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Safety Recommendations For Lead-Acid Industrial Storage Batteries For Railway and Marine Starting Applications

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ● 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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TABLE OF CONTENTS

		Page
	FOREWORD	i
	SCOPE	iii
Section 1	DEFINITIONS	1
Section 2	INTRODUCTION	2
Section 3	MARKINGS	3
Section 4	GENERAL SAFETY PRECAUTIONS	4
Section 5	INSTALLING AND HANDLING BATTERIES	5
Section 6	BATTERY BOXES AND COMPARTMENTS	6
Section 7	BATTERY INSTALLATION	7
Section 8	GENERAL MAINTENANCE	8

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Foreword

The purpose of this Standards Publication is to provide practical information on the safe installation, maintenance, and use of lead-acid industrial storage batteries for starting railway and marine diesel engines.

These standards have been developed by the Industrial Battery and Charger Section of NEMA which periodically reviews them for any revisions necessary to keep them up to date with advancing technology. Comments or recommended revisions are welcome and should be submitted to:

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Scope

This Standards Publication covers safety recommendations for lead-acid industrial storage batteries used as a source of power for starting railway and marine diesel engines.

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Section 1
DEFINITIONS

The terms used in this publication are defined in accordance with NEMA Standards Publication IB 1-1982, *Defintions and Precautionary Labels for Lead-Acid Industrial Storage Batteries,* if applicable.

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Section 2
INTRODUCTION

If the following precautions are not fully understood, clarification should be obtained from the battery manufacturer or supplier. Local conditions may introduce situations not covered by these safety precautions. The battery manufacturer or supplier should be contacted for guidance with a particular safety problem.

Before proceeding with the unpacking, handling, installation, and operation of a lead-acid industrial storage battery, the following instructions should be read and understood:

1. The manufacturer's or supplier's installation and operating procedures, or both
2. The manufacturer's or supplier's maintenance procedures, or both
3. The safety precautions referenced in this document.

Only trained personnel who are totally familiar with and understand the above documents should be permitted to install, operate, and maintain lead-acid storage batteries.

A lead-acid battery is an electro-chemical device containing electrolyte which is a dilute solution of sulfuric acid and water. This electrolyte is corrosive and may cause burns.

A lead-acid battery, especially over 50 volts, may cause electrical shock to personnel.

All lead-acid batteries generate a mixture of hydrogen and oxygen gases which is explosive if ignited.

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Section 3
MARKINGS

The following legible information should appear on each battery:

1. Name of manufacturer
2. Manufacturer's model number
3. An electrolyte hazard label
4. An explosive gas hazard label
5. An electric shock hazard label for batteries over 50 volts
6. The polarity of the positive terminal should be permanently identified by either a "POS", "P", or "+" and, if colored, should always be red. The polarity of the negative terminal should be permanently identified by a "NEG", "N", or "–" and, if colored, should always be black
7. The positive side of the battery charging plug should be permanently identified with the marking "POS", "P", or "+" and the negative side with the marking "NEG", "N", or "–".

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Section 4
GENERAL SAFETY PRECAUTIONS

4.1 Nonporous, acid resistant apron, gloves, and safety goggles (or face shield) should be worn when handling and installing batteries. This should help prevent injury due to splashing or spillage of electrolyte.

4.2 Smoking should be prohibited. Flames and sparks of all kinds should be kept away from the vicinity of storage batteries. The mixture of gases in the cells can be ignited, causing an explosion and injury to personnel.

4.3 Metallic jewelry, such as rings, watches, bracelets, and necklaces should not be worn when working on batteries. Instruments and tools should never be placed directly on top of the cells. Conductive tools and test prods should be insulated whenever possible. Conductive items which come in contact with the cell terminals can:

1. Cause electric shocks
2. Cause severe burns from high current shorting
3. Create sparks which can ignite the gases in the cells causing an explosion.

4.4 When preparing electrolyte, the manufacturer's instructions should be followed.

4.5 Any spills of electrolyte on skin or clothing should be immediately flushed with water. If electrolyte comes in contact with the eyes, any contact lenses should be removed and the eyes should be flushed immediately and thoroughly with water. Medical attention should always be obtained immediately when eyes are affected.

4.6 Any electrolyte spilled when handling, installing, or servicing cells should be promptly neutralized and removed. A sodium bicarbonate ($NaHCO_3$)/water solution of one pound of $NaHCO_3$ per gallon of water should be used to neutralize the electrolyte and prevent possible injury. Electrolyte is neutralized when addition of $NaHCO_3$ solution does not bubble.

4.7 Care should be exercised when handling units. A nonconductive or insulated lifting device is recommended and should be used with appropriate mechanical equipment to safely handle cells and avoid injury.

4.8 All battery connections should be properly prepared and tightened to prevent possible injury or failure of the system. The manufacturer's published instructions should be referenced for making corrections.

4.9 Access to battery service areas should be restricted to trained authorized personnel only.

4.10 The dc circuits should be interrupted before working on a battery.

4.11 Precautions should be taken against static sparks while working on batteries. To discharge static electricity from a human body, a grounded conductor located well away from the top of the battery should be touched. The wearing of leather soled shoes is recommended where static electricity is a problem. A cotton cloth, rather than one made from synthetic materials, should be used when cleaning the battery.

4.12 The vent plug gas holes should be kept clean and open and the plugs kept firmly in place when handling or installing batteries to prevent splashing of electrolyte.

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Section 5
INSTALLING AND HANDLING BATTERIES

5.1 A damaged battery should not be installed.

5.2 The battery and pallet should be moved to the installation area before unpacking. The material holding the battery to the pallets should be removed. Care should be exercised when cutting banding material to prevent injury or shorting the battery. To prevent spillage of electrolyte, caution should be exercised when batteries are tilted. Battery electrolyte which has spilled on battery shipping cartons or packing materials can cause chemical burns if it comes in contact with the skin or clothing. The precautions given in Section 4 should be followed when handling this material.

5.3 The procedures given in the manufacturer's or supplier's instructions on handling batteries should be followed.

5.4 Batteries should not be lifted by their cells or terminal posts.

5.5 Batteries should never be placed or slid across rough surfaces as the cell containers may be ruptured.

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Section 6
BATTERY BOXES AND COMPARTMENTS

6.1 The battery should be lifted into the compartment of the correct size in compliance with pertinent standards.

6.2 The compartment should be ventilated and periodic checks should be made to ensure that the ventilation is not impaired.

6.3 Compartment drain holes should be kept clean for adequate drainage.

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Section 7
BATTERY INSTALLATION

7.1 The manufacturer's or supplier's published instructions and applicable drawings should be referenced to ensure that correct layout of batteries and location of battery terminals is achieved before final connections are made.

7.2 The battery should be securely fastened in the compartment to prevent loosening of terminal and inter-tray connections.

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Section 8
GENERAL MAINTENANCE

8.1 The battery should always be disconnected before making any repairs.

8.2 The battery should be clean, ventilated, and dry to prevent ground leakage before doing any work on it.

8.3 Before performing any maintenance work on a battery, the vent caps should be removed and each cell ventilated with a gentle stream of air (fanning with a piece of cardboard is suitable) to remove explosive gas mixtures. An air hose should not be used as the flow of air may be too strong causing splashing of the electrolyte.

8.4 Sources of electrolyte leakage evidenced by corrosion or dripping should be located and corrected.

8.5 Batteries should be watered with a nonconductive device to prevent accidental shorting.

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September 1984

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(Bylaw—Art. V, Sec. 1)

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(Bylaw—Art. V, Sec. 2, Subsection A)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the standards publication may be capable of otherwise equivalent performance.

(NEMA Policy Memorandum 84-2, dated June 7, 1984)

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1. NEMA Standard, which relates to a product commercially standardized and subject to repetitive manufacture, which standard has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon;
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote thereon.

(Bylaw—Art. V, Sec. 2, Subsection B)

Authorized Engineering Information

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(Bylaw—Art. V, Sec. 6, 1st Sentence)

Official Standards Proposal

An Official Standards Proposal is an official draft of a proposed standard which is formally recommended to an outside organization(s) for consideration, comment and/or approval.

(Bylaw—Art. V, Sec. 4, Subsection A)

Identification of Status

Standards in NEMA Standards Publications are identified in the foreword or following each standard as "NEMA Standard" or "Suggested Standard for Future Design." These indicate the status of the standard. These words are followed by a date which indicates when the standard was adopted in its present form by the Association.

The material identified as "Authorized Engineering Information" and "Official Standards Proposal" is designated similarly.

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INDUSTRIAL STORAGE BATTERY SECTION OF THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

MEMBER COMPANIES

C & D Power Systems
An Allied Company
Plymouth Meeting, PA 19462

Chloride Battery Div.
Chloride Inc.
Tampa, FL 33601

Douglas Battery Mfg. Company, Inc.
Winston-Salem, NC 27117

East Penn Mfg. Company, Inc.
Lyon Station, PA 19536

Exide Corporation
Horsham, PA 19044

Ferro Magnetics Corp.
St. Louis, MO 63045

General Battery Corp.
Reading, PA 19603

Globe Battery
Div. of Johnson Controls, Inc.
Milwaukee, WI 53201

GNB Batteries Inc.
Langhorne, PA 19047

Hobert Brothers Company
Tryo, OH 45373

KW Battery Co.
Skokie, IL 60076

LaMarche Manufacturing Co.
Des Plaines, IL 60018

Mining Machinery Group
Sub. Ingersoll-Rand Corp.
Bristol, VA 24201

Pluskota Electric Company
Worth, IL 60482

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