Lighting Technology & Strategies to Enhance Wellbeing

thoma-holec design

Meet Your Presenters

Lisa Warnock
Principal
Thoma-Holec Design

Lisa Warnock has over 20 years of interior design, space planning and business experience. She is very passionate and knowledgeable about sustainable lighting design practices and specializes in designing senior living communities.

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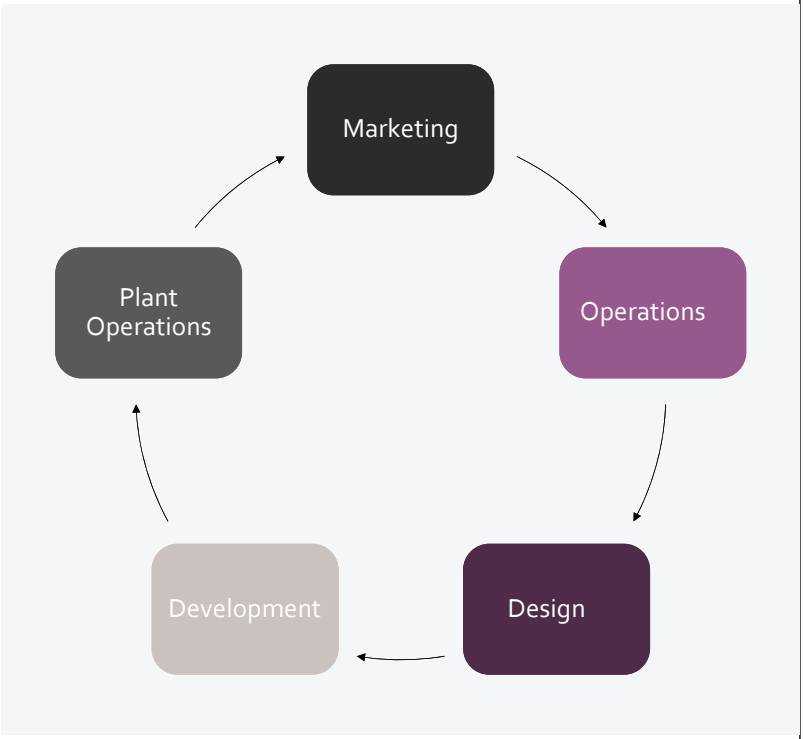
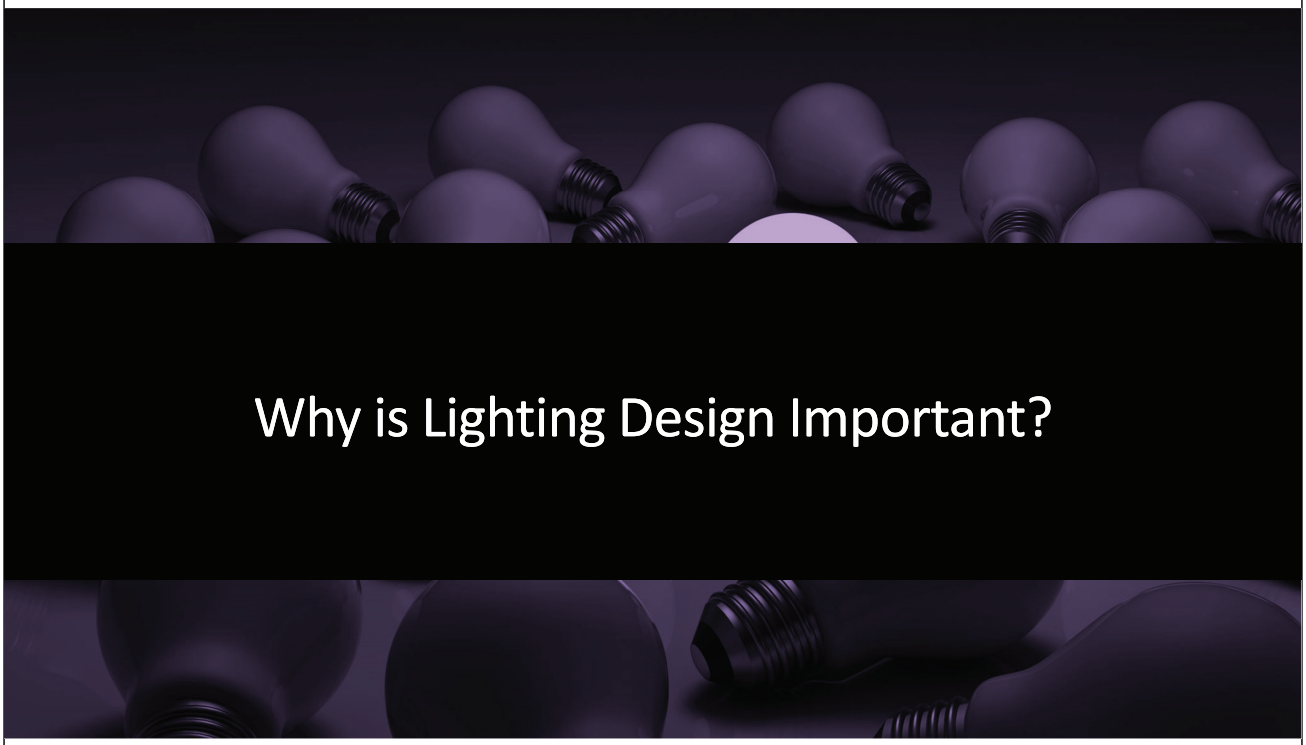
WHO ARE YOU?

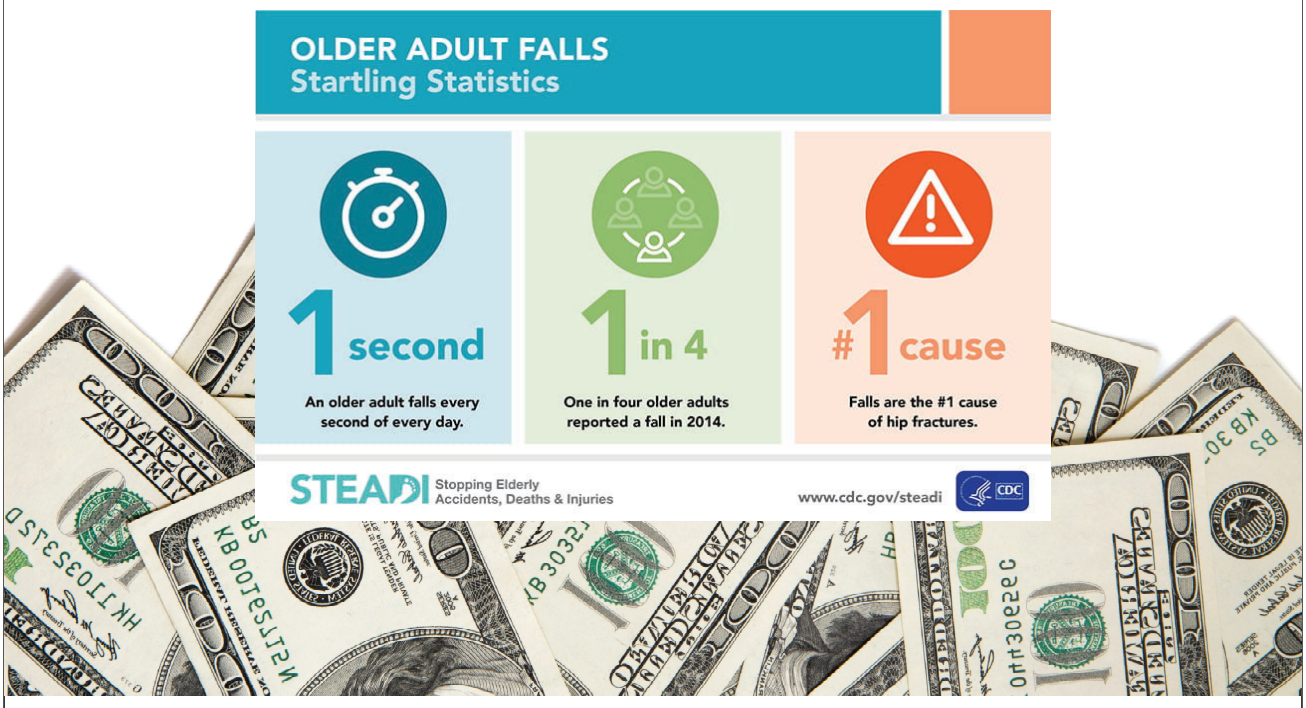


Agenda

1. Why is Lighting Design Important?
2. Fundamentals of Lighting Design
3. Lighting Technology



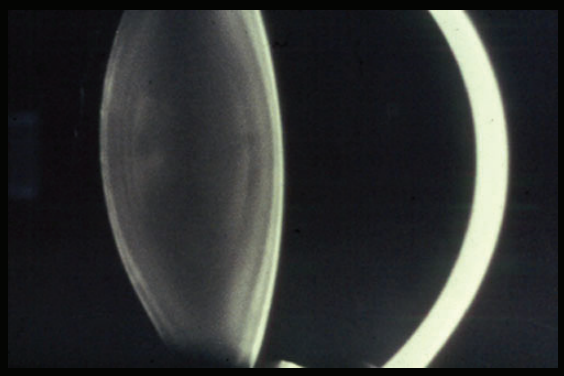
Why is Lighting Design Important?



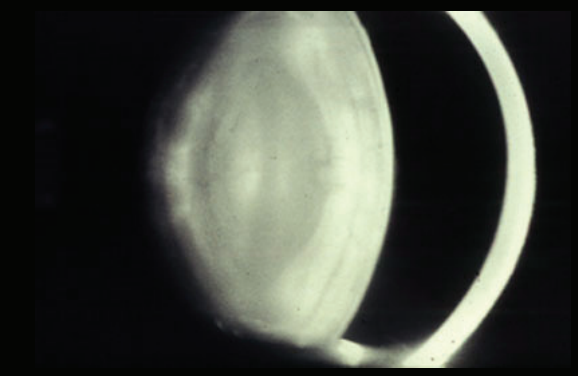
Why is Well Designed Lighting Important?

Benefits of well-designed lighting, for both care providers and residents include:

- Increased safety
- Reduced need for psychotropic medication
- Energy efficiency and reduced operating costs
- Increased staff retention
- Research studies show an increased risk of cancer, particularly breast cancer, for night shift employees.
- Some studies suggest up to a 50% risk increase.



Lens of a 10-year-old

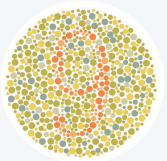


Lens of a 65-year-old

Age & Visual Function

Less light received by the retina

- Need for more light
- Reduced image/object contrast and increase in glare



Problems discriminating color (due to yellowing and darkening of lens)

- Problems with subtle colors in short wavelengths (blues) and yellow

Decline in visual acuity

- Needing higher light levels (illuminance)
- Need more contrast
- Problems evaluating the visual environment

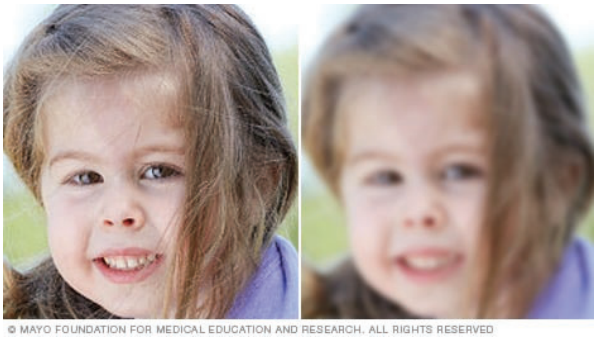
Problems with daily living and mobility

- Falls and injuries
- Loss of independence

Understanding Age-Related Eye Disease

According to a 2004 study by the National Eye Institute, the four most common age-related eye diseases (AREDs) are:

- Glaucoma
- Age-related macular degeneration (AMD)
- Diabetic Eye Disease
- Cataracts



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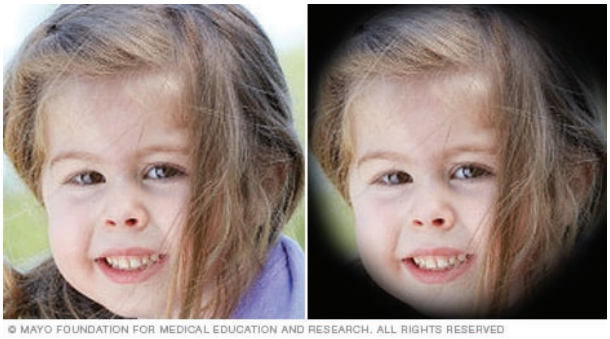
Vision with Cataracts



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Vision with Glaucoma

Understanding Age-Related Eye Disease

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Vision with Macular Degeneration

Vision with Diabetic Retinopathy

Age Related Vision Problems That Lead to Falls

People with vision problems are more likely to fall because:

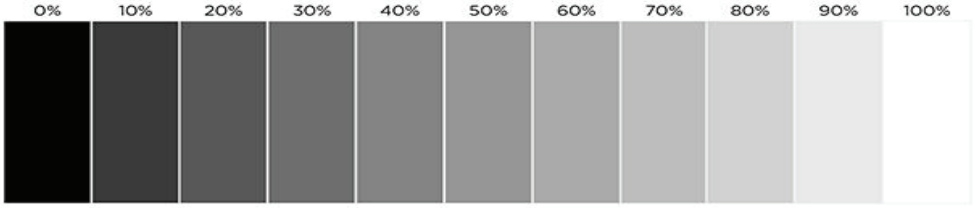
- Reduced contrast
- Slower adaptation (light to dark) by up to 2 ½ minutes
- Reduced depth perception
- Increased sensitivity to glare
- Poor visual acuity

Sources Of Glare

Lighting Fundamentals

LIGHT LRV

LRV [Light Reflectance Value] is a measurement commonly used by design professionals to identify the percentage of light that is reflected from a surface.



Light Reflectance Value Scale (LRV)

Diamond Vogel
the Miracle of Paint

LRV

Same light source, but lighter, brighter paint color here REFLECTS more light

Darker paint color here ABSORBS more light

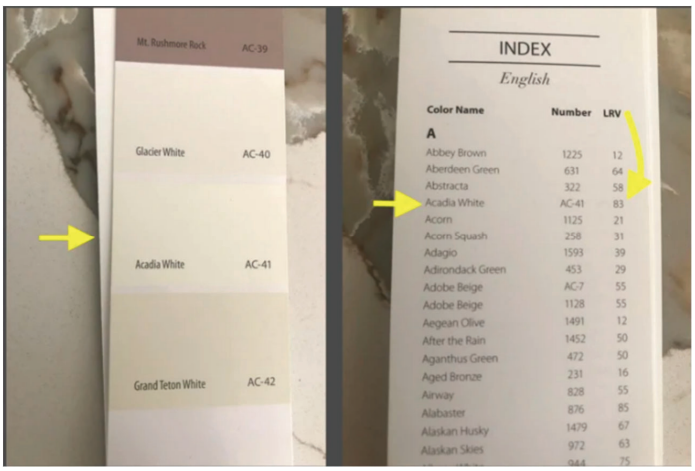
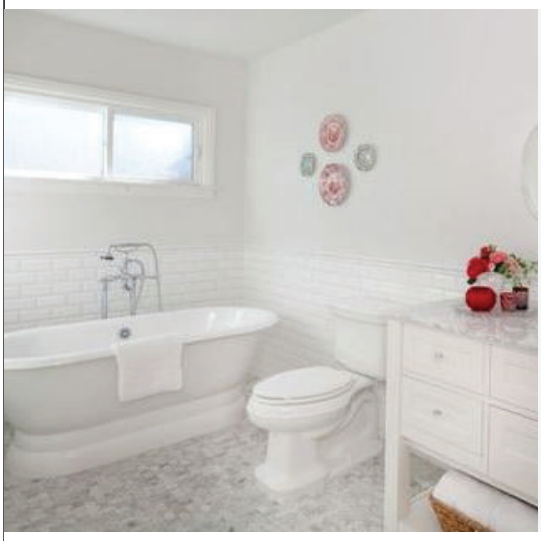


Image courtesy of brickandbatton.com

Dementia Friendly Flooring Selection Guidelines

- Tonal contrast us critical for materials to be seen against each other
- Both DSDC and BS8300:2009 recommend a difference of **30 degrees** of LRV between critical surfaces such as floors to walls and doors to walls
- Adjoining flooring should be tonally similar to reduce the risk of falls
- Flooring LRVs should be within **8** degrees of each other (less is better) and no more than 10 degrees
- Transition strips should match the tones of both surfaces with an ideal difference of no more than 3 degrees of LRV step differences

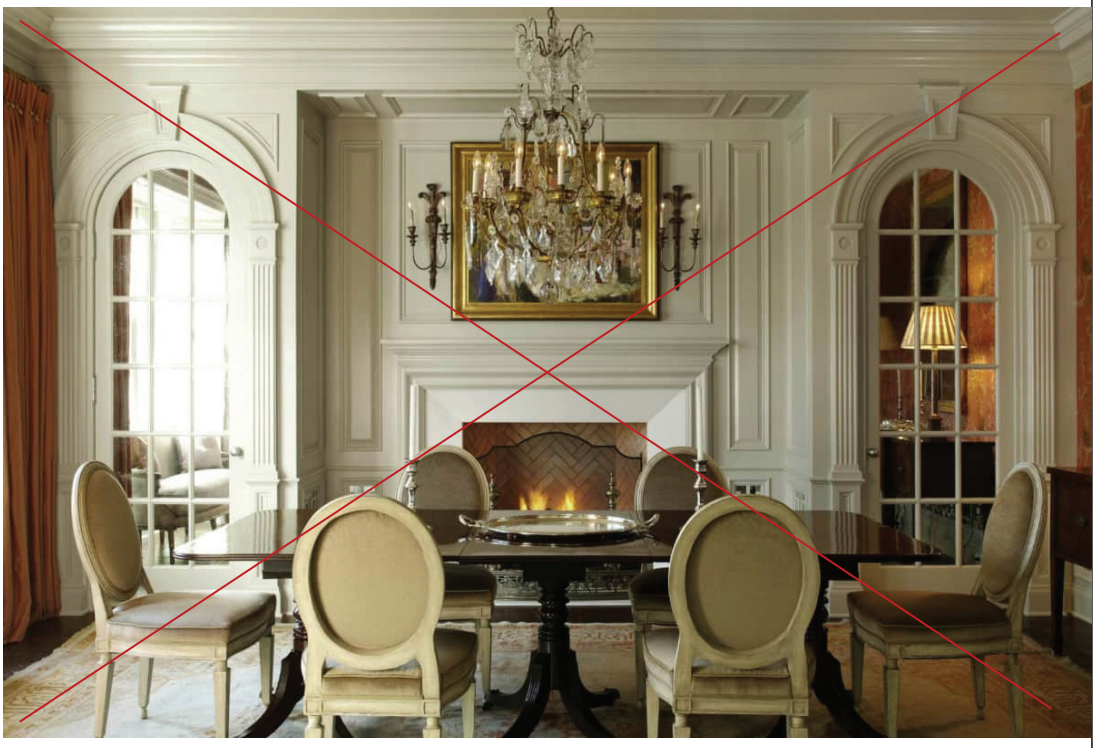
UNIVERSITY of STIRLING dsdc Dementia Design Accredited Product Forbo FLOORING SYSTEMS



Contrast- Higher Intensity Light

In the areas that need it most.

Simple contrast can help someone remain independent.



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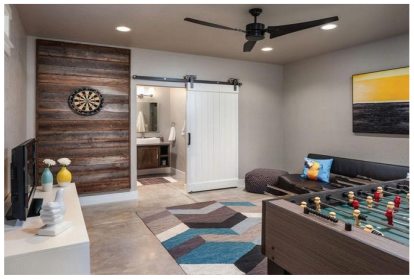
Entry Cove Light

- Accentuates the entry door
- Lights the keyhole and room numbers
- Provides light on visitors faces for ease of recognition

Photo: Jeffrey Totaro

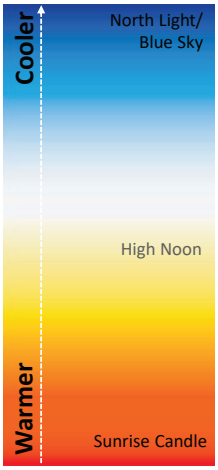
Don’t forget to give the staff nice lighting too!

The aesthetics of a space is important not only to the mental framework of the staff who work in a space, but there is good science to indicate the environment plays a really important role in the healing process.



Lighting Technology

Light Color & Temperature



Daylight fluorescent
Clear mercury vapor

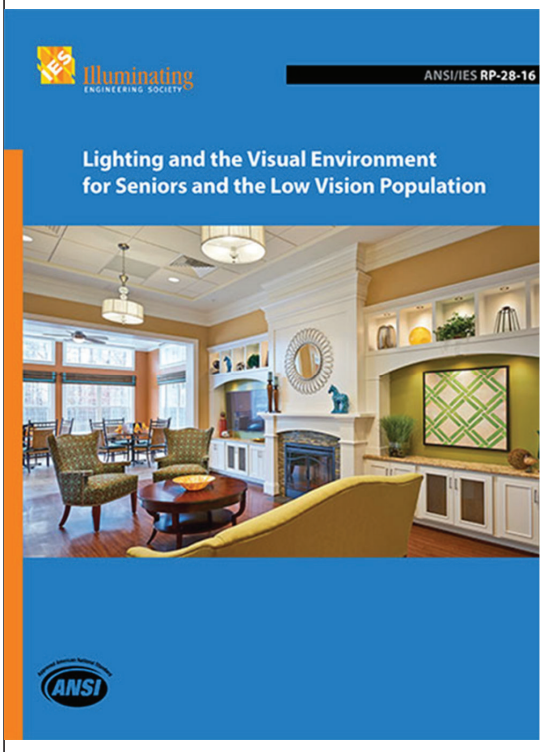
Clear metal halide
Cool white fluorescent
Halogen lamp
Warm white fluorescent
40W incandescent
High pressure sodium

Light And Dark, We Need Both

Both light and dark are essential to good health

Quality darkness is needed

People often experience too little of both



RP-28 Contents

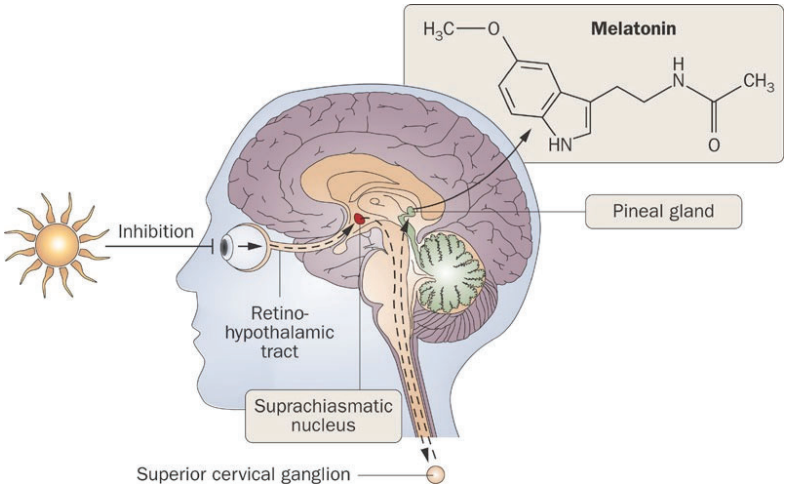
1. **Introduction**
2. **Quality and Quantity of Lighting for Vision:** Source-Dependent Factors; View Dependent Factors; and Considerations to Improve Visibility.
3. **Design Guide:** Design Issues Common to all Space Types; Consideration by Area; Transitions Spaces between Exterior and Interior Spaces; Interior Common Spaces; Commercial Spaces; Lodging and Residential Spaces; Senior Care Facilities; and Visually Based Work and Classroom Accommodations for Those with Traumatic Brain Injury and Photosensitivity
4. **Light Sources:** Qualitative and Quantitative Characteristics: Choosing Light Source Color; and Labeling
5. **Daylight:** Advantages of Daylight; Daylight Availability; Understanding Daylight Distribution; Daylighting Analysis Methods; and Guidelines for Good Daylighting Design.
6. **Light for Health:** Circadian System; Sleep Disturbances in the Aging Population; Seasonal Depression (SAD); Hazards of Light Therapy, and Vitamin D3.
7. **Lighting Controls:** Code Requirement, Lighting Control Technologies, Area-Specific Strategies for Senior Care Facilities

IES RP-28 Recommended Maintained Illuminance Levels (partial)

	Recommended Maintained Illuminance Recommendations			
	Ambient Light[d]	Notes	Task Light[e]	Notes
AREAS	Lux (fc)		Lux (fc)	
Exterior Entrance (Night)	50-100 (5-10)			
Interior Entry (Day)[c]	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)	100 (10)			
Exit Stairways and Landings	100 (10)	Minimum, measured at the center of the step[d] (If local code permits, stairwell lighting can be reduced when unoccupied.)		
Elevator Interiors	100 (10)			
Exterior Walkways[f]	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)	100 (10)		500 (50)	
Indoor circulation/lobby/lounge areas(Night)	100 (10)		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	100 (10)			
Living Room	200 (20)		750 (75)	Reading Work Surfaces

Eye-to-Brain Pathways

- Retina
- Optic Nerve
- Visual Cortex
- Retinohypothalamic Tract (RHT)
- Suprachiasmatic Nucleus (SCN)
- Pineal Gland (Melatonin Secretion)
- Spinal Cord
- Superior Cervical Ganglion (Sympathetic Nervous System)



Melatonin

- Highest levels are produced at night
- Regulates activity-sleep cycle and body temperature
- Is not adversely affected by daytime light exposure
- Reduced levels can negatively influence circadian rhythm
- Healthy melatonin production can suppress cancer cell growth
- Production is reduced by nighttime exposure to light, particularly blue light

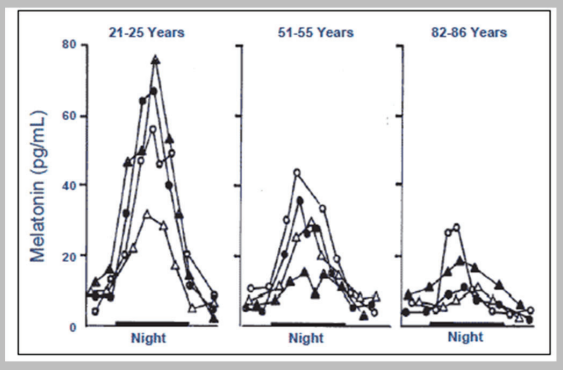
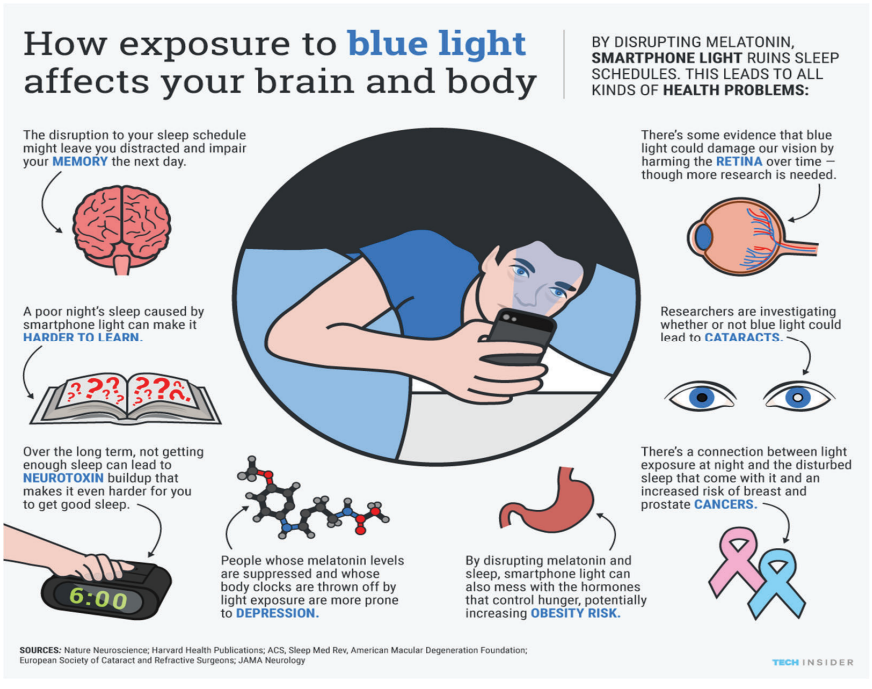


Image courtesy of "Melatonin and Aging", by Prof. George A. Bubenik

Effects of Blue Light



Circadian Rhythms-Staff

- Exposure to light increases impulse control, pleasure and alertness
- Circadian rhythm disruptions occur from lighting and changes in work schedules. These often result in increased daytime sleepiness, insomnia, upset stomach, irritability and mild depression and
- Adaptation to night shift work is possible with timed light exposure at night and light avoidance by day
- Intermittent bright light can reset the clock

Tunable Led Lighting

Timing For Each Color Temperature

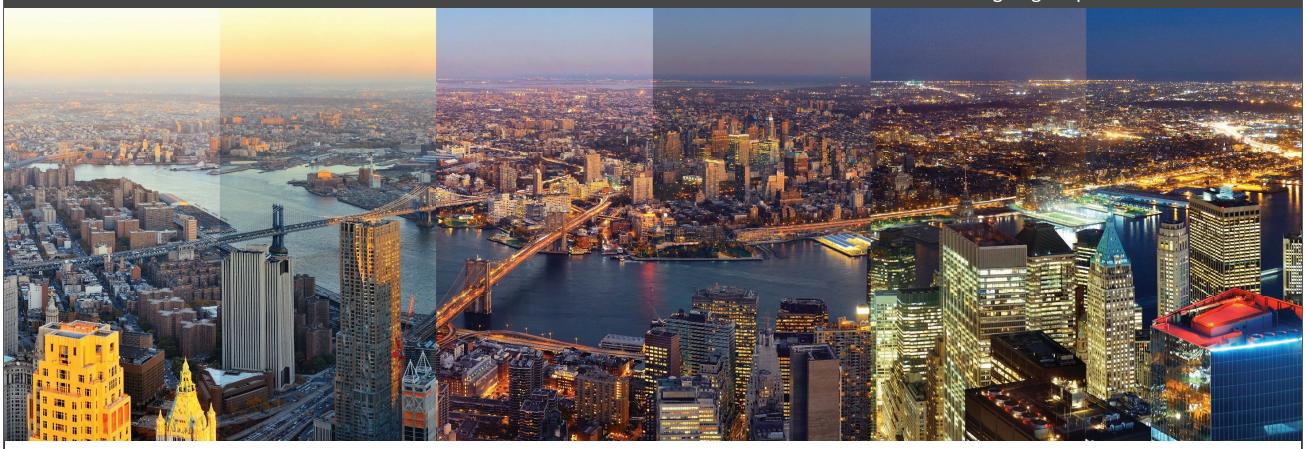
Suggested timing schedules

7 am – 4 pm: 6500K @100% output

4 pm – 7 pm: 4100K @100% output

7 pm – 8 pm: 2700K @20% output

Nightlight option: 2400K



Controls

Image Source: http://pressroom.gelighting.com/news/ge-announces-link-connected-led-an-easy-affordable-way-to-light-up-your-smart-home#.Wi-88DdrxPY

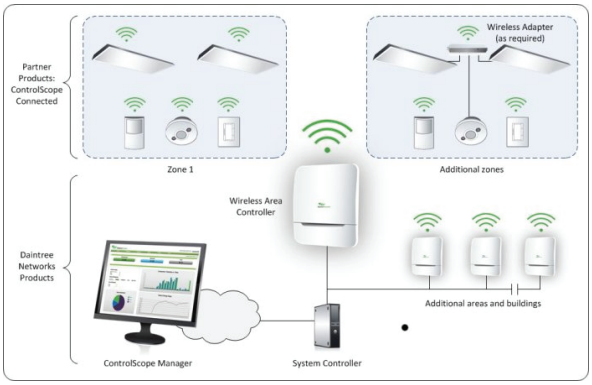
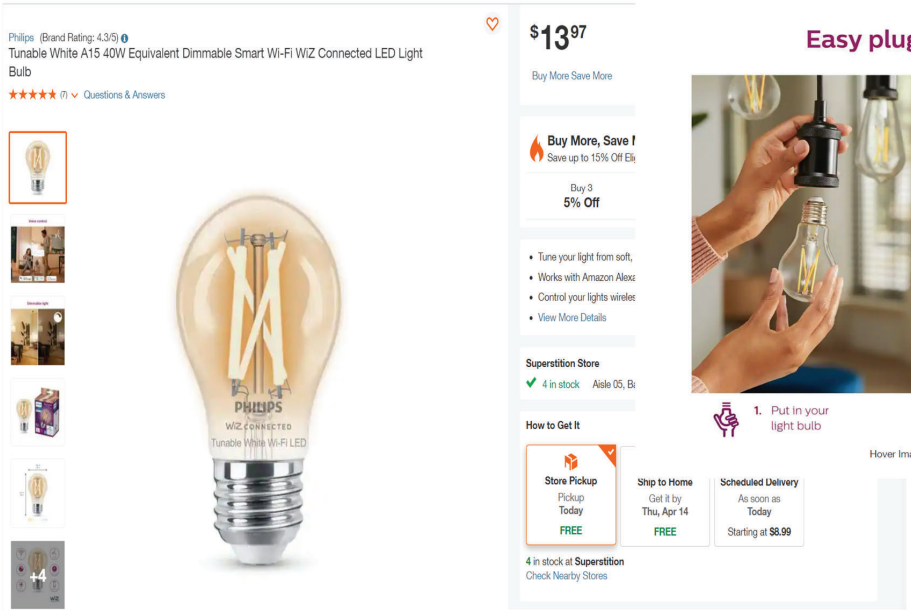
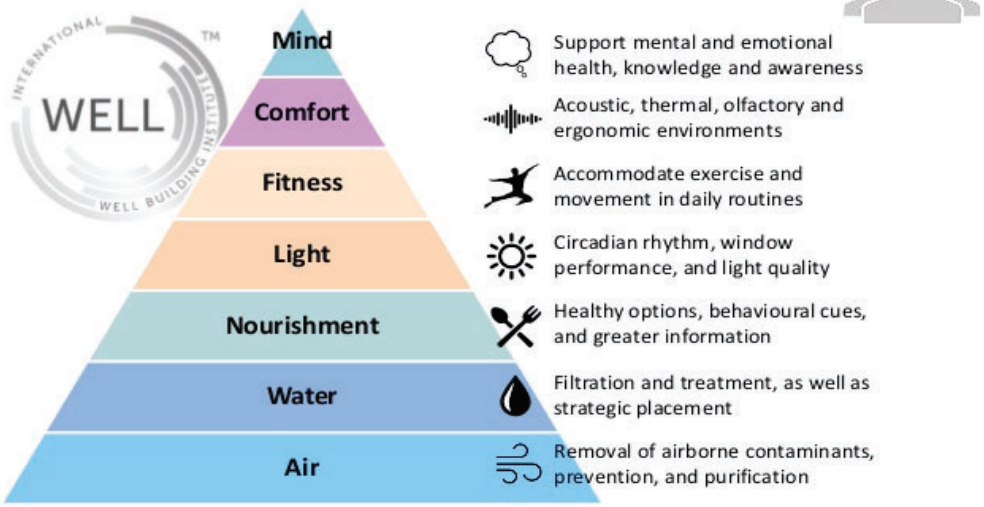


Image source: http://www.ledsmagazine.com/content/dam/leds/migrated/objects/news/9/3/12/Daintree03152012.jpg

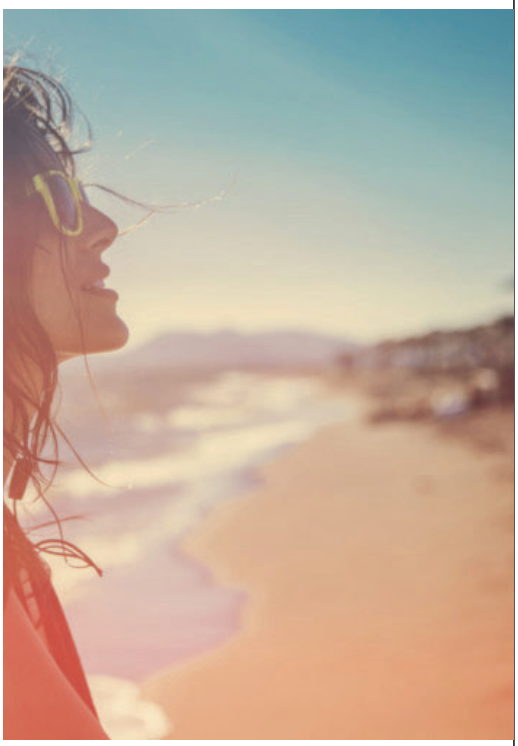

Philips (Brand Rating: 4.3/5)
Tunable White A15 40W Equivalent Dimmable Smart Wi-Fi WiZ Connected LED Light Bulb
Questions & Answers
+4
PHILIPS
WiZ CONNECTED
Tunable White Wi-Fi LED
$13.97
Buy More Save More
Buy More, Save
Save up to 15% Off
Buy 3
5% Off
Tune your light from soft,
Works with Amazon Alexa
Control your lights wireless
View More Details
Superstition Store
4 in stock
How to Get It
Store Pickup
Pickup
Today
FREE
Ship to Home
Get it by
Thu, Apr 14
FREE
Scheduled Delivery
As soon as
Today
Starting at $8.99
4 in stock at Superstition
Check Nearby Stores
Easy plug and play
1. Put in your light bulb
2. Download the WiZ app
Hover Image to Zoom

7 Wellness Concepts



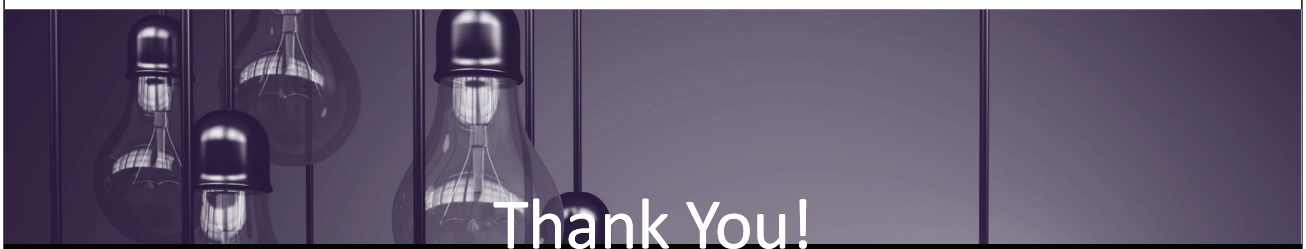
WHY?

- Disruption to the **body's circadian rhythm** are associated with chronic diseases including **obesity, depression and diabetes.**
- Studies have shown a relationship between **proximity to windows and productivity.**
- Studies additionally prove that proximity to windows, and **access to daylight improves healing outcomes**
- Everyone needs **more light** as the lenses age to see properly.



Preconditions:

- Lighting design must be able to meet an **average intensity of 215 Lux, individual task lighting** must be provided where light levels are lower than 300 lux at task zones
- Lighting must be able to controlled **in individual zones**
- Brightness of lighting must be **designed carefully from room to room**, from surface to surface, and must be **uniform within a room**
- **Circadian lighting** must be provided for a % of spaces
- Electrical lighting AND Daylighting must be **controlled to prevent uncomfortable glare**
- Optimizations include:
  - ✓ Quality of **color rendering index** of light
  - ✓ **Reflectivity** of task surfaces
  - ✓ **Providing automated shading and dimming**
  - ✓ Daylighting access to **55%** of occupied space
  - ✓ **Window to wall** ratios



Thank You!
Questions?

Reach me at: Lisa@thoma-holecdesign.com

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