



**Illuminating**  
ENGINEERING SOCIETY

**APPROVED METHOD:**  
**PHOTOMETRY OF**  
**REFLECTOR TYPE LAMPS**  
AN AMERICAN NATIONAL STANDARD



**ANSI/IES LM-20-20**

**APPROVED METHOD:  
PHOTOMETRY OF REFLECTOR TYPE LAMPS  
AN AMERICAN NATIONAL STANDARD**

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

**Prepared by:  
The IES Testing Procedures Committee**



*Copyright 2020 by the Illuminating Engineering Society.*

*Approved by the IES Standards Committee November 22, 2019 as a Transaction of the Illuminating Engineering Society.*

*Approved February 7, 2020 as an American National Standard.*

*All rights reserved.* No part of this publication may be reproduced in any form, in any electronic retrieval system or otherwise, without prior written permission of the IES.

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](mailto: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# 978-0-87995-194-8

---

## 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 an 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

P. Elizondo

D. J. Ellis

K. C. Fletcher

M. L. Grather

Y. H. Hiebert

J. Hospodarsky

J. N. Hulett

P.-C. Hung

M. Kotrebai

J. E. Leland

S. Longo

J. P. Marella

P. McCarthy

G. McKee

C. C. Miller

E. Radkov

M. B. Sapcoe

J. E. Walker

**Advisory Members**

L. M. Ayers

J. Baker

C. A. Bloomfield

P.-T. Chou

M. Damle

L. Davis

J. J. Demirjian

M. E. Duffy

V. Eberhard

J. Frazer

K. J. Hemmi

S. Hua

G. John

H. Kashaninejad

T. Kawabata

R. Kelley

K. C. Lerbs

K. M. Liepmann

J. Lockner

Y. Ohno

E. Page

D. Park

E. S. Perkins

M. Piscitelli

D. Rogers

M. P. Royer

T. Schneider

A. W. Serres

G. A. Steinberg

L. Swainston

J. S. Swiernik

A. Thorseth

R. C. Tuttle

J. C. Vollers

Y. Zong

---

# CONTENTS

<b>Foreword</b> .....	<b>1</b>
<b>1.0 Introduction and Scope</b> .....	<b>1</b>
1.1 Introduction.....	1
1.2 Scope .....	1
<b>2.0 Normative References</b> .....	<b>1</b>
2.1 ANSI/IES LM-35-20.....	1
2.2 ANSI/IES LM-45-20 .....	1
2.3 ANSI/IES LM-51-20.....	1
2.4 ANSI/IES LM-54-20 .....	1
2.5 ANSI/IESLM-63-19 .....	1
2.6 ANSI/IES LM-66-20 .....	1
2.7 ANSI/IES LM-75-19.....	2
2.8 ANSI/IES LM-78-20.....	2
2.9 ANSI/IES LM-79-19.....	2
2.10 ANSI/IES LS-1-20.....	2
<b>3.0 Definitions</b> .....	<b>2</b>
3.1 beam axis .....	2
3.2 central cone .....	2
3.3 extraneous light.....	3
3.4 photometric axis .....	3
3.5 photometric center of lamp .....	3
3.5.1 for non-symmetric beam patterns.....	3
3.5.2 for symmetric beam patterns.....	3
3.6 stray light .....	3
3.7 undirected light .....	3
<b>4.0 Ambient and Physical Conditions</b> .....	<b>3</b>
4.1 General .....	3
4.2 Temperature .....	3
4.3 Airflow .....	4
4.4 Vibration .....	4

<b>5.0</b>	<b>Electrical and Photometric Test Conditions</b> .....	<b>4</b>
5.1	Wave Shape .....	4
5.2	Voltage or Current Regulation .....	4
5.3	Circuits and Lamp Connections .....	4
5.4	Photometer System .....	4
<b>6.0</b>	<b>Lamp Test Procedures</b> .....	<b>4</b>
6.1	Lamp Seasoning .....	4
6.2	Lamp Stabilization .....	5
<b>7.0</b>	<b>Photometric Characterization by Measurement of Intensity Distribution</b> .....	<b>5</b>
7.1	Goniophotometer .....	5
7.2	Goniophotometer, Optical Alignment .....	5
7.3	Test Distance .....	5
7.4	Angular Resolution .....	6
7.5	Undirected Light .....	6
7.6	Number of Distribution Curves .....	7
7.7	Polar Goniophotometer Based Measurement .....	8
7.8	Beam with Rotational Symmetry .....	8
7.8.1	Polar Scan Method .....	8
7.8.2	Rotation of Lamp Method .....	8
7.9	Beam without Rotational Symmetry .....	8
7.10	Determination of Derived Quantities from the Intensity Distribution .....	9
7.10.1	Luminous Flux .....	9
7.10.2	Beam Angle .....	10
7.10.3	Field Angle .....	10
7.10.4	Beam Flux Values .....	10
7.10.5	Beam Pattern Classification .....	10
7.11	Special Applications .....	10
<b>8.0</b>	<b>Total Flux Measurement by Integrating Sphere Method</b> .....	<b>10</b>
8.1	Calibration of Integrating Sphere .....	10
8.2	Exclusion of Undirected Light by Using a Luminaire Inside an Integrating Sphere .....	10
8.3	Measuring Compact Fluorescent Reflector with an Integrating Sphere .....	11
<b>9.0</b>	<b>Test Report</b> .....	<b>11</b>
9.1	Lamp and Test Description .....	11
9.1.1	Lamp, General .....	11
9.1.2	Sphere-Specific .....	12
9.1.3	Gonio-Specific .....	12
9.2	General Test Conditions .....	12
9.3	Lamps Designed for General Lighting .....	12
9.4	Lamps Designed for Spotlighting and Floodlighting .....	12
	<b>Informative References</b> .....	<b>13</b>

## Foreword

---

This approved method is a revision of *IES LM-20-13, IES Approved Method: Photometric Measuring and Reporting Tests on Reflector-Type Lamps*, published in 2013.

## 1.0 Introduction and Scope

---

### 1.1 Introduction

As used in this laboratory method, a *reflector type lamp* is a lamp having a reflective element(s) intended to redirect flux from the emitting element (e.g., filament, arc, LED) to form the intended spatial distribution of the light. For example, a reflective element might take the form of a reflective coating applied to the lamp bulb, or a reflector positioned relative to the emitting element and permanently affixed in this position. In addition, integrated LED lamps using reflective and refractive elements to create the intended spatial distribution are within the scope of this LM. Using the current IES definitions these lamps are called projector lamps, floodlights, pressed-reflector lamps, and spotlights, among other terms. Through popular usage, the scope of this LM covers the “bulb,” which is component of a luminaire.

### 1.2 Scope

This Approved Method describes photometric testing procedures and reporting guidelines for reflector type lamps and LED based lamps that mimic this traditional style of lamp. The application of the described procedures and guidelines will improve reproducibility within a laboratory, and will improve measurement agreement and facilitate comparison of results between laboratories. This laboratory method does not apply to the following: lamps of standard bulb shape to which an integral reflector is added, such as silver-bowl and silvered-neck lamps; reflector type lamps that are designed for special applications, such as automotive headlamps and projection lamps, for which lamp specific test procedures have been established; or lamps that are known to have special testing requirements beyond those addressed in this laboratory method, such as linear fluorescent reflector lamps that have special temperature or orientation requirements.

## 2.0 Normative References

---

### 2.1 ANSI/IES LM-35-20

Illuminating Engineering Society. Approved Method: Photometric Testing of Floodlights Using High Intensity Discharge or Incandescent Filament Lamps. New York: IES; 2020.

### 2.2 ANSI/IES LM-45-20

Illuminating Engineering Society. Approved Method: Electrical and Photometric Measurement of General Service Incandescent Filament Lamps. New York: IES; 2020.

For measurements of general service incandescent filament lamps, the laboratory shall meet the requirements stated therein.

### 2.3 ANSI/IES LM-51-20

Illuminating Engineering Society. Approved Method: The Electrical and Photometric Measurements of High Intensity Discharge Lamps. New York: IES; 2020.

For measurements of high intensity discharge lamps, the laboratory shall meet the requirements stated therein.

### 2.4 ANSI/IES LM-54-20

Illuminating Engineering Society. Approved Method: IES Guide to Lamp Seasoning. New York: IES; 2020.

### 2.5 ANSI/IES LM-63-19

Illuminating Engineering Society. IES Standard File Format for Electronic Transfer of Photometric Data and Related Information. New York: IES; 2019.

### 2.6 ANSI/IES LM-66-20

Illuminating Engineering Society. Approved Method: Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps. New York: IES; 2020.

For measurements of single-based fluorescent lamps, the laboratory shall meet the requirements stated therein.