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


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

<table>
<thead>
<tr>
<th>RP-28-07</th>
<th>RP-28-16</th>
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<tbody>
<tr>
<td><strong>Lighting and Visual Environment for Senior Living</strong></td>
<td><strong>Lighting and Visual Environment for Seniors and the Low Vision Population</strong></td>
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<tr>
<td>Review of visual issues specific to aging population</td>
<td>Re-organization of topics, updated research</td>
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<td>Lighting and interior design and daylighting recommendations</td>
<td>Adds low vision, traumatic brain injury, Alzheimer’s disease</td>
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<td>Target population includes those with age-related vision loss and eye diseases</td>
<td>Now includes commercial and public areas such as offices, museums, libraries</td>
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<td>Area-specific lighting recs address private homes and multi-family and assisted living spaces</td>
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ISSUES DRIVING THE DEVELOPMENT OF NEW STANDARDS

Seniors are the 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)

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Typical</th>
<th>Visually Impaired</th>
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</thead>
<tbody>
<tr>
<td><strong>Dining/Activity Areas</strong></td>
<td>.65</td>
<td>2.65</td>
</tr>
<tr>
<td><strong>Corridors</strong></td>
<td>.66</td>
<td>.92</td>
</tr>
<tr>
<td><strong>Lobbies</strong></td>
<td>.90</td>
<td>1.80</td>
</tr>
<tr>
<td><strong>Restrooms</strong></td>
<td>.98</td>
<td>1.21</td>
</tr>
</tbody>
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<tr>
<th>Building Type</th>
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<th>Visually Impaired</th>
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</thead>
<tbody>
<tr>
<td><strong>Living Room/Recreation</strong></td>
<td>.73</td>
<td>2.41</td>
</tr>
<tr>
<td><strong>Chapel</strong></td>
<td>1.53</td>
<td>2.21</td>
</tr>
</tbody>
</table>
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
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

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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

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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

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
APPLICATONs - 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.

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
Independent retinal photoreceptors respond to light signals.

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

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).

Typical dose needed:

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

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Photo
Larry Lefever/RLPS Architects
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.