The Vision Professional’s Perspective on Space & Environment

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Key Points

- Persons with visual impairments are able adapt their personal environments to improve performance.

- Public spaces, such as buildings, walkways, business offices and transportation hubs contain design elements that can be visually confusing, inaccessible and even dangerous to persons with low vision.
What is Low Vision

By definition:

- **20/70** visual acuity or worse in the better seeing eye *with the best spectacle correction*

- **20/30 to 20/60** : is considered mild vision loss, or near-normal vision

- **20/70 to 20/160** : is considered moderate visual impairment, or moderate low vision
What about legal blindness?

- **20/200 to 20/400**: is considered severe visual impairment, or severe low vision
- **20/500 to 20/1,000**: is considered profound visual impairment, or profound low vision
- **No Light Perception**: is considered total visual impairment, or total blindness
What is visual acuity?

- It is the person’s ability to see a certain sized letter at a certain distance.

<table>
<thead>
<tr>
<th>Test distance</th>
<th>or, 20 feet</th>
<th>or, 6 meters</th>
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</thead>
<tbody>
<tr>
<td>Size letter read</td>
<td>20 foot target</td>
<td>6 M letter</td>
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By definition, 20/20 means the ability to distinguish an 8.7 mm letter at 20 feet.
How does this relate to function?

- Not at all, unless
  - The person wants to read
  - The person wants to leave their own personal environment once in awhile
- The guidelines are primarily designed to provide measurable aspects of vision for the purpose of disability
What are the key aspects of design that relate to vision?

- Glare
- Contrast
Glare: doesn’t everyone want an outside window?

- Window walls are nice, but…
- Changing conditions throughout the day
- We need designs that allow for flexibility in position and control of ambient light.
- What are the best types of illumination to enhance contrast and reduce glare?
What are some of the ways we control glare?

- Shades, drapes, blinds
- Changing the type and position of artificial light
- Shields around monitors
- Cubicle barriers
- Focused vs. indirect light
- Tinted glasses
- Hats, visors
Contrast: telling one surface from another

- “Doctor, if I just get enough light...”
- Pure black and white should give 100% contrast, but...
- Monochromatic color schemes reduce the contrast between surfaces
So far, we have focused on personal space...

- What about public spaces?
- How can they be made visually friendly?
- How can we avoid hazards?
- Where is the line between accessible and esthetic?
Normal changes to the eyes...

- Presbyopia
- Shifts in refractive error
- Declining sensitivity
- Need more light

*These are all changes that can usually be compensated for with lenses, light, and environmental changes!*
More serious changes...

- Cataracts
- Glaucoma
- Macular degeneration
- Diabetic retinopathy
Cataracts

- Clouding of the crystalline lens of the eye
- Natural process of aging
- Vitamins proven to be ineffective in prevention
- Surgical intervention when advanced
Cataracts

- *Glare* is a real problem for persons with cataracts when point sources of light strike the cloudy lens and scatters the light in different directions.
- Small point sources (LED’s, car headlights, reflected sunlight) are worse than diffuse light.
Cataracts

- *Contrast* is lost because the scattered light reduces the sharp edges between letters and surfaces
- Adding light judiciously can reduce the impact of poor contrast
Glaucoma

- Optic nerve atrophy caused by intolerance to pressure
- There are high and low tension causes
- Causes peripheral vision loss
- Treatment with drugs, laser and surgery
Glaucoma

- *Contrast and Glare* both combine to create challenges since the visual receptors lost are those that respond to dim light.

- Good contrast is important in wayfinding; the peripheral visual field is affected and patients use different cues to keep from bumping into objects.
Age-Related Macular Degeneration (AMD)

- Dry and wet versions
- Risk factors:
  - Ultra-violet
  - Diet
  - Smoking
- Treatment
  - Vitamins
  - Laser
  - Photo-dynamic
  - Surgical
AMD

- Generally central vision affected
- **Contrast** improvements can help the brain fill in the gaps in missing vision
- **Glare** from bright direct light can wash out the peripheral receptors that the patient becomes more reliant on.
- Filtered lenses are often very useful to reduce this effect
Diabetic Retinopathy

- Leading cause of new blindness
- Prevention is much better than treatment
- Treatment options
  - Laser
  - Vitrectomy
Diabetic Retinopathy

- There are many different manifestations of diabetic vision loss
- Some have peripheral vision loss mimicking glaucoma
- Others have central loss similar to AMD
- Bleeding in the vitreous can create a glare problem like cataracts
Daylighting
Artificial Lighting
Low Contrast
Fixtures and Finishes
Finish Materials
Conclusion

- Visually impaired persons can modify their home and work environments to minimize the effects of vision loss.
- Public spaces must be designed to allow visually impaired persons full and free access.
- Collaboration between designers, low vision specialists and consumers is needed to develop new guidelines.