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Testing Flame Arrestor Vents Used on Lead-Acid Industrial Storage Batteries for Stationary Service

NEMA

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

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TESTING FLAME ARRESTOR VENTS USED ON LEAD-ACID INDUSTRIAL STORAGE BATTERIES FOR STATIONARY SERVICE

Published by

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Foreword

The purpose of this Standards Publication is to determine the ability of a flame arrestor vent to vent gases from a lead-acid cell and to prevent the gases inside the cell from igniting.

User input has been considered throughout the development of this Standards Publication.

This Standards Publication has been developed by the Industrial Battery and Charger Section of NEMA, which periodically reviews it for any revisions necessary to keep it up-to-date with advancing technology. Comments or proposed revisions are welcome and should be submitted to:

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

This 1987 edition revises and supersedes IB 7-1980.

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Scope

This Standards Publication covers test procedures for determining the flame arresting ability of new or aged vents used on lead-acid industrial storage batteries for stationary service.

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TESTING FLAME ARRESTOR VENTS USED ON LEAD-ACID INDUSTRIAL STORAGE BATTERIES FOR STATIONARY SERVICE

Section 1

REFERENCED STANDARDS AND DEFINITIONS

1.1 REFERENCED STANDARDS

The following publications are adopted in whole or in part as indicated by reference in this Standards Publication.

National Electrical Manufacturers Association
2101 L Street, N.W.
Washington, D.C. 20037

IB 1-1982 *Definitions and Precautionary Labels for Lead-Acid Industrial Storage Batteries*

1.2 DEFINITIONS

The terms contained in this Standards Publication shall be defined in accordance with NEMA IB 1, as applicable.

NEMA Standard 11-19-1987.

Section 2

TESTING

2.1 TEST PROCEDURE

2.1.1 Back Pressure Test

Air shall be vented through a new flame arrestor vent until a back pressure of 15 millimeters of water is reached. The test shall be started at a cubic-centimeter-per-minute flow rate equivalent to 40 cubic centimeters per minute per square inch of external vent surface. Increase at 10 percent intervals, holding for 15 seconds at each rate, until 15 millimeters of water is reached. See Figure 2-1.

NEMA Standard 11-19-1987.

2.1.2 Sparking Test

THIS PARTICULAR TEST IS VERY DANGEROUS AND PROPER PRECAUTIONS MUST BE TAKEN TO SAFEGUARD PERSONNEL AND EQUIPMENT FROM EXPLOSION HAZARDS AND BURNS. Two parts hydrogen and one part oxygen gases shall be piped from a gas generator source into a water trap and from a water trap into the flame arrestor vent. The gas volume above the water level shall be held at a minimum. The exterior of the flame arrestor shall be exposed at a distance of 6.5 millimeters from the surface to a flame or spark. The source of flame or spark must be positioned at intervals of not less than 60 degrees around the circumference or adjacent to venting port(s).

The gas flow shall be started at a cubic-centimeter-per-minute rate equivalent to 40 cubic centimeters per minute per square inch of external vent surface. The vent shall be exposed to a flame or spark for 5 seconds. The gas flow rate shall be increased at 10 percent increments and the flame or spark exposure shall be repeated until a flame ignites on the surface of the vent (as determined by a thermocouple) or an explosion occurs. The gas source shall be shut off immediately on ignition. See Figure 2-2.

NEMA Standard 11-19-1987.

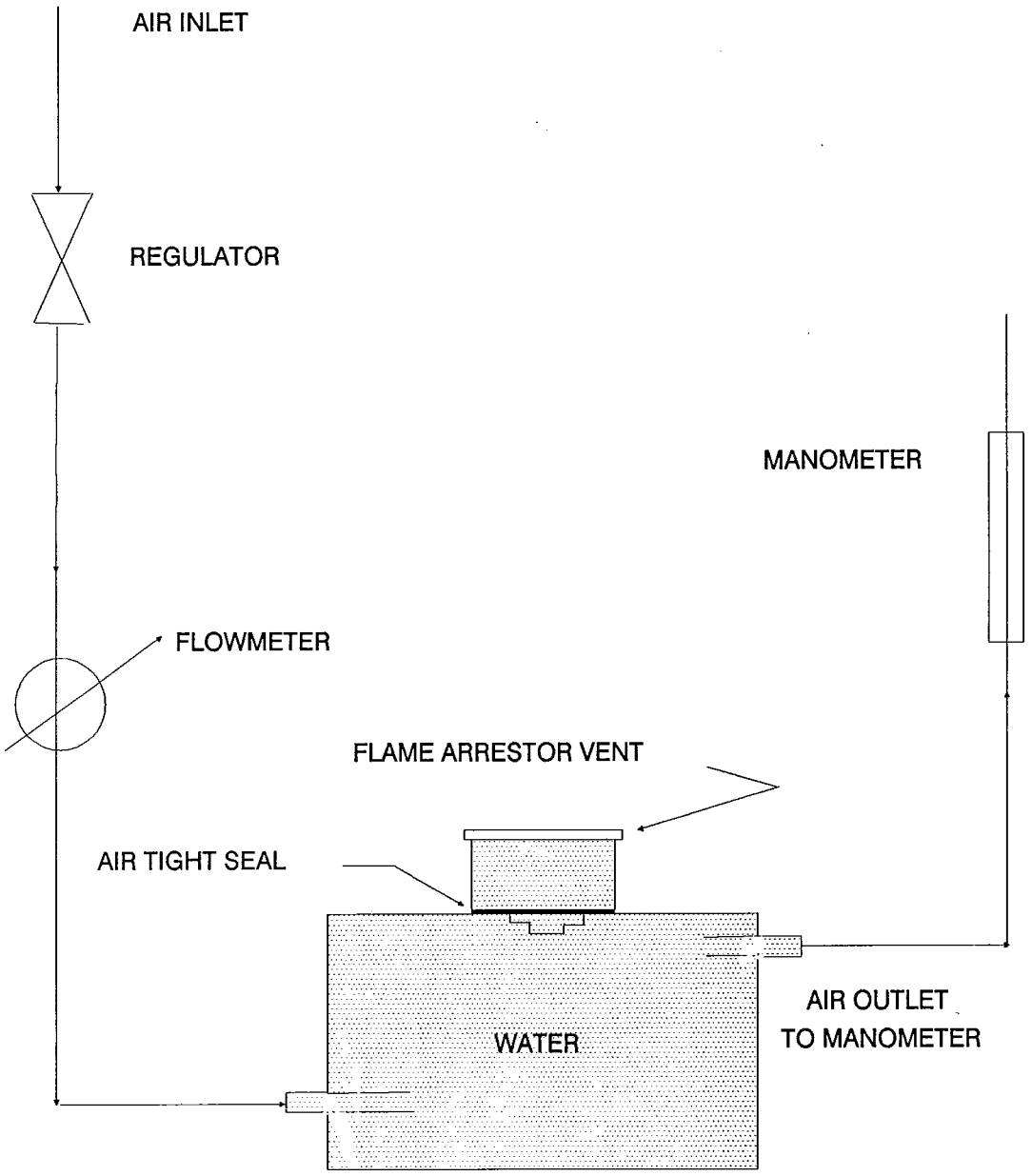
2.1.3 Simulated Aging Test

The flame arrestor vent shall be placed on a cell and charged for 60 days at a rate that would produce the same amperehours as when floated at the voltage recommended by the manufacturer for the duration of one maintenance period of the vent. The flame arrestor vent shall then be subjected to the back pressure test (2.1.1) and sparking test (2.1.2).

NEMA Standard 11-19-1987.

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Figure 2-1
FLAME ARRESTOR VENT BACK PRESSURE TEST



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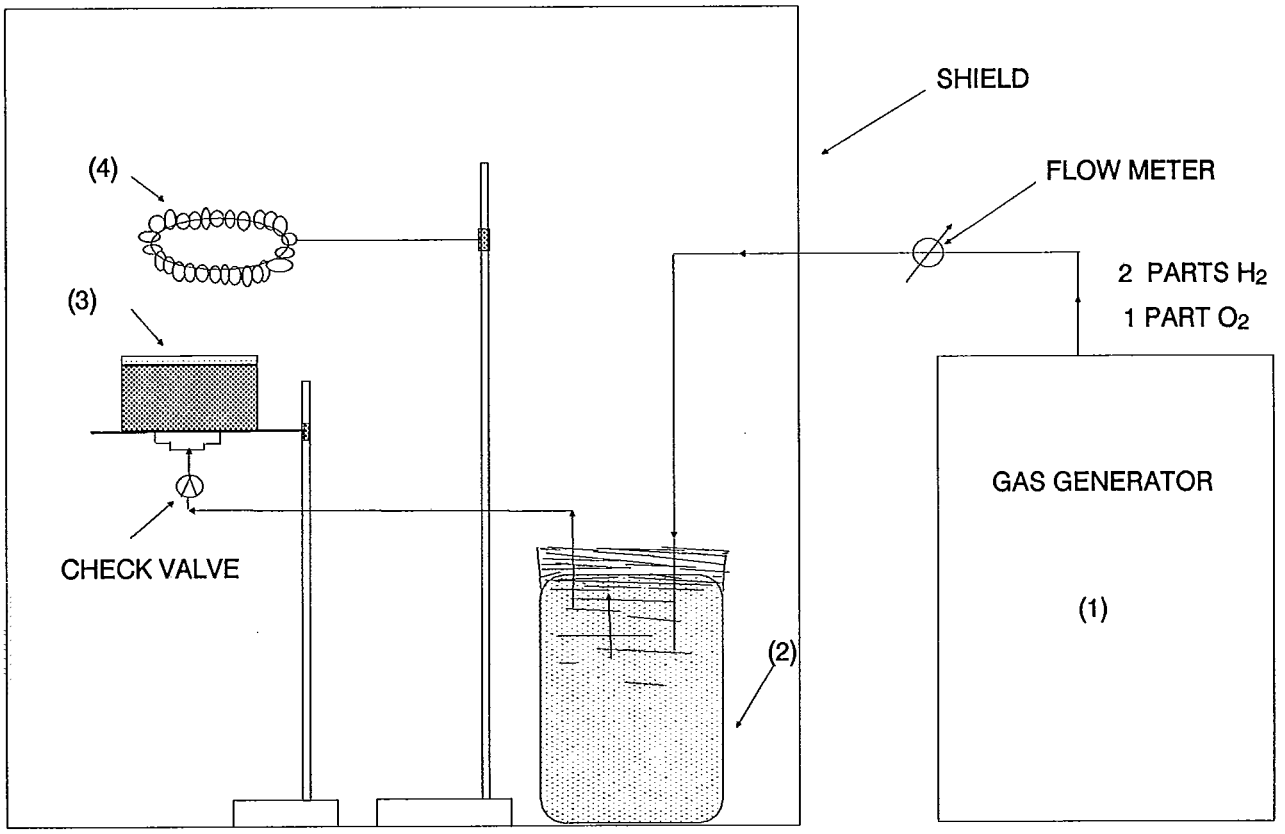


Figure 2-2
TYPICAL SPARKING TEST APPARATUS

Description: Hydrogen (H_2) and Oxygen (O_2) generated at (1) are piped into the plastic bottle bubbletrap (2) equipped with a stopper. Gases discharge below water level and are collected above water levle and piped to the Flame Arrestor (3). The spark or Flame Generator (4) is then lowered to fit around the circumference of the vent and ignited.

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Section 3
RATINGS

3.1 DETERMINATION OF MAXIMUM AMPERE RATING

3.1.1 Back Pressure Test Rating

The cubic centimeters per minute of air required to produce 15 millimeters of water back pressure shall be divided by 11.50 to determine the ampere rating for the new vent on the back pressure test. The value 11.50 represents the cubic centimeters per minute of gas produced by 1 ampere of charge current.

NEMA Standard 11-19-1987.

3.1.2 Sparking Test Rating

The cubic centimeters per minute of gas required to cause flame ignition or explosion shall be divided by 11.50 to determine the ampere rating for the new vent on the sparking test.

NEMA Standard 11-19-1987.

3.1.3 Simulated Aging Test Rating

Tests 3.1.1. and 3.1.2 shall be repeated on the back pressure test results and sparking test results, respectively, of the aged vent to determine the ampere rating of each test.

NEMA Standard 11-19-1987.

3.1.4 Maximum Ampere Rating

The maximum ampere rating of the vent is the lowest value in amperes as determined by 3.1.1, 3.1.2, and 3.1.3.

NEMA Standard 11-19-1987.

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NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status, are set forth in certain clauses of the NEMA *Standardization Policies and Procedures* manual and are referenced 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. *(Standardization Policies and Procedures, p. 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.

(Standardization Policies and Procedures, p. 2)

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.

(Standardization Policies and Procedures, p. 9)

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.

(Standardization Policies and Procedures, pp. 8 & 17)

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, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote on the standard.

(Standardization Policies and Procedures, pp. 8 & 17)

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, and which has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon.

(Standardization Policies and Procedures, pp. 8 & 17)

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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