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Cycle Life Testing of Lead-Acid Industrial Storage Batteries for Motive Power Service

NEMA

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

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Foreword

These standards are periodically reviewed by the Industrial Storage Battery Section of NEMA for any revisions necessary to keep them up-to-date with advancing technology. In the preparation of this publication, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed revisions should be submitted to:

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This 1983 edition revises and supersedes IB 3-1978. It incorporates a revision in test methods approved November 3, 1983. At that time the balance of the standards was reaffirmed.

Scope

This NEMA Standards Publication covers cycle life test conditions and procedures for lead-acid industrial storage batteries for motive power service.

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CYCLE LIFE TESTING OF LEAD-ACID INDUSTRIAL STORAGE BATTERIES FOR MOTIVE POWER SERVICE

Section 1
DEFINITIONS

1.1 GENERAL

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

NEMA Standard 11-3-1983.

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Section 2
TESTS

2.1 TEST CONDITIONS

2.1.1 Cells for Determining Life Performance

Cell or Cells to be used for determining life performance of a battery shall be selected at random from production.

2.1.2 Test for Determining Initial Capacity Requirements

A test for determining initial capacity requirements as included in NEMA Standards Publication for *Capacity Determination of Lead-Acid Industrial Storage Batteries for Motive Power Service,* IB 2-1974 (R 1980), shall be started within 90 days after the cell or cells have been filled with electrolyte and fully charged.

2.1.3 Life Testing

Life testing shall be started within 30 days after meeting the initial capacity requirements.

2.1.4 Temperature

The ambient temperature during storage of the cells shall not exceed 100 °F (37 °C).

The electrolyte temperature throughout the test shall be within a range of 70 °F (21.1 °C) through 115 °F (46.1 °C).

2.1.5 Freshening Charge

Cells shall be given a freshening charge prior to the initiation of the test.

NEMA Standard 11-3-1977.

2.1.6 Electrolyte Level

The electrolyte level in all cells should be maintained in accordance with the manufacturer's published instructions.

Authorized Engineering Information 11-3-1977.

2.2 TEST METHODS

2.2.1 Method

The test shall consist of a series of cycles as follows:

1. A discharge of 4 hours at an average rate in amperes equal to $0.2C_6$ (C_6 = rated capacity in ampere hours at the 6-hour rate) to remove a total of $0.8C_6$ plus or minus 2 percent ampere hours.

2. A charge in accordance with the manufacturer's published instructions, but not to exceed 115 percent of the ampere hours removed. (The preceding sentence is approved as Authorized Engineering Information.) The charge, including any open circuit period, shall not exceed 8 hours.

3. The total time for one complete cycle shall equal 12 hours.

2.2.2 Additional Charging

Additional charging, not exceeding the rated 6-hour ampere hour capacity, may be given monthly to assure the cells are in a fully charged state.

2.2.3 Voltage at End of Discharge at Intervals of Not More than 100 Cycles

In lieu of 2.2.3, the test unit shall be tested at intervals of not more than 100 cycles in accordance with NEMA Standards Publication *Capacity Determination of Lead-Acid Industrial Storage Batteries for Motive Power Service,* IB 2-1974 (R 1980).

2.2.4 Alternate Test for Intervals Not More than 100 Cycles

In lieu of par. C above, the test unit shall be tested at intervals of not more than 100 cycles in accordance with NEMA Standards Publication for *Capacity Determination of Lead-acid Industrial Storage Batteries for Motive Power Service,* IB 2-1974.

2.2.5 Test When Terminal Voltage of Unit is Less than 1.70 Times the Number of Cells

If the terminal voltage of the unit is less than 1.70 times the number of cells, the unit may be retested in accordance with NEMA Standards Publication No. IB 2-1974 (R 1980). Failing to meet the requirements on the second capacity test, the life test shall be considered complete and the cycle number of this discharge shall be considered the number of life cycles obtained.

2.2.6 Evaluation

If cells are damaged as a result of malfunction of test equipment, the life test shall be considered void.

NEMA Standard 11-3-1983.

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

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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.

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INDUSTRIAL STORAGE BATTERY SECTION

OF THE

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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

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