



Lighting Design for Aging Eyes



As people age, there are some significant changes in vision that occur which affect their ability to perceive and understand the world around them.

These significant changes are:

1. normal age-related changes in the pupils (less light can enter the eye)
2. the eyes' reaction time decreases (it takes longer for eyes to transition to different light levels)
3. color perception weakens (yellowing of the lens makes it difficult to distinguish greens from blues) and
4. older eyes become more sensitive to glare

If we apply these physical changes in vision into considerations when designing lighting systems for older eyes, we come up with the following needs:

- **A sixty-year-old needs ten times as much light as a normal twenty-year-old to perform the same seeing task with equal speed and accuracy**

On the most basic level, the goal of lighting design for older adults is to increase foot-candles, which are units of illumination on a surface, without increasing glare. An excellent way to accomplish this when ceiling heights are sufficient (generally a minimum of 8'6", preferably 9', for indirect lighting) is through cove or indirect light that is bounced off the ceiling. This indirect lighting provides even, low-glare illumination. However, because the ceiling absorbs some of this light, it requires more foot-candles to achieve adequate lighting. Daylighting and dimmable fluorescent are good indirect ambient light sources. An ambient light level 2 to 3 times "normal" is considered appropriate, with additional carefully designed task and accent lighting to allow older eyes to see what they are doing safely and effectively.

- **Older eyes adapt more slowly to changes in the light levels between rooms so having a more even distribution of light makes navigation easier.**

On a bright day, a person entering the building from outdoors might have to stop and wait up to 90 seconds for his or her eyes to adjust to the lower light levels indoors. Excessive differences in lighting levels should be avoided in transition areas between driveways, garages, entries, lobbies and corridors as well as where flooring changes occur. The best way to do this is by having higher light levels that automatically switch on when necessary. Consider using motion sensor switching to turn on coves, sconces, overhead illumination with frosted diffusers and other non-glare lighting (such as linear lighting in lower height placement) in these transition areas. Other technologic advances include voice-command light switches. These are available through many home technology catalogs, but are not widely used as of yet. Also, consider lighting design ideas that add safety to night-time trips to the kitchen and bathroom, such as motion sensors and/or energy efficient, long-life sources that can burn all night without using a lot of energy or causing frequent lamp replacement.

- **As eyes age, they lose their ability to distinguish color, particularly in the short wave lengths (blue, violet) and need light sources that provide natural color rendering.**

Traditional Incandescent lights add to this problem since they emphasize yellow and red. This effect is even stronger when dimming the fixtures because the filament burns at a lower temperature. It is important that bulbs meet the appropriate Color Rendering Index (CRI), so that colors appear natural (i.e., as they are seen in sunlight). For residential lighting applications, the main color-correct alternatives to “yellowing” Incandescent bulbs are Fluorescent, Xenon and Halogen. These bulbs also provide cost-savings because of their long life (average life for Halogen) and energy efficiency.

- **Older eyes become highly sensitive and lighting designs should address glare as much as possible .**

The two types of glare that affect our eyes are direct glare (from a directly visible lighting source, such as an unshielded bulb) and indirect glare (a consequence of bright light bouncing off reflective surfaces, such as shiny floors). Therefore, bare bulb fixtures should be avoided because they cause glare spots to which the older eye is actually painful. Use frosted diffusers and indirect lighting where possible, such as cove lighting, sconces and toe-kick lighting previously mentioned. Shiny floors provide another source of glare when they reflect ‘hot spots’ of overhead bulbs. Consider using working surfaces, flooring, appliance finishes, etc. that have matte surfaces in order to reduce the effect of reflection in your universal designs.

Other things to remember regarding lighting for “aging-in-place”:

- Scallop lighting effects on hallway walls or alternating high and low illumination levels within a space create a visual distraction.
- Poorly lit dining rooms can result in insufficient nutritional intake and a variety of other consequences, simply because older folks cannot see their food very well.
- Avoid (or correct) common lighting switching problems:
 - Switch plates that are the same color or pattern as the walls can be unnecessarily hard to spot. Use high contrast colors so they don’t “blend in”.
 - Position switches low enough for someone seated in a wheelchair to reach easily.
 - Use 3-way and 4-way switching for lighting so it can be accessed from several locations in the room giving an older or disabled person more control over the lighting in his or her environment.
- A good source for lighting design for older eyes is the Illuminating Engineering Society of North America (IESNA). www.iesna.org.