

NEMA EM 1

---

# Exit Sign Visibility Testing Requirements for Safety and Energy Efficiency



# NEMA EM 1

## EXIT SIGN VISIBILITY TESTING REQUIREMENTS FOR SAFETY AND ENERGY EFFICIENCY

Currently in preview, click buy full version

Currently in preview, click buy full version

**NEMA Standards Publication EM 1-2007**

*Exit Sign Visibility Testing Requirements for Safety and Energy Efficiency*

*Published by:*

**National Electrical Manufacturers Association**

1300 North 17th Street, Suite 1752

Rosslyn, Virginia 22209

[www.nema.org](http://www.nema.org)

© Copyright 2007 by the National Electrical Manufacturers Association. All rights, including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American Copyright Conventions.

## NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

NEMA standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no warranty or warranty, express or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety-related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.

## CONTENTS

Foreword.....	iii
1 Scope .....	1
2 Definitions.....	1
2.1 Chevron, or directional indicator .....	1
2.2 Edgelit sign .....	1
2.3 Exit sign.....	1
2.4 Legend .....	1
2.5 Legibility .....	1
2.6 Luminance .....	1
2.7 Luminance contrast.....	1
2.8 Power demand .....	2
2.9 Visibility .....	2
3 Referenced publications .....	2
4 General requirements.....	2
4.1 Luminosity of elements and legend .....	2
4.2 Legends.....	2
4.2.1 General .....	2
4.2.2 Aspect ratios of characters .....	3
4.3 Chevrons .....	3
4.3.1 Shape .....	3
4.3.2 Size .....	5
4.3.3 Location .....	5
4.4 Luminous background .....	7
5 General test and equipment requirements.....	7
5.1 Ambient conditions .....	7
5.2 Energizing the exit sign .....	7
5.3 Power supplies.....	7
5.3.1 AC power supply .....	7
5.3.2 DC power supply .....	7
5.4 Test instruments .....	7
5.4.1 Calibration and read-out .....	7
5.4.2 Photometers.....	7
5.4.3 Electrical instruments .....	8
6 Luminance requirements .....	8
6.1 Exit Signs in the non-energized state.....	8
6.1.1 Test conditions .....	8
6.1.2 Luminance uniformity within the legend .....	8
6.1.3 Luminance uniformity across the background .....	8
6.1.4 Luminance contrast .....	8
6.1.5 Luminance contrast of concealing mechanisms for unused chevrons .....	8

6.2	Exit signs using normal AC power.....	8
6.2.1	Test conditions .....	8
6.2.2	Luminance uniformity within legends and chevrons.....	9
6.2.3	Luminance uniformity across the background .....	9
6.2.4	Luminance contrast .....	11
6.2.5	Minimum luminance of a luminous element.....	11
6.3	Exit signs using emergency DC power .....	13
6.3.1	Test conditions .....	13
6.3.2	Luminance uniformity within legends and chevrons.....	13
6.3.3	Luminance uniformity across the background .....	13
6.3.4	Luminance contrast .....	14
6.3.5	Luminance contrast of concealing mechanisms for unused directional indicators .....	14
7	Luminance measurements.....	14
7.1	General.....	14
7.2	Illuminance apparatus .....	14
7.3	Luminous legend and chevron .....	16
7.4	Background.....	21
8	Luminance calculations .....	21
8.1	Contrast formula .....	21
8.2	Mean luminance of the legend .....	22
8.3	Mean luminance of the background.....	22
9	NEMA Premium.....	22
9.1	Energy measurement .....	22
9.2	Input power demand.....	22

## Foreword

The purpose of this NEMA Standards Publication is to promote safety by setting forth visibility testing procedures and requirements for exit signs. These procedures and requirements are based on the best available objective research by the National Institute of Standards and Technology and the Lighting Research Center and on independent testing by CSA International. For the purposes of this standard, the function of an exit sign is regarded as two-fold, for readability and to attract attention in an emergency situation.

This standard is based largely on the work done by CSA International and participating companies and organizations in developing CSA Standard C860-01, *Performance for Internally Lighted Exit Signs*. However, this NEMA Standards Publication is not intended for listing or certification of products covered in its scope. For listing and certification purposes, consult the appropriate publications of Underwriters Laboratories Inc. and/or CSA International.

This standard includes energy efficiency requirements for declaration as NEMA Premium rated products. All safety related requirements and energy efficiency requirements shall be met for NEMA Premium ratings.

In the preparation of this standards publication, input of users and other interested parties was sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the Emergency Lighting Subdivision of NEMA by contacting:

Vice President, Engineering  
National Electrical Manufacturers Association  
1300 North 17th Street, Suite 1752  
Rosslyn, Virginia 22209

The standards or guidelines presented in a NEMA standards publication are considered technically sound at the time they are approved for publication. They are not a substitute for a product seller's or user's own judgment with respect to the particular product referenced in the standard or guideline, and NEMA does not undertake to guarantee the performance of any individual manufacturer's products by virtue of this standard or guide. Thus, NEMA expressly disclaims any responsibility for damages arising from the use, application, or reliance by others on the information contained in these standards or guidelines.

The Emergency Lighting Section developed this standard. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time the standard was approved, the Emergency Lighting Section was comprised of the following members:

Acuity Brands Lighting  
Cooper Lighting  
Genlyne Thomas Group, LLC  
Gilbert Industries, Incorporated  
Hubbell Lighting, Incorporated  
Lumina Lighting Incorporated  
Technical Consumer Products, Incorporated  
The Bodine Company, Incorporated  
Thomas & Betts Corporation

< This page is intentionally left blank. >

Currently in preview, click buy full version

## 1 Scope

This standards publication contains performance requirements and test methods for evaluating exit sign visibility. Visibility requirements are based on an assumed normal visual acuity and normal color recognition in clear air at a maximum viewing distance of 30.5 m (100 ft). This scope does not imply that exit signs conforming to the requirements of this standard will be visible to all people under all environmental conditions.

This standards publication contains energy efficiency requirements and test methods for evaluating exit sign performance in order to declare a NEMA Premium rating.

These requirements apply to exit signs that illuminate an integral legally required legend for installation in accordance with the *National Electrical Code* (ANSI/NFPA 70) and the *Life Safety Code* (ANSI/NFPA 101), including exit signs intended for use near the floor.

## 2 Definitions

### 2.1 chevron, or directional indicator

A graphical symbol used in conjunction with a legend on an exit sign to indicate a preferred direction of egress.

### 2.2 edgelit sign

A type of exit sign, in which the light from an enclosed light source is directed through a light-transmitting plate that has the legend etched in or attached to its surface. The sign face appears luminous when light leaves disruptions in the plate.

### 2.3 exit sign

A device used in buildings to identify the most direct path of egress for emergency purposes. It contains a legend and optional directional indicator(s). The exit sign is considered to be internally illuminated if the legend and optional directional indicator, or background, or both, are illuminated by a light source contained within the assembly supporting the legend and optional directional indicator.

### 2.4 legend

The word or words required to be contained on an exit sign.

### 2.5 legibility

The attributes of alphanumeric characters, including contrast, luminance, stroke width, and shape, that make it possible for each one to be distinguished and identified.

### 2.6 luminance

The luminance of a surface is the luminous intensity in a given direction per unit area of that surface as viewed from that direction. Luminance is measured in candelas per square meter ( $\text{cd}/\text{m}^2$ ). An older unit for luminance is footlamberts ( $1 \text{ fL} = 3.43 \text{ cd}/\text{m}^2$ ).

### 2.7 luminance contrast

Luminance contrast quantifies the relative brightness of an object against its background. For exit signs, the relevant contrast is between the luminance of the letters and the luminance of the rest of the sign face (background). Luminance contrast can vary from zero to one. The closer the