IB 10-84 6470247 0001456 5
A-01-11

STANDARDS PUBLICATION / NO. IB 10-1984

nema

Safety Recommendations For Lead-Acid Industrial Storage Batteries Used For Motive Power Service

NEMA

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

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

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	INSTALLATION AND HANDLING OF BATTERIES	5
Section 6	CHARGING BATTERIES	6
Section 7	GENERAL MAINTENANCE	7

© 1984 by National Electrical Manufacturers Association

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

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 motive power service.

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

Manager, Engineering Department
National Electrical Manufacturers Association
2101 L Street, N.W. Suite 300
Washington, D.C. 20037

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Scope

This Standards Publication covers safety recommendations for lead-acid industrial batteries used as a source of power for motive power systems.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Section 1
DEFINITIONS

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

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

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.

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

Section 3
MARKINGS

The following legible information should appear on each battery:

1. Name of Manufacturer
2. Manufacturer's model number
3. Serial number
4. Nominal voltage
5. Capacity in ampere hours (6 hour rating)
6. Fully charged electrolyte specific gravity range
7. Service weight in pounds
8. An electrolyte hazard label
9. An explosive gas hazard label
10. An electric shock hazard label for batteries over 50 volts
11. 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
12. The positive side of the battery charging plug should be permanently identified with the markings "POS", "P", or "+" and the negative side with the markings "NEG", "N", or "−".

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

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 washed 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 the $NaHCO_3$ solution does not bubble.

4.7 Care should be exercised when handling batteries. The use of lifting bars and spreaders is recommended with appropriate mechanical handling equipment.

4.8 Mechanical connections on a battery, if present, should be tightly maintained in a corrosion free condition. Connections should be made in accordance with the manufacturer's instructions.

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

4.10 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.

4.11 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.

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Section 5
INSTALLATION AND HANDLING OF 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 metallic banding material to prevent injury or shorting of 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 A nonconductive or insulated lifting bar should be used with mechanical lifting devices. 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 nor by the chest handles provided on certain trays. Holes are provided on lifting ears or tabs for lifting purposes.

5.5 Batteries should never be placed or slid across rough surfaces as the cell containers may be ruptured through the drainage holes in the bottom of the tray resulting in leakage of electrolyte.

5.6 The battery should be lifted with an appropriate lifting bar and installed in the truck. All restraining and safety devices should be adjusted, closed, and locked to ensure that freedom to move is ½ inch or less.

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Section 6
CHARGING BATTERIES

6.1 The vent plugs should be kept firmly in place at all times to minimize electrolyte spray when the battery gases.

6.2 All charger switches should be in the OFF position before connecting the battery to the charger.

6.3 All connections should be made positive to positive, and negative to negative, when connecting the charger to the battery.

6.2 All mechanical connections on the battery and charger should be tight. Loose connections can cause overheating due to high resistance contacts and may cause battery gases to explode if spark occurs.

6.5 The charging area should be restricted to authorized personnel only.

6.6 The battery should not be disconnected from the charger unless the charger output is turned off because arcing may cause the connector contacts to pit or the battery gases to ignite explosively.

6.7 To avoid the possibility of an electric shock, the battery should always be disconnected from the charger, and the charger from the ac power line before opening the charger cabinet.

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Section 7
GENERAL MAINTENANCE

7.1 The battery should always be disconnected from the truck or the charger before making repairs.

7.2 To prevent ground leakage, the battery should be clean and dry before doing any work on it.

7.3 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.

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

Authorized Engineering Information 9-20-1984.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

September 1984

NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status are set forth in certain clauses of the NEMA Bylaws, which are quoted below:

Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for its particular need. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

(Bylaw—Art. V, Sec. 1)

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(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)

Classes of Standards

National Electrical Manufacturers Association Standards are of two classes:

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

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design.

(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.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

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. Co.
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

Hobart Brothers Company
Troy, 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

Varta Industries, Inc.
Toledo, OH 43608

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

PROBLEM HARD COPY