5.	Weight per unit with acid (approx)	kg	41.5±5%
6.	Weight per unit in dry condition	kg	22.4±5%
7.	Cell Container material	–	Polypropylene flame retardant grade
8.	Type of Positive plates	–	Tubular
9.	Type of Negative plates	–	Flat pasted
0.	Type of separators	–	microporous PVC/PE envelope
11.	Max. electrolyte temp. the cell/battery will withstand without damage a) Continuously b) For a short period	 °C °C	 48 54
12.	Electrolyte height above top of separators (a) – minimum (b) – maximum	mm mm	50 87
13.	Electrolyte depth below bottom of plates	mm	17
14.	Quantity of electrolyte per cell (Approx)	litres	5
15.	Sp. Gr. of electrolyte for initial filling (at 27°C) –		1.190
16.	Initial charging current	Amps	14A to 2.35 VPc follwed by 7A till end of charge
17.	Initial charging time	hrs.	75 (max)
18.	Material of end connectors – interunit connectors		Antimonial lead Flexible Copper Cable
19.	Normal charging rate	Amps	12

N. B. – For 3LMX120P the governing RDSO Specification is RDSO / PE / SPEC / AC / 0058-2005 (Rev-0)


Blind Plug
Positive Take-off
Negative Take-off
Flame Retardant Polypropylene Lid
End Strap
Extrusion Fusion Intercell Welded Connector
Positive Group Bar
XIDE
LMX 120P
C10 -120 Ah.
Flame Retardant Polypropylene Container
MADE IN INDIA
Buffer
Negative Group Bar
Low Antimonial Tubular Positive Plate
Gr. 1.210/27°C
Polyethylene Envelope Separator
Negative Plate

NETWORK



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