

RP-28 UPDATE: LIGHTING AND THE VISUAL ENVIRONMENT FOR SENIORS AND THE LOW VISION POPULATION

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RP-28 ORIGINS AND DEVELOPMENT

History of lighting recommendations
by the IESNA

1947 – first Lighting Handbook

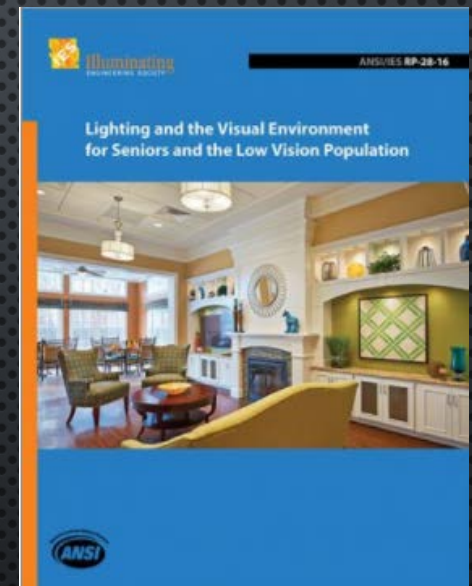
1998 – first RP-28 for seniors in residences
or living facilities. Updated 2007 as ANSI
standard.

Recognition that aging impacts vision and
light has other photobiological effects

2016 – RP-28-16 expands scope.

Updated research included.

Recommendations refined to include new
findings.



NEW DEVELOPMENTS - 2016

RP-28-07

Lighting and Visual Environment for Senior Living

Review of visual issues specific to aging population

Lighting and interior design and daylighting recommendations

Target population includes those with age-related vision loss and eye diseases

Area-specific lighting recs address private homes and multi-family and assisted living spaces

RP-28-16

Lighting and Visual Environment for Seniors and the Low Vision Population

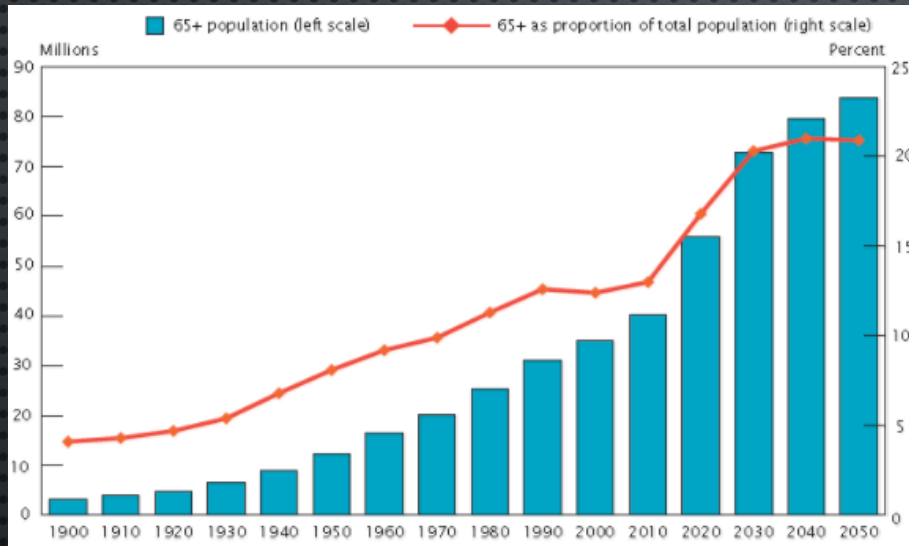
Re-organization of topics, updated research

Adds low vision, traumatic brain injury, Alzheimer's disease

Now includes commercial and public areas such as offices, museums, libraries



ISSUES DRIVING THE DEVELOPMENT OF NEW STANDARDS



Seniors are fastest growing sector of the US population, currently more than 45 million.

National standards committee ASHRAE/IES 90.1-2013 increased the lighting level recommendations for licensed senior living communities.

Established that higher lighting power density (LPD) for these facilities was justified.

NEW STANDARDS

ASHRAE/IES 90.1 - 2013

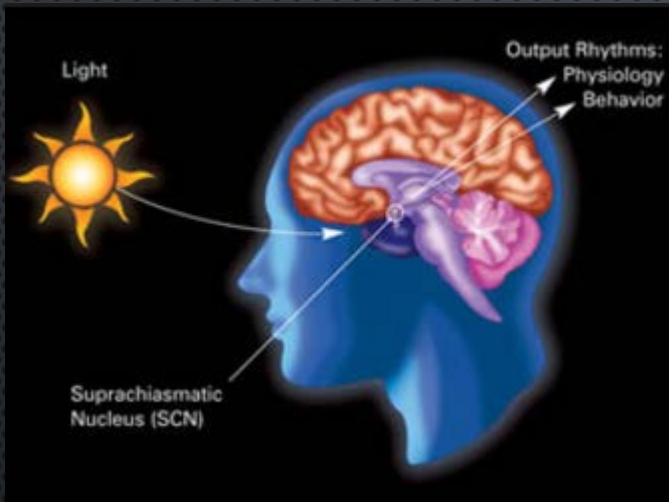
HIGHER LPD'S PROVIDED FOR VISUALLY IMPAIRED:

TABLE 9.6.1 (PAGES 95 – 99)

<u>SPACE TYPE:</u>	<u>TYPICAL</u>	<u>VISUALLY IMPAIRED</u>
• DINING/ACTIVITY AREAS:	.65	2.65
• CORRIDORS:	.66	.92
• LOBBIES:	.90	1.80
• RESTROOMS:	.98	1.21
<u>BUILDING TYPE</u>	<u>TYPICAL</u>	<u>VISUALLY IMPAIRED</u>
• LIVING ROOM/RECREATION:	.73	2.41
• CHAPEL	1.53	2.21

NEW SECTIONS – RP-28-16

NEW - Lighting Sources section, with emphasis on LEDs



NEW – Light for health section discusses the human circadian system and Vitamin D₃ absorption.

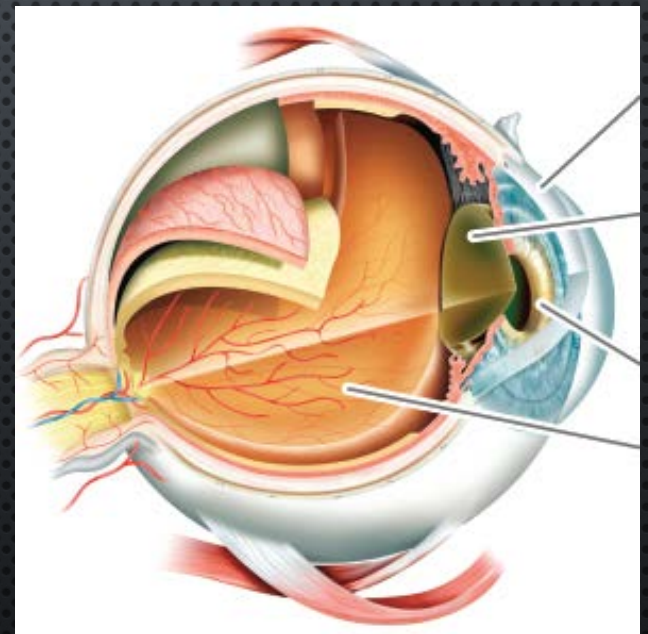
NEW – Lighting controls section covers code requirements, control technologies, and control strategies



TYPICAL VISUAL SYSTEM CHANGES IN SENIORS

Changes in the eyes, the visual pathways and the visual cortex:

- Thickening/yellowing lens
- Less accommodation
- Slower adaptation
- Higher likelihood of retinal and other diseases



CHANGES IN THE VISUAL SYSTEM OF SENIORS

Results:

- Poorer visual acuity
- Less contrast sensitivity
- Reduced ability to distinguish colors
- Slower adaptation to new light levels
- Increased sensitivity to glare



NEW MINIMUM MAINTAINED ILLUMINANCE RECOMMENDATIONS

Interior entry 100 fc
Common Room 30 fc

Corrections:

Illuminance at entry
Day circulation 100 fc
Night circulation 10 fc
(off by factor of 10)

Day circulation 20 fc
Night circulation 10 fc

ANSI/IES RP-28-16

Table 1: Minimum Maintained Illuminance Recommendations

AREAS	Recommended Maintained Illuminance Recommendations		Task Light*	Notes
	Ambient Light ^d			
Exterior Entrance (Night)	50-100 (5-10)			
Interior Entry (Day) ^e	1000 (100)			Includes a median value for daylight. Electric lighting to be responsive to daylight and maintain the recommended minimum ambient level until exterior daylight levels are consistently below the noted day recommendation.
Interior Entry (Night)	1000 (100)			
Exit Stairways and Landings	1000 (100)			Minimum, measured at the center of the step ^d (if local code permits, stairwell lighting can be reduced when unoccupied.)
Elevator Interiors	1000 (100)			
Exterior Walkways ^f	100 (10)	20 (2)		Measured on the surface in the center of the walkway.
Administration (when active)	300 (30)		500 (50)	
Visitor Waiting (Day)	200 (20)		500 (50)	
Visitor Waiting (Night)	1000 (100)		500 (50)	
Indoor circulation/lobby/lounge areas(Night)	1000 (100)		500 (50)	
Indoor circulation/lobby/lounge areas(Day)	200 (20)		500 (50)	
Activity/Meeting/Common Rooms	300 (30)		500 (50)	
LODGING/APARTMENTS/ RESIDENTIAL ROOMS				
Entrance	1000 (100)			
Living Room	200 (20)		750 (75)	Reading Work Surfaces

CONTROL SPECTRUM

- Use high color rendering sources
- Make value (lightness and darkness) distinct to show edges and features



Photo
Linda Sanford

MANAGE COLOR AND LUMINANCE CONTRAST

Providing distinct color
contrast at edges helps
those with low vision.

Bathrooms
Lighthouse for
the Blind, SF



INCLUDE DAYLIGHTING

Issues for seniors:

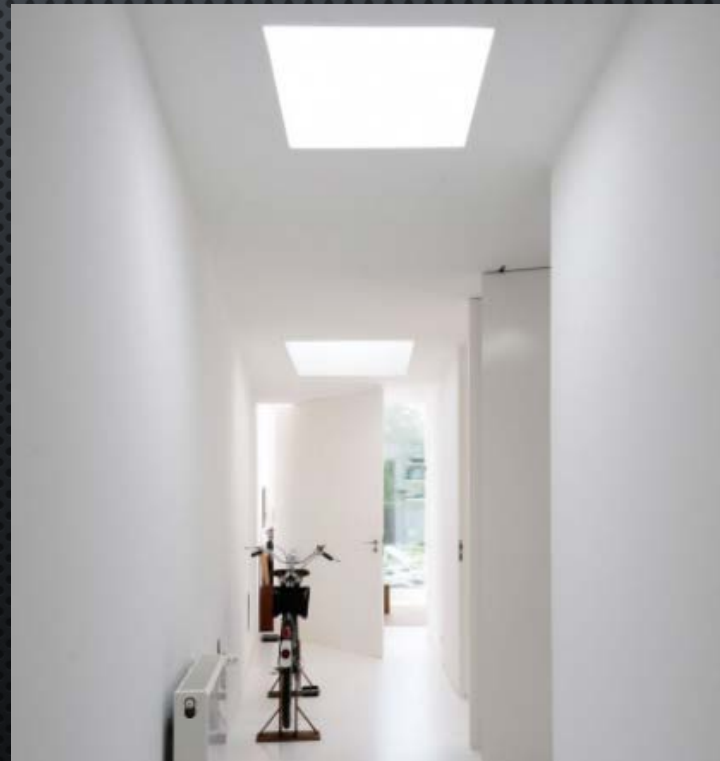
- Well-planned transition spaces from daylight to interior
- Glare and shadows from direct sunlight
- Bright levels during the day to support circadian rhythms



Photos
Eunice Noell

REDUCE GLARE

Avoid extreme differences in luminance



DESIGN TO SUPPORT GIVING VISUAL INFORMATION

Visual space communicates

- orientation
- identification of space type
- edges

And avoids

- confusing visual busyness
- patterns and contrast that give the wrong cues



Auerbach Glasow
Sanford Lighting Design



Photos
Eunice Noell and Norman Waff

MANAGE TRANSITIONS



Bathroom lighting
Photo: *Connie Samla*
ACC Care Facility

Sufficient light for the transition of light level on the way back to bed from bathroom.

APPLICATIONS

CORRIDORS

Recommendations :

- Even lighting distribution – avoid high luminance ratios
- Avoid glare from fixtures, glossy surfaces and emergency lighting
- Manage bright window luminance



APPLICATIONS - OFFICES

New space in recommendations

- Combine ambient and task lighting so high levels can be used on tasks
- Control distribution to manage direct and screen glare
- Create local control



APPLICATIONS

ASSEMBLY AND CONFERENCE ROOMS

New space in recommendations

- Main paths of travel easily read
- Step lights for stairs
- Contrasting handrails, etc
- Make sure there are transition spaces between light and darkened spaces.



Photo
Eunice Noell

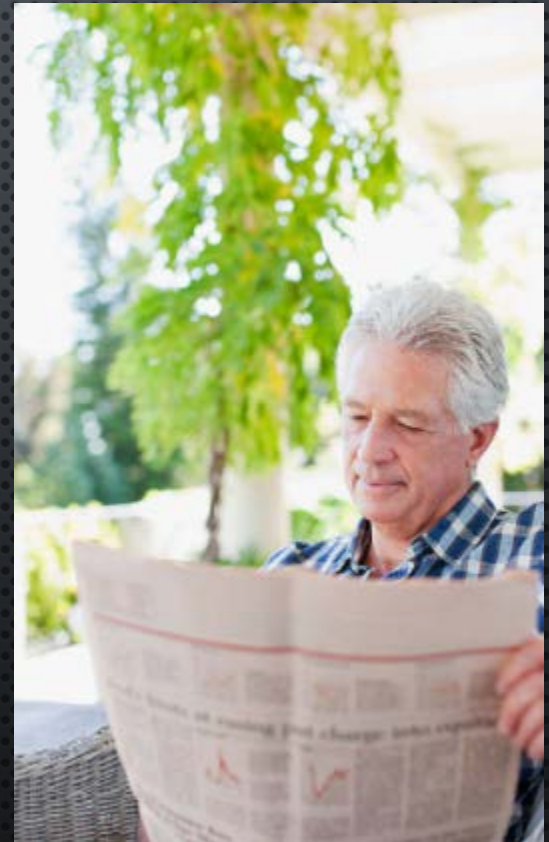
Avoid speaker's podium and refreshment or exhibition tables in front of bare windows to avoid glare and seeing clearly.

LIGHT FOR MAINTAINING THE HEALTH OF SENIORS

Fractures account for a major part of worsening health. Manage visual environment to reduce falls.

Design lighting and daylighting to support circadian system

Provide lighting to encourage Vitamin D synthesis



DESIGN LIGHTING TO SUPPORT CIRCADIAN SYSTEM

Independent retinal
photoreceptors
respond to light signals

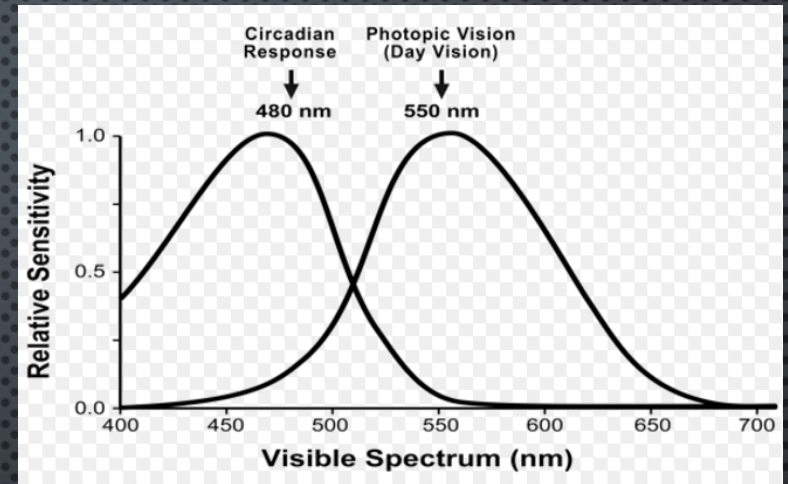
Daily light-dark cycle
resets our internal clock,
affecting our physiology
and behavior



LIGHT AND THE CIRCADIAN SYSTEM

Factors that impact circadian response:

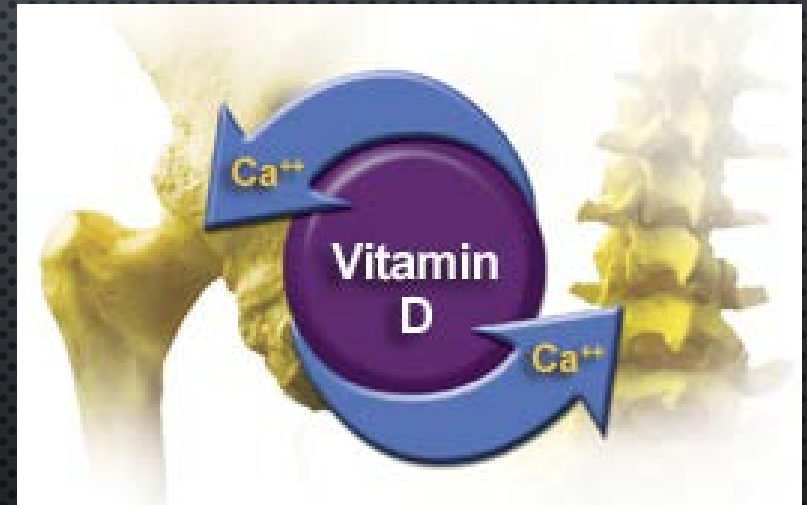
- Peak sensitivity at 460-480 nm (long blue wavelength region)



- Luminance at the eye must be higher than needed for vision
- Seniors have less distinct variation in melatonin cycle, causing sleep disturbance
- Those with Alzheimer's disease are more impacted by circadian disruption

LIGHTING TO SUPPORT VITAMIN D₃ SYNTHESIS

- optimizes utilization of calcium to bones and muscle function, maintaining strength
- Increases bone density
- May help reduce falls
- Has anti-cancer effects



LIGHTING TO SUPPORT VITAMIN D₃ SYNTHESIS



Typical dose needed:

¼ to ½ the time it takes for a person's skin to begin to turn pink.

Vitamin D production occurs in humans in the skin with exposure to the sun's UV-B radiation in the 290-315 nm range.

Affected by person's age, skin type, access to daylight (location, time of day, intensity).

LIGHTING TO SUPPORT VITAMIN D₃ SYNTHESIS

Garden access and ways to draw seniors out to the exterior should be encouraged.

Photo
Eunice Noell



LIGHTING CONTROLS

To be sensitive to senior's needs provide:

- Large easy-to-read buttons that are tactile and easy to operate
- Separate "circadian-optimized" lighting control in common rooms



Photo
Linda Sanford

DIMMING CONTROLS

Critical for

- Managing those who need a lot of light and those who can see only if it's dim
- Changing light level from day to night

Table 1 requires some spaces have

- 100 fc during day
- 10 or 20 fc at night



DESIGN RESPONSES IN BRIEF

Provide an option for very high illumination at visual tasks for the visually impaired

Provide for controls to dim to low levels to manage glare

Create visual scene using color contrast and light to help with orientation

Avoid confusing shadows, patterns, edges

Create zones of transition from light-to-dark



Photo
*Larry Lefever/
RLPS Architects*

VISUAL ENVIRONMENT AND HEALTH EFFECTS



Create visual environments with sufficient lighting, minimal glare, access to daylight and exterior views, and care with light transitions.

Include well-planned design elements like contrast and value differences to provide useful visual cues.