



# KDZ RAILWAY DIESEL STARTING BATTERIES

## INSTALLATION AND OPERATING INSTRUCTIONS

**CAUTION - READ THE ENTIRE INSTALLATION AND OPERATING INSTRUCTIONS BEFORE PLACING BATTERIES IN SERVICE.**

### 1. SAFETY

- 1.1 Follow your company's Safety Instructions when working with or near diesel starting batteries. Observe the caution label affixed to the battery. Thoroughly familiarize yourself with industry and government guidelines (OSHA, ANSI) for charging, handling and maintaining diesel batteries.
- 1.2 Assign battery and charger care to properly trained personnel.
- 1.3 This battery contains sulfuric acid. Avoid contact with skin, eyes, or clothing. Wear rubber apron, gloves, boots and goggles or face shield when handling, checking, filling, charging or repairing batteries.
- 1.4 Keep water readily available for flushing spilled electrolyte from eyes or skin. Use plain water only and obtain medical attention immediately. Special deluge showers and eye wash basins are required.
- 1.5 Batteries produce hydrogen during charge. Keep open flames away. Do not check electrolyte level with a cigarette lighter or match. Use a flashlight or permanent lights. Do not smoke or create sparks.
- 1.6 Lift batteries with a hoist, crane, lift truck, or similar equipment. Move batteries on trucks, conveyors or rollers. Be sure to place a rubber mat or similar insulating material across tops of batteries without covers when handling. Make sure equipment is of ample strength and properly installed.

**CAUTION: Do not use chain or wire rope slings.**

- 1.7 Never lay metal tools, such as wrenches or other material on top of a battery.
- 1.8 Disconnect the battery from the locomotive when performing maintenance and repair on the motor or electrical system.
- 1.9 Open or "break" the battery circuit before attempting repairs to terminal connections.

- 1.10 Apply a strong neutralizer, like baking soda, when acid is spilled on the floor. Check local regulations regarding disposal of neutralized waste.

### 2. RECEIVING BATTERIES

Immediately upon receipt of shipment, examine the outside of the packing for signs of rough handling before accepting battery from carrier. Wet spots on the shipping pallet may be an indication of leaking jars broken in shipment.

If there is evident damage, the receipt should be signed and both copies (carrier's and receiving copies) marked "Shipment Received Damaged". The carrier should be called immediately and asked to make a "Carrier's Inspection for Damage Report".

If "concealed" damage is later detected, the carrier should be called immediately and requested to make a "Carrier's Inspection for Concealed Damage Report". After inspection by the carrier, arrangements should be made with the local GNB® Industrial Power representative to have the battery repaired before placing it in service.

#### CAUTION

**Before placing a battery in service, review and adhere to the Safety Guidelines listed in Section 1.**

### 3. INITIAL FRESHENING CHARGE

Remove the vent caps from each cell and check to see that the electrolyte level is above the plates. During shipment of the battery, low temperatures and/or normal shock and vibration often results in a drop in the electrolyte level. If the level is below the plates, recheck it after three hours of charging. If the level remains below the plates, add water until the plates are covered. If it is obvious that electrolyte has spilled out of any cells, replace it with electrolyte of the same specific gravity as found in the other cells of the battery.

Replace the vent caps and give the battery a freshening charge of 3 to 6 hours or by continuing

the charge until there is no increase in specific gravity for three hydrometer readings taken at one hour intervals. **CONTINUE CHARGING AND MAKE FINAL ADJUSTMENT OF THE ELECTROLYTE LEVEL TOWARD THE END OF THE CHARGE.**

Upon completion of the freshening charge, the normal fully charged specific gravity should be 1.245 to 1.255 at 77°F.

#### **4. INSTALLING BATTERY (BLOCKING)**

Negligence in properly blocking a battery in the compartment is apt to permit shifting and may cause damage. All trays should be securely blocked, but care should be taken to avoid overtight wedging. Clearance of about 1/8" should be left between the blocking and the battery trays.

#### **5. TERMINAL CONNECTIONS**

Make original connections clean and tight to 100 in-lb. Inspect terminal connections regularly and keep them clean and tight to 100 in-lb.

#### **6. VOLTAGE REGULATOR**

The battery is only one part of a total system, all of the parts of which are inter-related and interdependent. The battery simply stores energy in a chemical form for use when the generating system is not running. It is not a source of power but merely a reservoir. The battery supplies power for starting but, as soon as the engine is running, the generating system must replace the power withdrawn from the battery.

Input from the generating system to the battery is controlled by the voltage regulator. It is important to make sure that the regulator is known to be in satisfactory operating condition and adjusted to the correct operating voltage.

If the voltage regulator is not in good operating condition or is adjusted to an incorrect operating voltage, the battery will not function satisfactorily because the charge it receives will be insufficient (undercharged) or excessive (overcharged). In severe cases of bad regulation and overcharging, failure can take place within a year. Overcharge is indicated by faster water loss than normal.

A bad regulator or one set too low can cause undercharge—a condition which will literally starve the battery to death. In this case, more power is drawn out of the battery than is replaced. As a result, the battery gradually runs down until it is so low that it fails completely. Undercharge

is indicated by decreasing electrolyte specific gravities.

The correct operating or battery float voltage to be set on the regulator is that which will maintain the battery in a fully charged condition. This correct setting depends on two factors—operating temperature and locomotive work schedule. It is recommended that voltage regulator adjustments be made while the engine is at operating speeds.

Correct battery float voltage at different environmental temperatures are as follows:

Temperature	Float Voltage (Volts/Cell)
Greater than 80°F	2.25-2.30
50°F to 80°F	2.30-2.33
Less than 50°F	2.33-2.38

The effect of locomotive work schedule on the correct float voltage is determined with experience. If a battery is used for starting very frequently, float voltages should be set at the higher end of the range indicated at the appropriate temperature; similarly, for infrequent battery usage, float voltages should be set at the lower end of the range.

#### **7. VENTILATION**

As explained in Section 2, gases produced from a charging battery are explosive! Clean all ventilating openings to remove any collection of dirt or dust that might prevent the free circulation of air.

#### **8. WATER ADDITION**

All lead acid batteries, in the course of normal operation, generate hydrogen and oxygen from water in the electrolyte.

Gassing or water consumption in a battery is a function of float voltage and operating temperature. Excessive water consumption indicates the voltage regulator setting is too high and should be reduced. Normally, it should not be necessary to add water to the battery more than once every 30-180 days in the summer and once every 60-180 days in the winter.

If the gravity reading shows a continual lowering, or consistently remains 10 to 20 points below the fully charged gravity, the voltage regulator is set too low for the locomotive's work schedule and it should be increased to allow more charge. Do not increase or decrease the voltage regulator setting more than 1/2 volt at a time. Recheck

the battery after each adjustment to see if an additional change in regulator setting is necessary.

The maximum electrolyte level, with the battery on charge, is at the bottom of the vent well. It should always be maintained between there and the top of the plates. However, such things as cold temperature or extended open circuit stands will cause the level to drop without the loss of electrolyte or water from the cells. Under these conditions, do not adjust the level without first charging the battery for 3-6 hours. Before charging, make sure the electrolyte covers the plates. Otherwise, electrolyte overflow may result.

When adding water, always use distilled water or water that is known to be free of abnormally high amounts of impurities. Contact GNB or your local Sales Representative if you are not sure of your water quality.

## 9. ADDING ACID

Acid should be added to a cell only when electrolyte is spilled or otherwise not returned. Always add acid of the same specific gravity as that in the cell and only in the same amount as was lost from the cell. To increase the electrolyte level in the cell, use water at all times.

## 10. SPECIFIC GRAVITY

Read the specific gravity of the electrolyte BEFORE adding water, otherwise the reading will be low. Return all of the electrolyte to the cell from which it was taken.

### a) *Effect of Temperature on Specific Gravity:*

Variations in temperature affect the specific gravity of the electrolyte and temperature corrections should be made. One point (.001) should be added to the hydrometer reading for each 3° above 77°F and one point should be subtracted for each 3° below 77°F. Make a record of the reading.

### b) Effect of Electrolyte Level on Specific Gravity:

Variations in solution height affect the specific gravity of the electrolyte. Normally water is consumed in the operation of a battery and electrolyte levels will decrease, causing a slight increase in specific gravity. For every 1/8" decrease in electrolyte level of these batteries, there will be an approximate increase of .003 in specific gravity. The specific gravity should be 1.250 when the

battery is fully charged and the electrolyte level is at the maximum.

## 11. CLEANING

Keep the vent caps in place during use and charging. Remove them only to observe levels, make water additions, take temperatures, or take specific gravity readings with a hydrometer. The battery can be washed off with water if dusty. Keep the vent caps in place. If electrolyte has accumulated on the top of the battery, wash with an approved neutralizing solution, available through GNB service. Follow the wash with a rinse using clear water. Dispose of all waste materials in an environmentally safe manner.

## 12. STORAGE OF SPARE BATTERIES

### a) General Care:

Spare charged (wet) batteries should be given regular good housekeeping care. A clean, cool, dry place, free from dust and debris, should be selected for storage space.

### b) Testing:

Spare charged (wet) batteries should be checked quarterly to determine the specific gravity. Batteries should be charged when the specific gravity drops thirty (.030) points below the specified fully charged reading. Temperature affects the need for charges. Usually a charge is required every three (3) months.

### c) Charging:

When charging is required, use the Finish rate. (See name plate for Finish rate.) Continue charging until gassing occurs. Charging should not be discontinued until the temperature-corrected specific gravity of the lowest cell has risen to the maximum and has shown no further rise for two (2) consecutive hourly readings.

### 13. REMEMBER THESE IMPORTANT FACTS

For maximum battery life and performance, always be aware of these potential problem areas and take the appropriate action to correct them should they occur.

*SHORT CIRCUITS*—cause electrical leaks that run batteries down.

*ENERGY WASTE*—running battery down with lights or accessories unintentionally left on when engine is not running.

*POOR, DIRTY CONNECTIONS*—corrosion builds up resistance which impedes—often stops—the flow of power to and from the battery .

*LOW REGULATOR SETTINGS*— limit the flow of recharging current to the battery thereby starving it.

*HIGH OR UNCONTROLLED REGULATOR*—permits excessive flow of current to the battery causing excessive loss of water and premature failure.

### 14. WARRANTY AND RECORDS

Diesel starting batteries are warranted against manufacturing defects or factors under GNB Industrial Power control. There are many factors under the control of the battery user that can damage the battery. The most important user-controlled

factor is the battery float voltage set on the voltage regulator of the locomotive generating or charging system. Many battery users routinely keep records of monthly readings of voltage regulator output with the engine at idle and at operating speed. As explained above (Section 6), the correct adjustment of battery float voltage is critical in ensuring battery performance. To keep the warranty valid, the following records must be kept:

- a) Quarterly record of voltage regulator output or battery float voltages together with the temperature range for which adjustment is made; and
- b) Quarterly log of electrolyte level and specific gravity in the cells of the battery. Such records can alert the user to the existence of abnormal conditions in his application that can adversely affect the battery. Preventive actions can then be taken promptly to ensure the battery is not damaged.

### 15. RECYCLING

U.S. Federal and State Regulations require that lead acid batteries be handled and disposed of in compliance with strict guidelines. GNB offers disposal service for lead acid batteries. Call 1-888-438-5865 to arrange a pick-up or to get additional information. In Canada, call 1-800-231-9081.

In the USA, call 1-800-GNB-RAIL for additional information.  
In Canada call 1-800-268-2698 for additional information.

For alternate language versions of this document, visit [www.gnb.com](http://www.gnb.com)



**POST THESE INSTRUCTIONS  
IN BATTERY MAINTENANCE AREA**

**GNB Industrial Power**

U.S.A. - Tel: 877.GNB.INFO

Canada - Tel: 808-268-2698

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