



RECOMMENDED PRACTICE:
LIGHTING AND THE VISUAL
ENVIRONMENT FOR OLDER ADULTS
AND THE VISUALLY IMPAIRED
AN AMERICAN NATIONAL STANDARD

Currently in preview, click buy full version



ANSI/IES RP-28-20

**RECOMMENDED PRACTICE:
LIGHTING AND THE VISUAL ENVIRONMENT FOR
OLDER ADULTS AND THE VISUALLY IMPAIRED
AN AMERICAN NATIONAL STANDARD**

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

**Prepared by
The IES Lighting for the Aged and Partially Sighted Committee**



Copyright 2020 by the Illuminating Engineering Society.

Approved by the IES Standards Committee October 11, 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 and Guides 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, please forward them to the Brian Liebel, Director of 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# 978-0-87995-068-2

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 Aged and Partially Sighted Lighting Committee

IES Lighting for the Aged and Partially Sighted Committee

Asha L. Hegde-Niezgoda, *Chair*

Octavio L. Perez, *Vice Chair*

Members

M. T. Acevedo

S.-C. Chien

P. Dee

R. J. Dupuy

S. J. Fisher

K. C. Gonzales

G. Guarnaccia

R. Hadley-Catter

A. Keller

P. Mercier

E. Noell-Waggoner

J. Radi

A. J. Randazzo

J. E. Roberts

L. J. Sanford

E. Schambureck

D. S. Walter

Advisory Members

D. Burnett

L. Davis

M. B. Gotti

C. W. Oty

N. Shishegar

L. Weinstein

D. W. 'burn

CONTENTS

Foreword	1
1.0 Introduction and Scope	1
1.1 Introduction.....	1
1.2 Scope	2
2.0 Quality and Quantity of Lighting for Vision	3
2.1 Source-Dependent Factors	4
2.1.1 Illuminance	4
2.1.2 Lighting Controls and User Interface (or User Experience, UX).....	4
2.1.3 Contrast and Light Reflectance	5
2.1.4 Glare	5
2.1.5 Flicker	7
2.1.6 Spectral Power Distribution	8
2.2 Viewer-Dependent Factors	8
2.2.1 Eye Diseases	8
2.2.2 Age-Related Eye Changes	10
2.2.3 Traumatic Brain Injury	10
2.3 Considerations to Improve Visibility	12
2.3.1 Luminance and Reflectance.....	12
2.3.2 Lighting the Task.....	12
2.3.3 Shadows and Modeling of Faces.....	13
2.3.4 Safety Accents	13
2.3.5 Luminaire Placement.....	13
2.3.6 Veiling Luminance	14
3.0 Design Guide	15
3.1 Design Issues Common to All Space Types	15
3.1.1 Appearance of the Space and Surface Characteristics.....	15
3.1.2 Color	15
3.1.3 Sheen, Texture and Pattern.....	16
3.1.4 Appearance of Luminaires.....	17
3.1.5 Daylighting Integration and Control	18
3.1.6 Light Distribution on Surfaces	18
3.1.7 Light Distribution on Task Plane (Uniformity).....	19
3.1.8 Luminances of Room Surfaces.....	19
3.1.9 Furniture and Free-Standing Objects	20
3.1.10 Special Considerations for Persons With Memory Impairment	20

3.2	Considerations by Area	20
3.2.1	Site	20
3.2.2	Parking Lot, Parking Garage	21
3.2.3	Exterior Walkways	21
3.2.4	Plazas, Porches, Gardens	23
3.2.5	Exterior Ramps and Stairs	23
3.2.6	Exterior Furniture, Bus Shelters and Other Obstacles	24
3.2.7	Outdoor Signage	24
3.3	Transition Spaces between Exterior and Interior Spaces	25
3.3.1	Canopies	26
3.3.2	Exterior Entry Doors	26
3.3.3	Vestibules (Interior Entrance, Night and Day)	27
3.3.4	Circulation Areas	28
3.3.5	Lobbies	29
3.3.6	Atria	30
3.4	Interior Common Spaces	30
3.4.1	Lighting Considerations for Means of Egress	30
3.4.2	Stairs, Escalators, Elevators	32
3.4.3	Corridors and Hallways	33
3.4.4	Public Restrooms	35
3.4.5	Directional and Indoor Signs and Bulletin Boards	36
3.5	Commercial Spaces	36
3.5.1	Offices	36
3.5.2	Assembly and Conference Rooms	37
3.5.3	Theaters, Galleries and Museums	38
3.5.4	Public Speaking or Performances	38
3.5.5	Medical Facilities	39
3.5.6	Fitness Clubs, Exercise Areas, and Physical Therapy	39
3.5.7	Dining and Food Service	40
3.5.8	Libraries	42
3.6	Lodging and Residential Spaces	43
3.6.1	Modifications to Existing Residences	43
3.6.2	Using Daylight	44
3.6.3	Spaces with Limited Daylight	45
3.6.4	Porches, Exterior Steps, and Garages	46
3.6.5	Indoor Apartment Entries	47
3.6.6	Living Rooms (Including Conversation Areas)	47
3.6.7	Private Dining Areas	49
3.6.8	Kitchens	49
3.6.9	Bedrooms	50
3.6.10	Bathrooms	52
3.6.11	Game and Activity Rooms	54
3.6.12	Hobby Spaces with Motorized Equipment	55
3.7	Senior Care Facilities	56
3.7.1	Meeting the Needs of the Oldest Adults	56
3.7.2	Special Needs for Individuals Living with Alzheimer's Disease and Other Forms of Dementia	57
3.8	Visually Based Accommodations for Those with Traumatic Brain Injury and Photosensitivity	58

4.0	Light Sources	59
4.1	Introduction	59
4.2	Choosing Light Source Color	59
4.3	Light Source Flicker	60
5.0	Daylight (Direct and Reflected)	60
5.1	Advantages of Daylighting	60
5.2	Guidelines for Good Daylighting Design	60
6.0	Light For Health	65
6.1	The Human Circadian System	66
6.2	Sleep Disturbances in the Aging Population	68
6.3	Seasonal Depression or Seasonal Affective Disorder (SAD)	68
6.4	Hazards of Light Therapy	68
6.5	The Role of Daylight and Vitamin D ₃	68
7.0	Lighting Controls	70
7.1	Introduction	70
7.2	Code Requirements	70
7.3	Lighting Control Technologies and Considerations	71
7.4	Area-Specific Control Strategies for Senior Care Facilities	71
7.4.1	Staff-Only Areas	71
7.4.2	Resident Rooms	71
7.4.3	Common Bathing Areas	71
7.4.4	Common Restrooms	71
7.4.5	Corridors, Stairs, or Common Intercourse Spaces (Resident Areas)	72
7.4.6	Common Resident Dining Rooms, Living Rooms, and Activity Areas	72
7.4.7	Entry Areas	72
7.4.8	Exterior Walkways and Parking	72
7.4.9	Parking Garage	72
7.5	Circadian-Supportive Lighting	73
7.6	Additional Considerations	73
	Annex A – Illuminance Recommendations	73
	Annex B – Additional Reading	78
	Annex C – Scatter	78
	References	81

Foreword

This Foreword is not part of ANSI/IES RP-28-20. It is provided for informational purposes only.

This Recommended Practice (RP) does not provide general lighting information that is included in other IES documents. If the reader does not already have this information, it may be obtained as needed from the following IES Standards:

The Lighting Science Series:

- ANSI/IES LS-1-20, *Lighting Science: Nomenclature and Definitions for Illuminating Engineering*
- ANSI/IES LS-2-20, *Lighting Science: Concepts and Language of Lighting*
- ANSI/IES LS-3-20, *Lighting Science: Physics and Optics of Radiant Power*
- ANSI/IES LS-4-20, *Lighting Science: Photometry – The Measurement of Light*
- ANSI/IES LS-5-20, *Lighting Science: Color*
- ANSI/IES LS-6-20, *Lighting Science: Calculation of Light and Its Effects*
- ANSI/IES LS-7-20, *Lighting Science: Vision – Eye and Brain*
- ANSI/IES LS-8-20, *Lighting Science: Vision – Perceptions and Performance*

The Lighting Practice Series:

- ANSI/IES LP-1-20, *Lighting Practice: Designing Quality Lighting for People and Buildings*
- ANSI/IES LP-2-20, *Lighting Practice: Designing Quality Lighting for People in Outdoor Environments*
- ANSI/IES LP-3-20, *Lighting Practice: Designing and Specifying Daylighting for Buildings*
- ANSI/IES LP-4-20, *Lighting Practice: Electric Light Sources – Properties, Selection, and Specification*
- ANSI/IES LP-5-20, *Lighting Practice: Lighting Control Systems – Properties, Selection, and Specification*
- ANSI/IES LP-6-20, *Lighting Practice: Lighting Control Systems – Properties, Selection, and Specification*
- ANSI/IES LP-7-20, *Lighting Practice: The Lighting Design and Construction Process*
- ANSI/IES LP-8-20, *Lighting Practice: The Commissioning Process Applied to Lighting and Control Systems*

- ANSI/IES LP-9-20, *Lighting Practice: Upgrading Lighting Systems in Commercial and Industrial Facilities*
- ANSI/IES LP-10-20, *Lighting Practice: Sustainable Lighting – An Introduction to the Environmental Impacts of Lighting*
- ANSI/IES LP-11-20, *Lighting Practice: Environmental Considerations for Outdoor Lighting*

1.0 Introduction and Scope

1.1 Introduction

Older adults represent the fastest growing segment of the population with over 49 million Americans over 65.¹ With over 10,000 Baby Boomers turning 65 everyday, ANSI/IES RP-28-20 has been expanded to include areas beyond housing and senior care facilities, such as offices, hospitals, healthcare, commercial spaces, and places of assembly. The over 40 population represents approximately 89 million people and of those 63 percent have vision problems.² However, there is a prevalence of low vision in the general senior population, which increases dramatically after the age of 70 (see **Figure 1-1**).

2010 U.S. Prevalence Rates
Low Vision

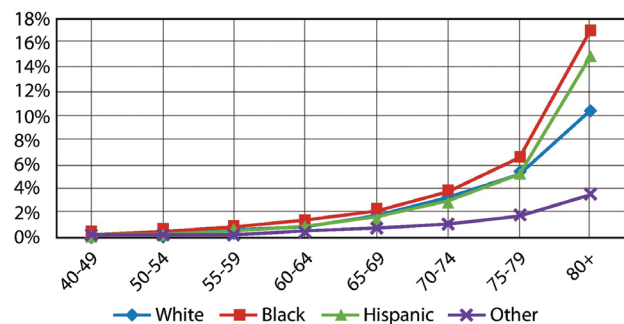


Figure 1-1. 2010 U.S. Age-specific prevalence rates for low vision by age, and race or ethnicity. (Graphic based on original by NEI [National Eye Institute] Low Vision, 20102)

Low vision is defined as vision impairment that is worse than 20/60 in the better eye, which cannot be correctable medically, surgically or with conventional eye glasses.³ People rely on a supportive visual environment to maximize their independence and safety. Whereas people with mobility impairments are easily identified

by their use of assistive devices, i.e., wheelchairs, canes or walkers, persons with low vision do not typically use assistive devices or trailing techniques. Sensory loss is common to the aging process; however, perception problems are not easily recognized by others.

1.2 Scope

As the workforce ages the need for lighting guidance becomes more of a concern. It seems clear that the Baby Boomer generation (born in the years 1946 through 1964) will see aging very differently from their parents. They will take their current life styles and modify them slightly but will expect to continue contributing to society and be visible in day-to-day life. This group will represent more than one in four Americans.

It should also be noted that according to the World Health Organization, the entire world, with a few exceptions, is aging, and governments are not prepared for the growth of the older adult population or how to care for them. A brief search of several industrialized countries determined that there are few regulations addressing senior vision and lighting needs and prior editions of IES RP-28 have been reported the document of choice by designers when seeking guidance in how to provide adequate light and meet the visual environmental needs for older adults in all settings.

The IES Aged and Partially Sighted Committee has worked to make this current Recommended Practice document inclusive of current research and design practice for the above population to help them maintain a quality of life into their third age. Loss of independence has been identified as the greatest fear of aging, so today's senior will be looking for answers to maximize their aging vision.

Current codes and standards are based on the needs of younger people. Steps have already been taken to begin the transition to recognizing the needs of older people. Of major importance to achieving higher lighting levels while still complying with energy restraints is the adoption of ASHRAE/IES Standard 90.1-2013 and its subsequent updates. Work by this committee's members along with the ANSI/ASHRAE/IES Lighting Subcommittee has succeeded in getting the lighting levels described in **Table A-1** (see **Annex A**) adopted

as an accepted compliance method for licensed senior living communities. This acknowledgement that senior populations have a high incidence of vision impairment and therefore require higher lighting levels was achieved by extensive investigations of 10 senior living environments. This research showed that the lighting levels in this document are being followed in the test buildings and that a higher lighting power density (LPD) was justified to meet the needs of those with vision impairment.

It should be recognized that the Americans with Disabilities Act 2010 (ADA) and the Architectural Barriers Act inadequately accommodate the needs of people who are blind and especially those with low vision.⁴ The ADA includes Braille, but people who develop low vision later in life may not know Braille. This document is intended to increase the designers' understanding of age-related vision loss and the importance of their design decisions that could affect the safety and independence of this growing sector of the population.

This section has a section devoted to light for human health (see **Section 6 Light for Health**), including vitamin D synthesis and circadian rhythms. Recent research has identified the special cells in the human retina that receive and transmit specific wavelengths of short (blue) visible light (450 to 500 nm) to the suprachiasmatic nucleus (SCN) in the hypothalamus, which controls human circadian rhythm.⁵ The fact that a large number of older adults experience circadian rhythm disturbances, underscores the importance of understanding and addressing this critical bodily function. Circadian rhythm entrainment and vision may be equally important elements for safety and quality of life for older adults and the low vision population. Circadian disruption has been tied to numerous serious diseases, such as cancer, diabetes, high blood pressure, and much more.

In recent years, much has changed in many fields affecting senior living. In lighting, the biggest game change has been the introduction of LEDs and the rapid adoption by the general public and design professionals. The unique qualities of LED technology have allowed some long sought after lighting solutions to be easier and simpler. It is now possible to change