



Illuminating
ENGINEERING SOCIETY

ANSI/IES RP-29-16

Lighting for Hospitals and Healthcare Facilities



Currently in preview, click buy full version



**Lighting for Hospitals
and Healthcare Facilities**

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

Prepared by:
The IES Healthcare Facilities Committee

Copyright 2016 by the Illuminating Engineering Society of North America.

Approved by the IES Board of Directors, October 23, 2016, as a Transaction of the Illuminating Engineering Society of North America.

Approved by the American National Standards Institute, December 1, 2016, 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 of North America, 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 Brian Liebel, Director of Standards and Research, bliebel@ies.org, at the above address for verification and correction. The IES welcomes and urges feedback and comments.

Printed in the United States of America.

ISBN # 978-0-87995-338-6

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.

Prepared by the IES Healthcare Committee

Paul Mustone, *Chair*

Richard Kassouf, *Vice Chair*

M. Alcaraz	K. Gayle	F. Moyers*	A. Sarkar*
B. Arguirova	E. Godson*	K. Murphy	T. Shaw*
C. Arroyo*	R. Hadley*	L. North	M. Sobylak*
A. Briej*	D. Jesurun*	T. Nguyen*	P. Spurley*
A. Brogden*	J. Johnson*	M. Olmos*	R. Wellman
J. Brownell*	G. Kilpatrick	S. Olson*	R. White
J. D'Angelo	D. King*	K. Packard*	H. Wu*
P. Dee*	R. Kurzawa*	S. Parish*	D. Zawodny**
J. Donovan*	K. Lee	O. Perez*	
D. Edge*	D. Le May Madden*	J. Perucho*	* Advisory
D. Errigo*	S. Li*	C. Rivera*	** Honorary
L. Fimek*	Y. Ling*	L. Roberts	
C. Fleming*	R. Lonsdale*	H. Robson*	
R. Funderburke*	G.P. Manatad*	S. Roos*	

Cover Image - Nemours Childrens Hospital
Architect of Record / Design Architect: Stanley Beaman & Sears.
Associate Architect: Perkins + Will
Photography: Jonathan Hillyer

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval 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 is 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 is 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.

Currently in preview, click buy full version

Contents

1.0	INTRODUCTION	1
1.1	Types of Facilities	1
1.2	Trends in Healthcare Design	2
1.3	Financial Implications	3
1.4	Regional Differences	
PART I: DESIGN CONSIDERATIONS		5
2.0	COMFORT	5
2.1	Overall Experience	5
2.1.1	Patient	5
2.1.2	Staff	5
2.1.3	Caregivers and Visitors	5
2.1.4	Respite	6
2.2	Lighting Considerations for Comfort	7
2.2.1	Prioritizing Needs	7
2.2.2	Daylight	7
2.2.3	Glare Mitigation	7
2.3	Design Aesthetic	8
2.3.1	Creating Visual Interest	8
2.3.2	Consideration of Demographic	8
2.3.3	Surfaces and Finishes	8
3.0	FUNCTION	9
3.1	Task Visibility	9
3.1.1	Visibility Factors	9
3.1.2	Uniformity	10
3.1.3	Task Geometry	11
3.2	Color	11
3.2.1	Correlated Color Temperature	11
3.2.2	Color Rendition	11
3.2.3	The Role of Light Color in Diagnostics	11
3.3	Illuminance Recommendations	12
3.3.1	Illumination Recommendations for Healthcare Facilities	13
3.4	Controls	13
3.4.1	Automated Controls	13
3.4.2	Patient Controls	23
3.4.3	Staff Controls	24
3.5	Flexibility	24
3.6	Wayfinding	24
3.6.1	Exterior Areas	24
3.6.2	Interior Areas	24
3.7	Special Populations	25
3.7.1	Lighting for the Aged	25
3.7.2	Lighting for Pediatrics	25
3.7.3	Lighting for Autistic Patients	26

3.7.4	Lighting for Behavioral Health	26
4.0	SAFETY	28
4.1	Medication Accuracy	29
4.2	Fall Prevention	29
4.3	Infection Management	29
4.3.1	Handwashing	29
4.3.2	Antimicrobial Finishes	30
4.3.3	Room Decontamination Methods	30
4.3.4	Pressurized Isolation Patient Rooms	30
4.3.5	Biohazard Spaces	31
4.3.6	Luminaire Characteristics	31
4.4	Medical Equipment Compatibility	32
4.5	Emergency Systems	33
4.6	Security	33
4.7	Photobiological Safety	33
4.7.1	Eye Fatigue	34
4.7.2	Headaches	34
4.7.3	Photosensitivity	34
4.7.4	Photosensitive Epilepsy	34
5.0	HEALTH AND WELLNESS	35
5.1	Psychological Impact	35
5.2	Circadian Systems and Human Physiology	35
5.2.1	Reinforcing Circadian Entrainment	37
5.2.2	Factors Associated with Circadian Disruption	38
5.3	Evidence-Based Research	39
5.3.1	Cycled Light in Pediatric Units	39
5.3.2	Daylight Exposure and Healing Rates	40
5.3.3	Daylight and Job Satisfaction	41
5.3.4	Circadian Adaptation for Night Shift Workers	41
5.3.5	Medication Error Reduction	41
5.3.6	Alzheimer's Disease	41
6.0	SUSTAINABILITY	41
6.1	Energy Efficiency	42
6.2	Daylighting	42
6.3	Environmental Impact	43
6.3.1	Long Life Solutions	43
6.3.2	Minimizing Hazardous Waste	43
6.3.3	Recyclable Content	44
6.3.4	Light Pollution	44
6.4	Financial Considerations	44
6.4.1	First Costs and Operational Costs	44
6.4.2	"Hard" Costs and "Soft" Costs	44
6.4.3	Public Relations and Marketing	44
	PART II: SPECIFIC ROOM TYPES	45
7.0	GENERAL AREAS	45

7.1	Site	45
7.1.1	Parking	45
7.1.2	Site Control Strategies	45
7.1.3	Exterior Entrances	46
7.1.4	Safety and Security	46
7.1.5	Landscape and Gardens	46
7.2	Circulation Areas	46
7.2.1	Lobbies, Vestibules, and Entrances	47
7.2.2	General Corridors	48
7.2.3	Reception and Check-In Areas	48
7.2.4	Waiting Areas	49
7.2.5	Elevator Lobbies and Elevators	50
8.0	NURSING UNITS AND PATIENT CARE AREAS	50
8.1	Patient Rooms	50
8.1.1	General Considerations for Patient Rooms	51
8.1.2	Airborne Infection Isolation Room (AIIR) and Protective Environment (PE) Rooms	54
8.1.3	Critical Care	55
8.1.4	Obstetrical Units	55
8.1.5	Nursery Units	56
8.1.6	Neonatal Intensive Care Units	57
8.1.7	Pediatric Units	58
8.1.8	Geriatric Skilled Nursing Extended Stay	59
8.1.9	Psychiatric Units	59
8.2	Nursing Units and Support Areas	60
8.2.1	Patient Corridors	60
8.2.2	Nursing Stations	61
8.2.3	Medication Rooms	62
8.2.4	Nourishment Areas	63
8.2.5	Handwashing Stations	63
8.2.6	Staff Sleeping Room	63
9.0	DIAGNOSTIC AND TREATMENT AREAS	64
9.1	Examination Treatment Rooms	64
9.2	Emergency Department Examination Rooms	64
9.3	Emergency Department Trauma Rooms	65
9.4	Seclusion Rooms	66
9.5	Surgical Suites	66
9.5.1	General Room Lights	67
9.5.2	Surgical Task Lights	68
9.5.3	Safety	69
9.5.4	Intraoperative MRI Rooms	70
9.5.5	Specialty Operating Rooms	70
9.5.6	Surgical Scrub Areas	71
9.5.7	Surgical Corridors	71
9.5.8	Preoperative Care Areas	71
9.5.9	Post-Anesthetic Care Units (PACU)	72
9.5.10	Pump Technicians Preparation Area	72
9.5.11	Soiled Holding Areas	72

9.5.12 Surgical Storage Rooms	72
9.6 Diagnostic Radiology and Imaging	72
9.7 Cardiac Function Laboratory	74
9.8 Chemotherapy and Infusion Therapy	74
9.9 Radiation Oncology	75
9.10 Dialysis Treatment	76
9.11 Endoscopy Suites	77
9.12 Hyperbaric Therapy	77
9.13 Prosthetic and Orthotic Work Areas	77
9.13.1 Prosthetics Laboratory	77
9.14 Rehabilitation and Physical Therapy	78
9.15 Occupational Therapy	79
9.16 Speech Pathology	79
9.17 Audiometry Testing	79
9.18 Telemedical Diagnostics	79
9.19 Dental Suites	80
9.19.1 Oral Surgery	80
9.19.2 Dental Exam	80
9.19.3 Oral Cavity	81
9.20 Ophthalmology	81
10.0 PATIENT SUPPORT FACILITIES	81
10.1 Clinical Laboratories	81
10.2 Pharmacy	82
10.2.1 Pharmacy Storage	83
10.2.2 Medication Preparation Areas	83
10.3 General Support Facilities	83
10.3.1 Autoclave Rooms	83
10.3.2 Wash-Down Areas	84
10.3.3 Clean Storage Rooms	84
10.3.4 Soiled Utility Rooms	84
10.3.5 Sterile Storage Rooms	84
10.3.6 Medical Gas Storage and Dispensing Rooms	84
10.4 Autopsy Suite	85
10.5 Morgue	85
ANNEX A - ADDITIONAL RESOURCES	85
ANNEX B – GLOSSARY OF LIGHTING TERMS	86
ANNEX C – HEALTHCARE TERMS	91
ANNEX D – LIGHTING QUALITY METRICS	93
ANNEX E – ILLUMINANCE TARGET VALUE SYSTEM	94
ANNEX F – COMMON APPLICATIONS ILLUMINANCE TABLES	97
REFERENCES	113

1.0 INTRODUCTION

Fifty years ago, the Illuminating Engineering Society recognized that healthcare facilities have unique and specialized illumination needs, resulting in the publication of the first version of this recommended practice. In the fifty years that have passed since the inaugural RP-29 publication, and in the ten years that have elapsed since the previous version, the only constant in both the healthcare and lighting arenas has been change. Technological advances (both within the lighting industry and within the medical equipment industry), changing regulations and guidelines, clinical breakthroughs, and philosophical shifts in healthcare delivery models have created a theme of “Health for Life” for this rewriting of ANSI/IES RP-29-06.

The mission of healthcare facilities is to save lives, enhance lives, and facilitate life’s transitions. Whether as a patient, supportive visitor, caregiver or resident, an encounter with a care environment is almost inevitable in one’s lifetime, and experiences within these settings can be intimidating or joyous, despondent or hopeful. Operationally, there are also considerations of the life and longevity of the physical infrastructure, fiscally responsible practices for owning long-term real estate, and sustainable practices. Designers working on healthcare projects have a unique opportunity to positively influence the lives of thousands of people who are in need of help, comfort, and care. The distinctly important nature of designing healthcare facilities places tremendous responsibility on the practitioner, but it also presents an invaluable chance to make a profound contribution through informed facility design. The authors of this document, therefore, emphatically encourage healthcare designers to unleash their creativity, immerse themselves in relevant subject matter, adopt innovative, evidence-based design approaches and, above all, embrace the opportunities to make a difference, because their work truly matters.

Healthcare facilities are, arguably, the most complex of architectural facility types (see **Figure 1**). They



Figure 1. Hospitals face multiple complexities and challenges. (©iStockphoto)

house the entire human drama, from birth to death. People are at their best, their worst, and certainly their most vulnerable within these buildings. There are a variety of occupancy types, such as public spaces, areas that are restricted to staff only, and patient care areas. Numerous people form the caregiving team that supports each patient both directly and indirectly. Examples of direct caregivers include physicians, nurses, residents and therapists, as well as friends and family. Examples of indirect caregivers include maintenance, pharmacy, food service, laundry and administrative personnel.

The objective of this document is to provide context, define challenges, and identify recommended lighting design practices for healthcare specific environments. This document is not prescriptive but is intended to provide guidance and to inspire by identifying possibilities that enable designers to develop the appropriate solutions for complex situations and spaces.

This document is organized to complement other authoritative references, such as the *Guidelines for Design and Construction of Health Care Facilities* by the Facility Guidelines Institute (FGI).¹ Part I of this document addresses the many design considerations important for healthcare facilities, while Part II identifies specific room types that have unique lighting needs. These room names and the chapter organization follow the format found in the FGI *Guidelines*. Utilizing a common language and approach helps foster integrated, collaborative project teams that include architects, medical planners, interior designers, engineers and lighting designers.

1.1 Types of Facilities

The FGI categorizes healthcare facilities as acute care, ambulatory care, or long-term care. The Center for Health Design has published a working paper on consumer perceptions of the healthcare environment.² This report identifies how important factors vary by facility type, some of which are excerpted and summarized in **Table 1**. While the needs of the facility often vary by category, seven