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# Aiding the visually impaired

Whether at home or out in public, visually impaired people have specific accessibility requirements that are different to those with physical disabilities. Thoughtful design and new technology can help.

**AT HOME.** visually impaired people can generally manage well without too many building modifications. However, public spaces are a different situation.

## No mandatory requirements

To live as normally as sighted people, the visually impaired need to be able to easily move around public places like malls, cafés, hospitals, airports, railway stations, theatres and education facilities.

While public buildings must be designed to be accessible for people with physical disabilities, designing for blind and visually impaired people is not mandatory, and their needs are not generally well understood.

## Designing residential buildings

In the home, there are some design features that improve accessibility for the blind or visually impaired.

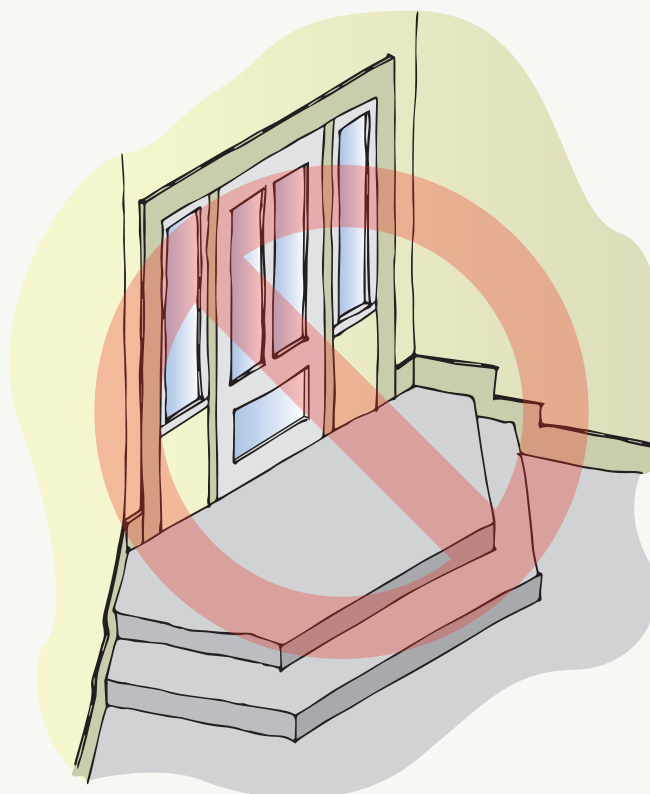
### Start with good lighting

Good lighting is essential. Light sources may be either natural or artificial, but regardless, there are some basic rules that should always be followed:

- Ensure there is good surface or task lighting for the activity being undertaken, particularly in the kitchen.
- Distribute lights evenly throughout an area to avoid contrast and variations in light levels.
- Locate light sources to avoid creating shadows.
- Avoid glare and reflection from shiny or glossy surfaces.

Where possible, use natural light for daytime lighting, particularly in kitchens.

Occupants of residential units in retirement villages often have impaired vision, yet a common



**Figure 1** Avoid small changes of level and angles or curves at tread edges. If necessary, incorporate ramps or stairs with handrails and/or tactile markers.

layout in these units is to locate the kitchen centrally and away from windows and natural light in an open-plan living space. This then necessitates the need for artificial light, even during the daytime.

### Include contrast and colour

To improve visibility:

- have colour-contrasted adjacent surfaces such as light walls and dark doors – even more important in public buildings where people are

less familiar with their surroundings

- avoid heavily patterned furniture and finishes as these can be visually cluttering
- install contrasting-coloured light switches and power points, for example, black switches and power points on a white or light-coloured wall
- select contrasting-coloured stair handrails, grab rails and stair nosings.

### Handrails and other features

Other features that can make the home easier and safer include:

- stair handrails that extend beyond the stairs at the top and bottom to give warning that they begin or end
- handrails that are easy to grasp and securely fixed as visual impairment can affect the sense of balance
- avoiding small changes of level or, if this is not possible, avoidance of angles or curves at tread edges or corner steps (see Figure 1)
- a secure outdoor area for a guide dog.

### Designing public buildings

Public buildings rely on sight for navigation, so unfamiliar buildings can be very difficult for blind or visually impaired people to move around in.

There are, however, some design features that can be incorporated to facilitate movement through unfamiliar buildings for people who cannot see.

#### Acoustic design important

Blind or visually impaired people make more use of their other senses, in particular, hearing, to detect sounds such as the ping of an elevator to pinpoint its location. Changes in acoustics in different spaces or the sounds from walking over or tapping different floor finishes are other examples.

When there are too many other sounds, such as music or excessive reverberation from hard surfaces, the sounds that aid navigation may not be audible. Acoustic design and managing sound therefore needs to be a significant consideration in the design of public buildings. For example:



**Figure 2** Dark doors, floor coverings and handrails provide good contrast with white walls.

- select materials and finishes that facilitate changes in acoustics, such as indicating the size of a room or the presence of corridors or structural barriers
- provide tactile indicators, such as different floor finishes, to indicate a transition from one area to another.

#### Good lighting design

As with residential design, good lighting to aid navigation is essential in public buildings. The same rules apply including:

- distributing lights evenly throughout an area to avoid contrast and variations in light levels
- locating light sources to avoid creating shadows
- avoiding glare and reflection from shiny or glossy surfaces
- ensuring there is good surface or task lighting for the activity being undertaken.

#### Contrast, colour and tactile indicators

Contrast and colour can facilitate movement around unfamiliar buildings by:

- defining a route of travel
- defining areas
- drawing attention to signage.

There should be good contrast between doors and walls and between floors and walls (see Figure 2). A perimeter band of contrasting colour that defines the transition between floor and wall can be effective when the floor and wall colours are similar.

Stair handrails should be colour contrasted with the walls and stair nosing colour contrasted at the front edge of each step.

Tactile indicators should be installed at the top and bottom of stairs, escalators and travelators.

Colour can be used to define specific spaces, for example, the same colour for each area with the same function in the building. Keep colour schemes simple, limit use of colour and, for adjacent blocks of colour, select colours with good contrast. Avoid the use of large- ➔

scale patterns as too many colours can create confusion.

### **Signage**

Low-level tactile signs help people who are blind or visually impaired to read the information, but it is common for signs to only have raised characters. Braille can be read more quickly and easily than raised print, so information in Braille should always be included on signage.

Signage should be located at a consistent height and distance from the area it is identifying. Signage lettering should be raised and colour contrasted with the background of the sign, and the background colour should contrast with the surrounding wall surface (see Figure 3).

### **Building layout generally**

Hallways should be straight with 90° turns rather than curves as these can disorientate. They should have a clean, uncluttered design and no obstacles.

Stairs should have handrails that extend beyond the stairs at both top and bottom to give warning that they are about to begin or end. Handrails must be easy to grasp and securely fixed.

Glass doors should have contrasting markings at their leading edges. They should also have two horizontal bands of contrasting colour across the glass at heights between 850–1,000 mm and 1,400–1,600 mm above the floor level.

### **Outdoors**

A simple, logical outdoor layout is easier to navigate for those people who are blind or have low vision. Permanent outdoor furniture such as seats, tables, drinking fountains and so on should not protrude into an accessible path of travel. They should be a contrasting colour to the surroundings.

Where bollards are installed, they should be at least 1.0–1.2 m high and a contrasting colour to the surroundings. Low bollards can be a stumbling hazard.

### **Technology aids**

Technology is contributing to the field of building and spatial design and, in recent years, has made enormous advances for blind and visually impaired people.

Although there have been specialist devices to aid navigation for some time, the introduction of Apple's screen-reading technology for iPhone, iPad and iPod now provides low-cost options for navigation tools for the blind. This technology, called Voiceover, speaks everything that is displayed on the device's screen.

### **BlindSquare**

BlindSquare is a GPS app for blind and visually impaired people that uses the Voiceover technology from Apple to describe the surroundings, such as street intersections, locations of buildings and points of interest. Information is provided both on the device's screen and in a spoken format through a headset or speaker.

While it provides excellent outdoor navigation assistance, information about the inside of the building is not available.

### **BlindSquare BPS**

Specifying an indoor navigation system, such as BlindSquare BPS (beacon positioning system) can fill this gap. This uses iBeacons – small, low-energy Bluetooth transmitters installed in buildings that provide information about the interior spaces.

iBeacon transmitters are battery operated, cheap, small and easy to install in different locations in the building. Each transmitter broadcasts a unique ID that can be received by

Apple devices. Data about the building must be created for each transmitter and published to the cloud.

When the app is launched, it accesses the information in the cloud and provides it as audio messages to navigate the user through the building. Information may include distance to the next door, whether the door is on the left or right side and the room or space that the door accesses. If the user turns 180°, the information they receive will be relevant to the direction in which they are now facing.

Several messages can be associated with one transmitter. If there are a number of messages, the message read out depends on factors such as the user's walking direction, the direction in which their device is pointing or the other transmitters that have already been detected. This helps BlindSquare BPS to be context aware as it relates the user's current location to where they have come from and to the direction in which they are moving.

The nature of storing information on the cloud means that, if information about a space needs to be changed, the new information is available for use as soon as it has been published to the cloud.

BlindSquare BPS can be installed at little cost and is ideal for large public buildings and spaces.

### **Additional references**

- NZS 4121:2001 *Design for access and mobility – Buildings and associated facilities.*
- AS/NZS 1428.4.1:2009 *Design for access and mobility – Tactile indicators.*
- RTS 14 – *Guidelines for facilities for blind and visually impaired pedestrians* (NZ Transport Agency).
- *Pedestrian planning and design guide* (NZ Transport Agency). ◀