ANSI/IES LM-61-20

Illuminating
ENGINEERING SOCIETY

APPROVED METHOD: IDENTIFYING OPERATING FACTORS FOR INSTALLED HIGH INTENSITY DISCHARGE LUMINAIRES

AN AMERICAN NATIONAL STANDARD

Approved American National Standard
ANSI

www.ies.org

ANSI/IES LM-61-20

APPROVED METHOD: IDENTIFYING OPERATING FACTORS FOR INSTALLED HIGH INTENSITY DISCHARGE LUMINAIRES

AN AMERICAN NATIONAL STANDARD

Publication of this Committee Report
has been approved by the IES.
Suggestions for revisions
should be directed to the IES.

Prepared by
The IES Testing Procedures Committee

Approved by the IES Standards Committee February 13, 2020 as a Transaction of the Illuminating Engineering Society.

Approved April 21, 2020 as an American National Standard.

Published by the Illuminating Engineering Society, 120 Wall Street, New York, New York 10005.

IES Standards are developed through committee consensus and produced by the IES Office in New York. Careful attention is given to style and accuracy. If any errors are noted in this document, they should be forwarded to Brian Liebel, Director Standards, at standards@ies.org or the above address for verification and correction. The IES welcomes and urges feedback and comments.

Printed in the United States of America.

ISBN# 978-0-87995-212-9

DISCLAIMER

IES publications are developed through the consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on lighting recommendations. While the IES administers the process and establishes policies and procedures to promote fairness in the development of consensus, it makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

The IES disclaims liability for any injury to persons or property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document.

In issuing and making this document available, the IES is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the IES 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.

The IES has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the IES list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or statement of compliance with the requirements of this document shall not be attributable to the IES and is solely the responsibility of the certifier or maker of the statement.

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether that person has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation to any American National Standard. Moreover, no person shall have the right or authority to issue and interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Prepared by the IES Testing Procedures Committee.

Becky Kuebler, *Chair*
Andrew Jackson, *Vice Chair*
David N. Randolph, *Secretary*
Jianzhong Jiao, *Treasurer*

Members

C. K. Andersen
R. P. Bergin
R. S. Bergman
E. Bretschneider
D. J. Ellis
K. C. Fletcher
M. L. Grather
Y. H. Hiebert
J. Hospodarsky
P.-C. Hung
J. N. Hulett
M. Kotrebai
J. E. Leland
K. M. Liepmann
S. Longo
J. P. Marella
P. McCarthy
G. McKee
C. C. Miller
S. Mitsuhashi
E. Radkov
D. Rogers
M. B. Sa[illegible]
J. C. Vollers

Advisory Members

L. M. Ayers
J. Baker
C. A. Bloomfield
B. Boudreaux
P.-T. Chou
P. Cruz
M. Damle
L. Davis
J. J. Demirjian
M. E. Duffy
V. Eberhard
P. Elizondo
A. A. Feldman
J. Frazer
K. J. Hemmi
S. Hua
G. John
J. Juhasz
H. Kashaninejad
T. Kawabata
R. Kelley
J. D. Kramer
K. C. Lerbs
J. Lockner
Y. Nichia
Y. Ohno
E. Page
D. Park
E. S. Perkins
M. Piscitelli
T. W. Rasinski
M. [illegible]oyer
T. Schneider
A. W. S[illegible]rres
[illegible]. A. Steinberg
L. Swainston
J. S. Swiernik
S.-H. Teoh
A. Thorseth
R. C. Tuttle
J. E. Walker
Y. Zong

Please refer to the IES Bookstore for possible Errata: www.ies.org.

CONTENTS

1.0 Introduction and Scope

1.1 Introduction

While lighting manufacturers and independent testing laboratories generally follow IES published procedures for testing HID luminaires under controlled laboratory conditions, measurements made in the field to confirm predicted performance can be influenced by a variety of factors. Under laboratory conditions, care is exercised in the control of the precision and accuracy of the photometric measurement conditions, including luminaire orientation, test distances, ambient temperature, electrical supply and regulation, and selection of lamps for optimal stability and arc tube geometry.

In the field, this level of control and accuracy in operating and measurement conditions is seldom possible, and measurements made of installed photometric performance can deviate from predicted performance levels. This Lighting Measurement (LM) document identifies many of the potential factors that apply to outdoor HID luminaires, including mercury vapor (Hg), metal halide (MH), and high pressure sodium (HPS), as well as low pressure sodium (LPS) lighting equipment utilizing core and coil ballasts for contemporary lamp wattage designations. The issues and factors associated with electronic ballasts for HID lamps have not been addressed in this revision of LM-61.

1.2 Scope

This LM outlines factors that can cause differences between calculated and measured illuminance and luminance values of outdoor high intensity discharge (HID) and low pressure sodium (LPS) lamps and luminaires. It does not offer solutions, nor does it quantify all of the possible variables that might be encountered. The relevant ANSI/IES Recommended Practice document should be consulted for specific design recommendations.

2.0 Variables

This document lists variables that can affect the results of an HID lighting design and outlines issues encountered when comparing field measurements with predicted calculations using photometric data. It is possible that the tolerances for all the components could combine to produce a substantial difference in illuminance or luminance performance between laboratory and field conditions. The variables can be divided into five general categories:

- Power supply and ballast variations
- Lamp variations
- Luminaire optical variations
- Field conditions
- Field measurement

Each category is reviewed and its significance with respect to HID luminaire operation is explained.

2.1 Power Supply and Ballast Variations

SAFETY PRECAUTION: Only persons experienced in using measurement equipment under high voltage conditions should make measurements of electrical characteristics at the lamp. High primary and secondary voltages, high-voltage starting pulses for both HPS and MH lamps (up to 5000 V), and high-voltage instant re-strike circuits (over 40 kV) present a serious shock hazard. It is critical that proper precautions also be taken to protect instruments from the high voltages and high-voltage starting pulses.

2.1.1 Power Supply Voltage. In the photometric laboratory, it is standard practice to maintain lamp watts at a constant value when HID lamps, or luminaires using them, are being photometered. This is typically accomplished by monitoring lamp power via a wattmeter and adjusting the supply voltage to the ballast until the lamp is stable at rated lamp watts. This establishes the luminaire performance and efficiency for the photometric report with a standardized procedure.

The predicted light output in the field assumes that a "nominal" electrical supply is used. In field installations, lamps may or may not operate at their rated wattage even though the ballasts are operated within the design limits of the electrical distribution system. The supply voltage at a luminaire is dependent on several electrical power system characteristics. Factors such as local time-variable power loads, transformer tap choices, and the length and gauge of the wiring runs can all