ANSI/IES LP-10-20

Illuminating Engineering Society

LIGHTING PRACTICE: SUSTAINABLE LIGHTING – AN INTRODUCTION TO THE ENVIRONMENTAL IMPACTS OF LIGHTING

AN AMERICAN NATIONAL STANDARD

Approved American National Standard

ANSI

www.ies.org

ANSI/IES LP-10-20

LIGHTING PRACTICE: SUSTAINABLE LIGHTING – AN INTRODUCTION TO THE ENVIRONMENTAL IMPACTS OF LIGHTING

AN AMERICAN NATIONAL STANDARD

The content of this Lighting Energy Management publication has been approved by the IES. Suggestions for revisions should be directed to IES.

Prepared for IES
By the Sustainability Committee

Approved by the IES Standards Committee August 23, 2019 as a Transaction of the Illuminating Engineering Society.

Approved February 7, 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# 978-0-87995-280-8

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 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 Sustainability Committee

Kenneth O. Latal, ***Chair***

Members

J. Boynton
P. Dee
N. D. Ferzacca
I. Fryc
C. C. Jones
H. M. Kaplan
L. J. Sanford
M. Smith

Advisory Members

G. Heinmiller
K. Kane
M. Latchford
M. Loeffler
L. M. North

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

CONTENTS

Foreword

The IES and the International Association of Lighting Designers (IALD) define *sustainable lighting design* as "meeting the qualitative needs of the visual environment with the least impact on the natural environment." Visually effective and appealing, high quality lighting provides the greatest environmental and economic value. The intent of this Lighting Practice (LP) document is to introduce the topic of sustainability, present its elements, and explain how it affects the design of lighting in process and product.

Sustainable lighting consists of the following elements:

- Optimizing the use of daylighting
- Minimizing the use of energy through integrated design and effective controls
- Reducing light pollution and light trespass
- Minimizing embodied environmental effects
- Specifying environmentally-preferable materials and equipment
- Ensuring system quality, flexibility, adaptability, maintainability, and durability
- Providing for optimum commissioning

It is important that sustainable lighting needs be addressed during each phase of the project:

- *Programming and schematic design:* The building site, massing, and orientation, determined in the earliest design phases, are critical to designing quality daylighting, integrating efficient electric lighting, analyzing accurate energy modeling that anticipates effective controls strategies, and establishing early commissioning performance goals.
- *Design development and construction documentation:* To achieve the desired programmatic results, an integrated lighting scheme needs to be fully designed and specified. Specifications can address environmentally preferable manufacturing attributes such as less toxic material content, proximity to the project site, and recycled or recyclable packaging. Energy and computer modeling can verify performance goals.
- *Construction and commissioning:* The person responsible for the lighting design can best respond to lighting information requests and substitution proposals. The commissioning process should include a full evaluation of the lighting and control installation to ensure that optimal performance will be realized to meet goals for energy efficiency and system integration. Post-occupancy commissioning and measurement can evaluate occupant satisfaction and verify or enforce achievement of performance goals and occupant satisfaction.

In this LP, design and application guidelines have been included for these topic areas:

- Lighting quality
- Optimizing the use of daylight
- Lighting and health
- Light pollution
- Maximizing energy efficiency
- Ensuring system flexibility, maintainability, and durability
- Providing commissioning
- End-of-life phase, demolition, disposal, and recycling or reuse considerations

1.0 Introduction and Scope

1.1 Introduction

Sustainability is an essential environmental, economic, and social issue representing the next natural progression in lighting standards and practice.

Applying sustainability to lighting design requires reevaluation of many systems choices in terms of their potential impact on the environment. Lighting systems affect the environment in a variety of ways. For example, lighting accounts for 26% of commercial building electricity demand in the U.S.[1] The percentage of source fuels varies significantly from state to state; however, overall in the U.S., 45% of this electricity is generated through the combustion of coal and another 23% by natural gas.[2] Both methods emit CO_2 and other greenhouse gases into the atmosphere, contributing to climate change. Carbon dioxide (CO_2) emissions from coal-fired electricity generation comprise nearly 80%