

# Guidelines for Designing for Persons with Low Vision

*Building accessibility standards, which have been in effect since the 1970s, do not yet mandate requirements for accommodating persons with low vision, which is defined as “chronic visual impairments that cause functional limitations (such as increased difficulty with reading, mobility, visual motor activities, interpreting visual information) or disability.” The National Eye Institute of the National Institutes of Health estimates that currently more than 38 million Americans age 40 and older experience blindness, low vision, and eye diseases such as macular degeneration, cone rod dystrophy, glaucoma, diabetic retinopathy, and cataracts—all of which can cause low vision. This number is expected to grow to more than 50 million people by year 2020.*

*To serve this growing population, the following supplementary guidelines are recommended for creating safer and more accommodating environments for people with low vision. These guidelines are offered in the spirit of broadening accessible facilities. As is true for many aspects of accessibility, designing for persons with low vision can create environments that are more universally user-friendly.*

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## General Requirements

### Visibility

Facilities should provide exterior and interior pathways and spaces that are safely illuminated and free from potentially hazardous visual obstacles, such as constructions or furnishings that may cause people to collide with them because they are not clearly distinguished from their surroundings by color, contrast or form.

### Safety

Site paved areas should provide contrasts in surface treatment, texture and lighting that improve the clarity of the geometry of pedestrian circulation routes.

## Site

Space and light should be used to enhance the intuitive quality of wayfinding on the site. Landscaping, bollards, and site furniture may be used as landmarks to help guide pedestrians in large, open paved spaces. Outdoor seating should be provided in appropriate locations such as bus stops and plazas and at approximately 50-M (55-yard) intervals along walkways.

**Circulation:** Circulation corridors should maintain constant widths where possible. Ramps and steps in circulation pathways should be clearly distinguished from the level areas by color value and texture.

**Furnishings:** Wall offsets, columns, furnishings, and other objects should be placed outside the paths of circulation and be clearly visible by contrasting color and value to avoid obstructing free

and safe movement. . Illumination levels from artificial and natural lighting should be as constant as practicable, and vary gradually – not suddenly—along the path of travel, with a maximum contrast ratio of 10:1.

**Paving and Curbs:** Paving should be of medium color value and not glaringly reflective, especially in plazas, outdoor seating areas and other open spaces where reflections of sunlight into the building could add to glare and to the heat load. Pavement patterns and color changes **that won't be mistaken for steps** may be used where they cross paths of travel.

**Curbs and edges:** Curbs and other walkway edges should be a minimum of 100 mm (4 inches) and of contrasting color or value to be clearly visible to the pedestrian as a pavement boundary. (Pavement edge curbs generally are not needed where there are handrails.) Wheel stops at curbs should be of contrasting materials and colors to paving.

**Drains:** Drains and gratings should be placed to the sides rather than in the pathways in paved areas. Gratings bars should run perpendicular to the path of travel and be spaced no more than 13 mm (.5 inch) apart.

**Landscaping:** Trees should be placed so low-hanging branches won't project into paved walkways and plazas where they could present a hazard to pedestrians. Also, trees that drop fruit, nuts, or cones seasonally should be located to avoid creating a falling hazard on paved walkways. For safety reasons, water elements should be designed so that unwary pedestrians can't step into the water at the edge of pavement.

**Outdoor Seating Areas:** To the extent possible, provide shading for outdoor seating areas to help avoid glare. Also to minimize reflective glare from sunlight, care should be taken to select paving, table, and other surface colors with matte finishes and medium value.

**Bollards:** To avoid pedestrian collisions with bollards in pathways, bollards should be at least 1M (3.25 feet) in height. The color, form and other features of the bollards and other barriers should contrast with site surroundings. Bollards with ornamental horizontal projections linked with chain or rope should be avoided.

## Exterior Design

Building orientation will affect the amount of direct and reflected solar penetration of interior spaces, as well as the need for controls to mitigate or prevent consequent glare.

**External Stairs:** The underside of stairs should be lighted after dark, and should be enclosed or protected to prevent pedestrians walking underneath from head injury on the sloping underside of the structure. Stair tread nosings, handrails and skirting should contrast with the treads in color and values, and should be abrasive in texture. Where steps cross grades, tapered risers to meet grade may be hazardous to the unwary pedestrian. Where possible, avoid tapering or use handrails to guide the pedestrian to the full step-and-riser section of the stair/steps. Open risers should be avoided.

**Entrances:** Entrances should be sheltered from the elements with overhangs or canopies. Where such shelter is constructed with columns, they should be clearly visible in all lighting conditions.

Entrances should be at least 1M (3.25 feet) away from steps or stairways. Entrance doors should be clearly visible and distinct from fixed glazing at the entrance.

**Windows:** Glare control should be considered when choosing window orientation as well as the number, size, and placement of windows. Light shelves on windows could redistribute daylight evenly across the building section, minimize glare and provide more comfortable, productive, daylit environments.

**Skylights and Sloped Glazing:** Skylights and sloped glazing should be used to provide the intended illuminance and luminance, and to prevent glare or overheating in the building interior. The potential for glare and high contrast caused by direct sunlight falling on task surfaces and/or causing confusing and hazardous shadow patterns should be evaluated. Consider the use of diffuse glazing or other sun control devices to reduce glare from skylights that serve office and other work areas. To reduce solar gain and glare, provide interior daylight control devices—and consider options for maintenance and cleaning as well as for repair and replacement.

## Interior Design

The interior of the building should be planned to take advantage of views and daylight using an integrated design approach. In offices, workstations should not face directly into windows; in courtrooms and conference rooms, users should not be distracted by windows or glare. With few exceptions, daylighting should be controlled to adjust to seasons and time of day.

### Public Spaces

High-contrast and low-glare materials should be selected for public areas, such as lobbies and vestibules that interface with the exterior environment. Information facilities should be located near and clearly visible from the entrance, waiting areas, and access to vertical transportation. Vestibules should provide transitional illumination levels between exterior and interior spaces.

**Corridors:** Public corridors should introduce as much natural light as possible without introducing excessive glare through windows, transoms, or borrowed light. Windows should not be placed at the ends of corridors or other pathways of travel where glare will cause discomfort and confusion.

**Elevators:** Passenger elevators should open to public circulation lobbies or corridors at each level with minimal change in illumination level from elevator cab to building space. Elevators should not open to face directly into sunlight and glare.

**Doors:** Door openings should be a minimum of 1200 mm (4 feet) wide to permit persons with escorts and seeing-eye dogs to pass through comfortably. Likewise, revolving doors should be sufficiently wide to accommodate a person with an escort.

Glazed doors should be used at building entrances and vestibules to facilitate orientation and safe movement. When revolving doors are needed, in addition to code requirements for egress, they should be accompanied with adjacent glazed swinging doors or be able to accommodate a person with an escort. When possible, use automatic sliding doors instead of automatic swinging doors. Swinging automatic doors should swing in the direction of traffic and incorporate safety devices to prevent a person from being struck by a swinging door.

Thresholds, floor mats and gratings all should be flush to avoid tripping hazards.

## **Tenant Spaces**

In designing office space, all decisions should involve providing long-term flexibility for future floor plan changes. An open plan approach, however, gives individual workstations less visual privacy, less artificial and natural daylighting control and less environmental control than closed offices. Glazed partitions with glare control fronting the open area can help add to a feeling of spaciousness and should be used where appropriate. However, care is needed to prevent glazed partitions from being dangerously less visible in circulation pathways.

In laying out workstations, avoid long rows of cubicles, or creating mazes or confusing paths of travel among workstations.

Training and conference rooms should avoid having occupants face directly into potential glare, such as a conference tables with one long side facing the windows. Lighting control for these facilities should offer a wide range of illuminance and luminance, while minimizing glare (see the current edition of the Illuminating Engineering Society of North America's *IESNA Lighting Handbook* for criteria).

## **Support Spaces**

**Custodial Spaces, Storage Rooms, Stockrooms, and Janitor's Closets:** Lighting in support spaces should be adequate for workers to read labels and written instructions. Walls should have a high light reflectance value to maximize lighting levels.

**Toilet Rooms:** Colors and values of finishes for plumbing fixtures, partitions and countertops should provide strong value contrast to improve their visibility for users. Matte finish walls and floor tile should be selected to avoid glare. Mirrors should be provided on walls in places other than over a lavatory in each public toilet. Lighting (not integral to the mirror) should be placed over the mirror itself.

**Structured Parking Garages** To avoid disability glare problems for drivers, avoid locating exits where they would face the rising or setting sun, if possible. Select garage light fixtures to produce minimal glare and choose ceiling surfaces with a high light reflectance value.

## **Finishes**

**Wall Coverings** Wall coverings should be selected to provide medium contrast value with the flooring and with a spectral reflectance that will minimize glare.

**Doors:** Interior doors should contrast with walls in color and value. Doors on corridors should have a finish that is the same on both sides of the door and in contrast with wall surfaces on both sides.

**Floors:** Floor finishes should comply with Architectural Barriers Act Accessibility Standard (ABAAS) slip-resistant requirements in entrances, lobbies, and atriums, where reflections and glare from windows on the flooring can cause glare and visual confusion. Resilient flooring should be selected with a spectral reflectance to minimize glare, and wall bases should be contrasted with both the wall and the floor in color and value. If using carpet, avoid contrasting colors in patterns that suggest changes in level.

**Stairways:** Stair nosings should contrast with treads and risers in color and value. Make all thresholds flush to avoid a tripping hazard.

## Lighting

Lighting is a critical and energy-intensive component of building design. Good lighting design is a careful integration of artificial lighting and daylighting principles to provide in an energy efficient manner for the health and safety of occupants; enhance the appearance of the space; and support the performance of the occupants. An energy efficient design should be the result of providing adequate lighting levels for people of all ages. Lighting designers should be added to the A/E team to ensure a high-quality workplace.

**Definitions:** For many spaces, lighting design uses a combination of ambient and task lighting to provide light levels that support occupant productivity. “Ambient Lighting” is defined in terms of luminance, contrast and glare, where:

- Illuminance = light impinging on a surface
- Luminance = light impinging on the eye (i.e.-reflected illuminance and direct impingement from lighting sources.)
- Contrast = ratio of light to dark illuminance. Contrast ratios between a task and the immediate field of view and between the immediate field of view and the surrounding area (ambient) should be 2:1 or 3:1.
- Glare = reduction in visibility caused by intense light sources in the field of view. There are two primary measures of glare: *Disability glare* is a reduction in visibility due to intense light sources in the field of view; *Discomfort glare* is a sensation of irritation or pain from high luminances in the field of view. Glare from daylighting should be considered as a major issue to be resolved.
- Lighting power density (LPD) = lighting power per unit floor area (i.e., W/sf).

**Criteria:** The current edition of the Illuminating Engineering Society of North America’s *IESNA Lighting Handbook* should be referenced for applicable values of illuminance, luminance, contrast and glare criteria, and color temperatures of ambient light lamps for interior and exterior lighting. The current edition of the American Society of Heating, Refrigerating and Air-Conditioning Engineers’ *ANSI/ASHRAE/IESNA Standard 90.1 or Standard 189.1* should be referenced for the applicable values of LPD criteria for energy efficiency. Care should be taken to rationalize the values for these two sets of criteria.

**Daylighting:** For daylighting design, the most critical luminance relationships are those between the daylight opening, its immediately adjacent surfaces and the surfaces surrounding the work tasks. Understanding the geometry between sun, sky, daylight opening and interior space at different times of the day and throughout the seasons is the key to setting the stage for visual comfort. When providing daylighting, glare should be minimized in open spaces with shading devices. For instance, lightshelves, which divide a window into an upper (daylight segment) and lower view segment, distribute daylight deeper into the spaces while shading the lower view window from direct sunlight and glare.

Daylighting design must mitigate the adverse effects of glare and solar heat gain. Ask these questions:

- How is daylighting factored into the energy reduction requirements?
- Does the use of daylighting also account for additional cooling loads caused by radiant heat gains from the daylighting?
- Does the use of daylighting account for the incremental heating loads caused by reduction in heating by the lighting system?

References for daylighting design include the *IESNA Lighting Handbook* and *IESNA RP-5, Recommended Practice of Daylighting*.

**Task lighting:** Task lighting (providing higher levels of light at specific locations, such as a desk top) may be employed to give users flexibility in creating their own custom illuminated environment. Some individuals prefer working in lower ambient environments and may choose not to use task lighting at all.

**Accent Lighting:** Color, illuminance, luminance and contrast ratios for accent lighting should be synchronized as described in the *IESNA Lighting Handbook*.

**Exterior Lighting:** To provide for the security and safety of the occupants and passersby, as well as to enhance the architectural aesthetics of the building, the exterior lighting system should provide the required contrast sensitivity as well as illumination levels.

**To improve the quality of lighting:**

- Control luminance and glare from both natural and artificial lighting sources to reduce high contrast (such as from deep shadows), prevent eyestrain, and to provide acceptable occupant contrast sensitivity and visual acuity.
- Use appropriate controls to balance daylighting, occupant needs and energy efficiency.
- Provide consistent levels of illumination in circulation zones.
- Provide increased task illumination.
- Consider "transition zones" for entry points to significantly higher or lower illumination levels.
- Provide vertical illumination on room surfaces for vantage point and space definition.
- Provide high color rendition sources.
- Avoid accent or spot lighting that creates high-contrast pools of light on dark surfaces.