

PANACEA ALLOYS PRIVATE LTD.



STATIONARY BATTERY

***INSTALLATION, COMMISSIONING, OPERATION
AND
MAINTENANCE MANUAL***

Customer : _____

Battery Type : _____

P.O. No. : _____

**Number of
Cells/bank** : _____

Installed at : _____

**Date of
Commissioning** : _____

SPECIFICATION OF BATTERY

Number of cells :

Cell Designation as per IS. :

Capacity at 10-hour rate of discharge :

Our Nomenclature of cell :

Specific gravity of acid for first filling :

Recommended specific gravity of electrolyte in fully charged condition :

First charge current :

Duration of charge :

Normal recharge current up to 2.40V per cell :

Finishing charge current above 2.40V per cell upto full charge. :

Equalising charge current :

Recommended floating voltage of the battery :

Nominal voltage of each cell :

Maximum permissible temperature during charge :

**Instructions for Installation
and First Charge of
“ PANACEA “ Stationary Battery**

UNPACKING:

- (i) Unpack each package carefully without imparting any damage to the contents inside. The cells should be removed carefully by holding them from the bottom. They should not be removed out of the packages by holding the terminals, since this is bound to disturb the group assembly inside the cell.

IN NO CASE SHOULD THE ELEMENTS INSIDE THE CELLS BE DISTURBED.

After removing the cells, any dust or straw of the packages lying on the cell should be carefully removed.

- (ii) The stores should be checked with reference to the delivery challans & attached list.
- (iii) The cells and accessories should be thoroughly inspected from outside for any possible breakage during transit. If there is any shortage or damage, notify the Company in writing immediately.
- (iv) In case the cells are not to be commissioned immediately, they should be kept in a cool, dry place sheltered from sun, rain and dust. The sealing plug over the vent holes should be intact.

STORAGE INSTRUCTIONS:

In order to ensure a reasonable storage period before installation it is necessary to take the following precautions during storage :-

1. The cells on receipt should be unpacked carefully from packages.
2. The cells shall be arranged in the stores on stillages or wooden racks so that there is at least about 5 mm. spacing between two adjacent cells.
3. The storage space shall be inside the building. It should not be a temporary shed lying outside any building.
4. There should not be direct sun rays or any opening leading to a possibility of rain water or moisture creeping inside the room.
5. The room shall be well ventilated so as to keep the atmosphere cool.
6. The stores being heavy shall be preferably stored on the ground floor.
7. The cells shall never be stacked on the ground as there is always a risk of the ground being flooded with water resulting on humid conditions around the cells.

BATTERY ROOM:

The battery room should be ready in all respects complete with well white-washed walls and ceiling and should be clean and dry. The flooring of battery room should be acid resistant.

The room should be well lit at all times of the day and night. Direct sun-light on the cells should be avoided.

The battery room should be well ventilated in order to keep it free of explosive atmosphere. This can be achieved by providing exhaust fan of suitable capacity which ensures minimum six air changes per hour. The exhaust fan, either single or a number of fans suitably distributed, shall be located on any one of the walls away from the entrance. It should not be installed directly above any window or door.

The battery room should never be located near radiators, heaters, etc. Care should be taken that no effluents, such as chlorine, acetic acid or any such gases from chemical factories or breweries in the vicinity have an access to the room.

The battery will give the best results when the room is maintained at a temperature between 20° C. to 35° C. High temperatures increase the capacity, but decrease the life of the cells. Low temperatures reduce the capacity but do not harm the battery.

BATTERY CHARGING SOURCE:

The output of the charging source should have a voltage equal to the number of cells in the battery multiplied by 2.7 approx and should be capable of delivering continuously a current in amperes equal to the normal charging rate of the battery at the above voltage. Also means should be available to control the current when the same tends to increase or decrease during charging. The voltage during charging should be adjustable between 1.85/1.80V to 2.70V per cell.

ELECTROLYTE (ACID):

The electrolyte supplied conforms to IS: 266 and has a specific gravity as indicated in Specification of Battery". This acid can be directly used for filling the cells.

If procured separately, it should be ensured that the acid has got the correct gravity as specified, Alternatively, the acid can be prepared by diluting concentrated acid (conforming to IS: 266) with distilled water (conforming to IS: 1069) When acid and water are mixed, there is a contraction in volume.

While preparing the acid solution, it is very important to note that acid is added to water and not vice-versa. This solution can be prepared in a clean lead-lined wooden tank or plastic or well glazed earthen ware vessel, the mixture being stirred by means of a plastic, glass or lead-rod. After mixing, the solution is allowed to cool overnight and the specific gravity and temperature noted by means of hydrometer and thermometer, respectively. If the specific gravity as required has not been obtained, add acid or distilled water as the case may be till the correct specific gravity is obtained.

When working with acid or electrolyte, use protective goggles, rubber gloves and aprons. In case acid splashes on garment remove the same immediately, neutralise the spot with 5% to 10% ammonia or soda solution and wash thoroughly in water. In case of acid splash on skin or other parts of the body, flush with large quantities of water and seek immediate medical aid.

TEMPERATURE CORRECTION:

The specific gravity of electrolyte varies with temperature. Any reading observed on the hydrometer should therefore be corrected to read to 27° C.

The correction should therefore be made as follows:-

For every 1 C. above 27°C., add 0.0007 to the specific gravity as read on the hydrometer. Similarly for every 1°C. below 27°C., subtract 0.0007 from the specific gravity as read on the hydrometer.

INSTALLATION AND TESTING: BATTERY CHARGER:

Install the battery charger at a suitable place partitioned from the battery room to protect against the acid fumes and level the same properly.

Inspect the battery charger with reference to the circuit and general layout drawings supplied. Connect the AC source to the charger through a fuse switch and test the charger on NO LOAD. If the voltmeter shows reading, the connections are in order. If no reading is observed, loose or open connections in the charger should be traced and set right. Gradually increase the voltage and observe the readings to test the efficacy of the voltage control provided.

INSTALLATION OF BATTERY 0:

- (i) Arrange the stands and place the insulating plastic sheets under the legs as per the layout drawing supplied. Level the stands properly.
- (ii) Place the cell insulators on the stands, mound the cells on the insulators and level them properly.
- (iii) Arrange the cells so that the positive terminal of one cell adjoins the negative terminal of the next throughout the battery.
- (iv) In case the cells are to be placed in more than one row or tier, ensure that the positive terminal of the end cell of one row or tier is connected to the negative terminal of the end cell of the other row or tier. The connection between the two rows or tiers may be made with the inter-row or inter-tier connector supplied.
- (v) Wipe the top of cover free of dust by means of a clean duster. Smear a little petroleum jelly on the threads, bolting faces and in the bolt holes before bolting up. Connect the inter-cell, inter-row and inter tier connectors sufficiently tight to avoid loose connections and smear petroleum jelly over the nuts, bolt heads and washers and also all exposed inter - cell/row/ tier connectors.

- (iv) Connect the external cables from the battery charger to the end battery terminals ensuring that the positive of charger is connected to the positive of battery.

NOTE: 1. While making connections ensure that no fastening components fall into the cell. Connections should be done after fixing the vent plugs

2. Do not leave metal tools (used for tightening the connection) on the top of the cells.

INITIAL FILLING OF ELECTROLYTE:

- (i) Remove the plug provided on the holes of the cover. Cooled battery grade sulphuric acid as specified, should be carefully poured into the cells with the help of a funnel and jog. The level of the electrolyte in each cell should be adjusted as indicated.
- (ii) Replace the vent plug on the cell.
- (iii) After filling in, leave the cells idle for 2 to 16 hours, or until the temperature falls to slightly above room temperature (but not more than 24 hours in any case after filling the electrolyte.) the plates will absorb the electrolyte causing a drop in the electrolyte level. Restore the electrolyte level at the end of this period by adding more acid of the same specific gravity as used initially. The battery is now ready for first charge.

FIRST CHARGE:

- (i) Check again the polarity of inter-cell/row/tier connections. Ensure that all fastenings and connections are tight.
- (ii) It is of utmost importance that the positive lead of the battery is connected to the positive terminal of the charger.

The polarity is usually marked near the terminals provided on the charger. In case of doubt the voltmeter provided on the charger can be used to check the polarity of the terminals. If the deflection is the Positive (clockwise) direction, the connections are in order. In case the deflection is reverse the lead ends should be interchanged and connected in order. The test must be repeated as described above. **The AC mains switch of the charger should remain switched off while taking the polarity test.** After the correct polarity is ascertained, switch off the DC output switch of the charger.

- (iii) Ensure that the voltage control device in the battery charger is at the minimum position so that when the charger is switched on, minimum or no current flows into the battery. Switch on the battery charger.

Slowly increase the current to the value specified below and follow the charging schedule maintaining the current constant throughout the first charge

- (iv) During the early stages of the first charge the specific gravity may fall but after the charging has been in progress for some time. The specific gravity of the electrolyte will gradually commence rising.
- (vi) The reading of specific gravity and voltage of each cell may be taken at intervals of 1 hour from the commencement of charge.
- (vii) Towards the end of charge, all the cells start gassing freely. The voltage will reach a final value of 2.50 to 2.65 V per cell and the specific gravity to 1.200/1.240 +/-0.005. Do not terminate the charge even if the specific gravity and voltage readings exceed the above values until the specified ampere hour input is fed into the battery.
- (viii) At no stage during charging, the temperature be allowed to exceed 55°C. If the temperature tends to rise beyond 45°C reduce the current to one third the value so that the temperature ceases to rise. However, if at any time the current is reduced the time of charging shall be correspondingly increased so that at the end of charging, **the specified ampere hour input has been put into the cells.**

The charging may be suspended for some time to allow the cells to cool.

At places where high ambient temperature normally prevails and where electrolyte temperature limit of 50°C would make charging impossible, it is recommended that the cell be filled during night time and charging undertaken during the night and suspended during the day.

- (ix) Before any discharge is taken on the cell, it is necessary that the specific gravity is adjusted to 1.200/1.240 +/-0.005. corrected to 27°C In order to achieve this specific gravity at the conclusion of first charge, it is necessary that this adjustment is done well in advance. If the specific gravity of the electrolyte exceeds 1.200/1.240 at 27°C withdraw some electrolyte and add distilled water. If the specific gravity of the electrolyte is below 1.200/1.240, withdraw some electrolyte and add acid of specific gravity 1.400 while adjusting the specific gravity. It is necessary to maintain the level of electrolyte in the cell to the pre-scribed level as indicated by the level indicator.

After the addition of distilled water or acid as the case may be, continue the charge so that water and acid mix thoroughly.

The final specific gravity of all the cells should be 1.200/1.240 +/-0.005. corrected to 27°C

IMPORTANT INSTRUCTIONS:

1. Smoking or use of naked flame in the battery room should be strictly prohibited.
2. Ensure correct polarity between adjacent cells and between the battery and the charging source. Charging the cell or battery in the wrong direction will ruin it.
3. Never make the specific gravity adjustment on a cell which does not gas freely on charge. Report the matter immediately to the manufacturer.

4. Use calibrated meters for measuring current, cell voltage, specific gravity and temperature.
5. The results obtained from a battery are affected to an incredible extent by the way in which the initial or first charge is carried out. Never terminate the charge **until the specific ampere hour input is put into the battery even through the cells may show constant or higher specific gravity and voltage reading that indicated above.**

CAPACITY TEST:

- (i) The battery which has been given the first charge as detailed above be allowed to stand on open circuit for not less than 12 hours and not more than 24 hours. Discharge the battery through a variable resistance or acidulated water load at a constant current of 10% of battery capacity. the discharge shall to stopped when the closed circuit voltage across the battery has fallen to $1.85/1.80 \times n$ volts, where 'n' is the number of cells.
 - (ii) The time in hours elapsing between the beginning and the end of discharge shall be taken as the period of discharge.
 - (iii) On the first discharge, the battery shall give not less than 85 per cent of the rated capacity. The rated capacity shall be achieved within ten discharge cycles subsequent to the initial (first) charge.
 - (iv) Recharge the battery at a constant normal recharge current of 10% amps. till the cells start gassing at a voltage of 2.35 to 2.40 volts per cell and thereafter reduce the charging current to the finishing rate of 5% Amps. and continue charging at this current till the voltage of each cell reached 2.50 V to 2.65 V and the specific gravity to 1.200/1.240 ± 0.005 and both remain constant for three consecutive hourly readings (at the reference temperature of 27° C)
 - (V) Take two or more such cycles of discharge and charge at currents specified against serial numbers (i) and (iv) above. The specific gravity of the electrolyte should always be adjusted to 1.200/1.240 ± 0.005 corrected to 27° C before the discharge is commenced.
 - (vi) If the discharge in ampere hours in any one of the above cycles exceeds the rated capacity of the cells it can be taken as the test discharge and the battery considered as having passed the capacity test.
- If the battery is not to be commissioned immediately and is to be kept idle for some period, it is essential that the battery be given a Freshning charge every fortnight. The specific gravity of all the cells should be equalised to the fully charged value.

Operating Instructions for the Maintenance of “ PANACEA ” Stationary Battery

GENERAL INSTRUCTIONS:

1. Cells containers stand and insulators should be kept dry and clean. Vent plugs and acid level indicating float plugs should be in position and light petroleum jelly should be applied to terminal posts, inter-cell/row/tier connectors, end-take offs, nuts, bolts and washers regularly to prevent them from corrosion / sulphation. Should terminal connectors be corroded, remove them and clean with warm water, dry, fix in place and coat with petroleum jelly. Wash all vent plugs regularly by immersing in a bucket of Demineralised or Distilled water and wipe them clean.
2. The battery room should be well-lit, cool, clean, dry and well-ventilated. Heat from sun, radiators, heaters or pipes can shorten the life considerably. Room temperature of 27° C, is recommended. When this cannot be achieved under normal conditions, suitable arrangement for a draught of cold air into the battery rooms should be made so as to maintain the battery room within the prescribed value.

Care should be taken that no effluent such as chlorine, acetic acid or any such gases from chemical factories or breweries in the vicinity have an access to the room.

FLOAT SERVICE:

The Correct float charge current is automatically controlled by maintaining the correct float voltage across the battery terminals. The recommended voltage of float charge is between 2.16 to 2.20 Volts per cell.

(At lower temperature than 27° C., this voltage setting is to be slightly increased whereas at high temperature it should be lower). Because the operation of a battery by the full float method is based on the overall voltage applied to the battery terminals, it is very important that the voltmeter used be accurate at this operating voltage value.

CHARGING OF THE CELLS:

Ordinary Charge:

The cells shall never be kept in a discharged or partially discharged condition. Following an emergency or test discharge or when the specific gravity in an majority of cells have fallen below 1.195, the battery should be charged at the normal recharge current as specified till the cells start gassing at 2.35 to 2.40 Volts per cell and thereafter reduced to the finishing charge current till the specific gravity and voltage remain constant for three consecutive half hourly readings.

Conditioning Charge with a curative Discharge:

It is recommended to discharge the battery once in a year at 10-hour rate to its ultimate capacity. i.e. to an end voltage of 1.85 volts per cell. The discharged battery should be immediately charged as detailed under 'Ordinary Charge!'

Equalising Charge:

An occasional equalising charge should be given to a lead-acid battery to compensate for low or uneven specific gravity.

(a) Floating voltage at 2.16V to 2.2V per cell:

An equalising charge shall be given to the battery at the rate specified, once in every three months still the voltage and specific gravity readings in all the cells have remained constant for three consecutive half hourly readings. The frequency of equalising charge may be increased if uneven specific gravities are indicated in different cells. The reason for continued low specific gravities should, however, be investigated.

MAINTENANCE EQUIPMENT:

The following equipment should be available to carry out satisfactory maintenance of the battery:

- (1) Voltmeter of sufficient accuracy and scale length to read cell voltage and voltmeter and ammeter to read battery voltage and current (usually provided in the charger panel.)
- (2) Hydrometer to read specific gravity with 0.005 division.
- (3) Thermometer to read electrolyte temperature having a range of 0-100°C with graduation of 1°C.
- (4) Pure battery grade distilled water (as per IS 1069) for topping up.
- (5) Funnel and Jug.
- (6) Nylon brush with stout bristles for cleaning connections.
- (7) Spanners of required size for tightening bolted connections.
- (8) Petroleum jelly for covering exposed metal parts.
- (9) Protective clothing (apron, rubber gloves, etc.)
- (10) Eyewash bottle.

PRECAUTIONS:

- (1) Top up as often as necessary with pure battery grade distilled water (as per IS: 1069) or demineralised water to keep the correct level of electrolyte.

- (2) Give equalising charge as recommended.
- (3) Do not exceed the electrolyte temperature during charge beyond 55 C.
- (4) Attend to weak cells without delay.
- (5) If battery is to stand idle, first give a freshing charge and repeat the equalising charge every fortnight.
- (6) Record the specific gravity and the temperature. The specific gravity and temperature of two pilot cells (not an end or regulator cell) should be recorded daily and that of each cell once in a month.
- (7) The terminals and connections should be checked regularly and cleaned or replaced as may be necessary. They should be coated with petroleum jelly.

SAFETY:

- (1) The battery (cells, stand, terminals etc.) should be kept clean and dry.
- (2) Naked lights, smoking of cigarettes or anything which may create a spark should be avoided in the battery room.
- (3) Care must be taken when using metal tools to prevent them from coming into accidental contact with connections and causing a short circuit. Insulated tools should be used. Do not leave metal tools on the top of the cells.
- (4) Protective measures (apron, rubber gloves and eyeshields) should be taken when handling electrolyte or concentrated acid. Any acid spilled on the skin or clothing should receive prompt treatment.

BATTERY DEFECTS:

- (1) Excessive gassing and progressive increase in specific gravity during floating indicates that the floating voltage is set high. Reduce the floating voltage to a lower value and check the accuracy of the voltmeter in the charger if necessary.

- (2) Progressive lower values of specific gravity during floating indicates that the floating voltage is set low. Increase the floating voltage to 2.16 to 2.20V per cell. Check the accuracy of the voltmeter in the charger if necessary. Grounded circuits also circulate leakage current thereby discharging the battery. Check for leakage of electrolyte or grounding of current carrying conductors in the charger, as well as in the battery circuit.
- (3) Battery voltage falling too rapidly on discharge may be due to loose connections or corroded terminals. Corroded parts should be cleaned with warm water, and coated with petroleum jelly.
- (4) Continuous lowering of electrolyte level may be due to leakage of electrolyte or loss of water in the electrolyte due to evaporation by too high a floating voltage or excessive charging. Replace container immediately in case of leakage. Addition of distilled water to maintain the electrolyte level in the leakage cell will result in diminution of capacity and continuous lowering of specific gravity.
- (5) Continued low reaching of specific gravity, loss of capacity after a full charge or low open circuit voltage in any cell is due to internal short circuit. Examine the plates for accidental contacts or missing or sheared separator.
- (6) Premature gassing in a few cells is due to the negative plates low in capacity due to sulphation. Prolonged charging at very slow rates at half the finishing rate of charge is the remedial solution. As soon as premature gassing is noted, the rate of charge should be reduced to a point where the gassing ceases.
- (7) Continuous low specific gravity reading of any cell in spite of normal cell voltage is due to sulphation. Such weak cells should be given a special charge.
- (8) The overflowing in cells due to increase in electrolyte level even without the addition of distilled water is due to damp atmosphere in the battery room causing condensation on the cell covers or spray arrestors. Improve ventilation in the battery room.

WEAK CELLS

Cells which do not pick up specific gravity in spite of repeated charging are weak cells and must be given a special charge. The weak cells must be removed from the battery and charged separately at normal charging rate until gassing point is reached and then reduced to half the normal rate. When the cells appear to be in fully charged condition i.e. the specific gravity of the acid seems to be stationary, the charging should be stopped for an hour and then be resumed at half normal rate until free gassing again takes place. A further stop of one hour's duration should be made and the charge should again be resumed still at half the normal rate. These stops of one hour duration alternated by charges should be repeated until gassing starts simultaneously with switching on the charging current.

If in spite of this special charge if the cells do not pick up the specific gravity the manufacturer should be approached.

As and when a stationary battery gives problems in service it is due to either or a combination of the following reasons:

- (1) Improper commissioning.
- (2) Insufficient topping up.
- (3) Improper float voltage setting
- (4) Deep discharge may be due to a charger fault.
- (5) Corroded inter cell connectors, nuts, bolts, washers.
- (6) Dusty dirty environment
- (7) Insufficient exhaust and air inlet arrangement
- (8) Impurities in electrolyte at commissioning stage / topping up water.

1) Effects of improper commissioning

The battery which has been not commissioned properly shall not be fully charged and hence not deliver the rated capacity and perform as expected at times of emergency. The back up duration expected from the battery shall not be fulfilled.

Battery manufacturers generally recommend a discharge and recharge cycle before use of the battery at the site after the commissioning.

2) Effects of insufficient topping up ELECTROLYTE BELOW TOP OF THE PLATES.

- 1) Abnormal sulfation take place.
- 2) Does not transfer heat from the plates.
- 3) Certain area above electrolyte level is electrochemically inactive.
(Does not take in the reaction)

NOTE: IF SUCH A CONDITION NOTICED.

- 1) Do not add electrolyte.
- 2) Add Distilled / Demineralised Water.
- 3) If necessary, inform / call manufacturer.

3) Effects of improper float voltage setting

A stationery battery cannot be allowed to remain on open circuit since it will undergo a continuous self discharge due to its in-ternal losses. Hence a battery is connected to a float charger with the float voltage set to the recommended range.

If float voltage is set high life of the battery is affected.

4) Effects of deep discharge (May be due to a charger fault)

In case of a deep discharge.

The sp. gr. of the Electrolyte becomes so low that conductivity is lost and recharging becomes difficult.

5) Effects of corroded inter cell connectors, nuts bolts, and washers

Corroded inter cell connectors, nut, bolts and washers, result in loose contacts and increase the resistance. Products of corrosion are non conducting substances which prevent battery from delivering sufficient current required at times by the load by making the resistance too high for the passage of the large currents.

6) Effect of dusty / dirty environment

Dusty/ dirty environment, clogs the vent holes, prevents escape of explosive gases, resulting in build up of pressure inside the battery with a possibility of explosion of the battery.

7) Effect of Insufficient Exhaust / Air Inlet Arrangement.

Exhaust fans to be provided. These fans to ensure six air changes per hour. Inlet to be such that there is no negative pressure otherwise a negative pressure can lead to evaporation of electrolyte necessitating frequent addition of water. Hydrogen forms an explosive mixture with air resulting in explosion. should a spark occur any where in the room.

8) Impurities in electrolyte during commissioning stage / topping up of water. Impurities Affecting Positive & Negative Plates.

Iron - oxidises at positive plates

- reduces at negative plates

resulting in discharge of both plates.

Manganese Attack wood and rubber

Damages both types of Separators

Chlorine - Bleaches the Separators

- Releases antimony from

positive plates.

Ammonia - Causes self discharge

Acetic Acid - Causes corrosion of grid metal

Alcohol - Gets oxidised to Acetic Acid and then after causes corrosion of grid metal.



Batteries



— Gebrauchsanweisung beachten.
— Please follow the instructions.
— Se conformer a la notice d' emploi.



— Schutzbrille and Schutzkleidung tragen.
— Use overalls and safety - goggles.
— Porter des lunettes de securite et des
vetements de protection.



— keine offene Flamme, Glut oder Funken.
— Cause no open flame, embers or sparks.
— Ni flamme ouverte, ni braises, ni etincelles.



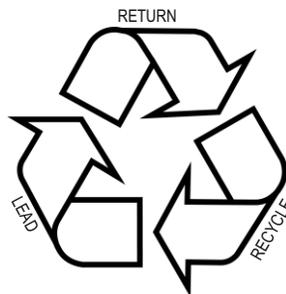
— Explosionsgefahr, Kurzschlusse vermeiden
— Explosion hazard, Avoid short circuits.
— Danger d' explosion, eviter les court-circuits.



— Elektrolyte ist stark atzend.
— Electrolyte is highly corrosive.
— Electrolyte fortement corrosif.



— Transporthinweis beachten.
— Please follow transport instructions.
— Respecter les consignes de transport.



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