CRC Construction Innovation
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Supported by
Queensland Government
Disability Services Queensland

Wayfinding design guidelines

CRC for Construction Innovation participants

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compiled by
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Foreword

It is generally taken for granted that people are aware of their surroundings and can navigate from one place to another. However, for an individual with a disability finding your way in often complex surroundings can be difficult.

The Cooperative Research Centre for *Construction Innovation* leads a collaboration of committed research professionals to develop a number of wayfinding solutions — creating a more accessible, more inclusive built environment.

The team comprises representatives from the Department of Public Works; the Building Commission, Victoria; the Australian Building Codes Board; the Queensland University of Technology and the CSIRO, as well as other interested individuals.

The team's work was recognised with a 2007 Disability Action Week Award, and their latest research has resulted in this significant and practical booklet. The inclusive design principles, techniques, strategies and solutions will help resolve problems associated with wayfinding, not only for people with a disability but also for the whole community.

I commend this book to you.

Honourable Rob Schwarten MP

Minister for Public Works, Housing and Information and Communication Technology

The *Disability Services Act 2006* aims to ensure that the conditions of everyday life for people with a disability are the same as, or as close as possible, to the conditions enjoyed by the general community.

This *Wayfinding design guidelines* booklet is an important resource that provides practical and cost-effective solutions to help designers, developers, property owners and managers do their part in improving access to buildings, properties and spaces for all people.

It complements a range of strategies introduced by the Queensland Government which aim to enhance people's ability to participate fully in their communities.

It is my pleasure to support this very practical booklet which offers people with a disability real solutions for wayfinding through their community, and I commend it to you.

Honourable Lindy Nelson-Carr MP

Minister for Communities, Disability Services, Aboriginal and Torres Strait Islander Partnerships, Multicultural Affairs, Seniors and Youth

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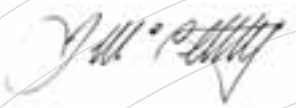
Preface

The outcomes of the *Wayfinding in the Built Environment* project result from the unique industry partnership of the public and private sector working together with a national research team. This collaboration under the leadership of the Cooperative Research Centre (CRC) for *Construction Innovation* is providing significant value, not only to industry, but also to the community generally.

This publication, *Wayfinding design guidelines*, outlines a practical and comprehensive design method to wayfinding using an inclusive design approach. The guidelines assist designers as well as developers, property owners and property managers in identifying ways of improving access to, into and through their new or existing property, particularly buildings and large complex facilities. The material sources include expert knowledge from architects, landscape architects, lawyers, engineers, building surveyors, building regulators, access consultants, local expertise and persons with a disability.

These guidelines complement the other project publication — *Wayfinding system audit*.

Construction Innovation looks forward to continuing to provide practical outcomes of benefit to the community and enhancing the future of the Australian construction industry.



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Without the financial and collaborative efforts bringing together such teams, this valuable report could not have been successfully delivered to our industry.

The Wayfinding project participants would like to thank and acknowledge Colleen Foelz (Communication and publications, CRC for *Construction Innovation*) for the management of this publication.

Project partners

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About the Cooperative Research Centre for *Construction Innovation*

The CRC for *Construction Innovation* is a national research, development and implementation centre focused on the needs of the property, design, construction and facility management sectors. Established in 2001 and headquartered at Queensland University of Technology under the Australian Government's Cooperative Research Program, *Construction Innovation* is developing key technologies, tools and management systems to improve the effectiveness of the construction industry. *Construction Innovation* is supported by investment from its industry, government and research partners, leveraged by a Commonwealth grant. More that 350 individuals and an alliance of 27 leading partner organisations are involved in and support the activities of this CRC.

There are three research areas:
Program A — Business and Industry Development
Program B — Sustainable Built Assets
Program C — Delivery and Management of Built Assets.

Underpinning these research programs is an Information Communication Technology (ICT) Platform

Construction Innovation's future research activities will build upon our strengths in sustainability, digital modelling, safety and improved project delivery. With increased industry engagement and support from its partners, this CRC is recognised for our unique role in providing leadership of industry-wide research and development. We are committed to continuing to provide valuable outcomes for Australian industry through applied research, education and technology transfer for the future.

Definition of terms

Accessible

Buildings or spaces with features to permit use by people with disabilities. Building Code of Australia (2007).

Accessway

A continuous accessible path of travel to, or within, a building suitable for people with disabilities.

Atlas Strider

An Atlas Strider combines a talking map system with a GPS positioning device. Atlas Strider systems use a spatial language interface — the environment around the pedestrian is explained verbally (e.g. 'On your left there is a bus stop').

Bluetooth

A short-range wireless specification for connecting mobile products such as mobile computers, mobile phones, digital cameras, and other portable devices. CRC for *Construction Innovation* (2006).

Braille

A system of touch reading for people who are blind or vision impaired that employs raised dots, evenly arranged in quadrangular letter spaces or cells. Braille symbols are formed within units of space known as braille cells. A full braille cell consists of six raised dots arranged in two parallel rows each having three dots. The dot positions are identified by numbers from one through six. Sixty-four combinations are possible using one or more of these six dots. A single cell can be used to represent an alphabet letter, number, punctuation mark, or a whole word.

When every letter of every word is expressed in braille, it is referred to as Grade 1 braille (uncontracted).

Grade 2 braille uses a similar system of cells, either individually or in combination with others, to form a variety of abbreviations and contractions or whole words. Grade 2 braille is the more commonly used form in publications and signage.

Australia inherited the British system of braille as compared with the American system and is referred to as Unified English Braille Code (UEBC) Grade 1 braille.

This system of braille is constantly being reviewed and upgraded. Refer to the Australian Braille Authority (ABA) website: http://www.e-bility.com/roundtable/aba/ and http://www.ebility.com/roundtable/aba/braillecodes_aust04.php

Braille Signage

Braille Signage is a specialist wayfinding device that incorporates UEBC Grade 1 braille as a primary source of information for people who are vision impaired and may be aided with raised tactile lettering, maps or pictorial images.

Some areas that may require special signs include:

- accessible parking spaces and passenger loading zones
- accessible entrances
- accessible toilets and parent rooms
- directions and information signs regarding functional areas
- directions to the nearest accessible facility, posted at non-accessible facilities
- designated areas for emergency assistance
- volume control telephones
- tactile signs identifying all permanently designated rooms and spaces
- elevator and lift signage
- approaching stairways, escalators, travelators, ramps or overhead obstructions less than two metres above the ground where no suitable barrier exists.

Refer current Building Code of Australia and Blind Citizens Australia (BCA) http://www.bca.org.au/Accessible_Environments_Signage_Specification.htm

Continuous accessible path of travel (refer also 'universal accessway')

An uninterrupted path of travel to, from or within a building, providing access to all required facilities. A continuous accessible path of travel should not incorporate any step, stairway, turnstile, revolving door, escalator or other impediment that would prevent it from being safely negotiated by people with disabilities. AS1428.1, part 1: General requirements for access — New building work, Building Code of Australia (2007).

Contrasting textures:

Contrasting textures act as tactile markers, which people can identify by touch. Examples include carpet matting on a vinyl floor surface, domed buttons on handrails to indicate the end of the stairway or ramp is approaching, and tactile ground surface indicators (TGSIs) at the top and bottom of stairs. Building Code of Australia (2007) Section D3.8 Tactile Ground Surface Indicators (TGSI) and Royal Blind Society (2003).

Colour contrast:

Viewing of any object involves the concept of 'figure–ground relationship' — the more an object contrasts with its surrounds, the more visible it is. The concept of 'figure-ground relationship' also includes the relationship between 'positive' and 'negative' space and the effective use of colour combinations. The basic guidelines for making effective colour choices use Itten's devised seven colour contrasts: saturation, light, dark, extension (or contrast of proportion), complements, hue, warm and cool.

These devised seven colour contrasts (or methodologies) for coordinating colours use the hues' contrasting properties (not physical and chemical properties) of colours. Primary colours, yellow, red and blue, produce the strongest contrast.

These colour contrasts add other variations to the intensity of the hues: contrasts may be obtained due to light, moderate or dark value. The colour contrast becomes weaker with secondary or tertiary colours or as the saturation decreases.

Disability

A condition or state of being, which is covered by the broad *Disability Discrimination Act 1992* (Cwlth) definition. The term includes physical, sensory, psychiatric, intellectual and neurological disabilities, physical disfigurement and the presence in the body causing, or capable of causing, disease. CRC for *Construction Innovation* (2006).

Forward-up equivalence principle

The upward direction on a map which must always show what is in front of the viewer. Levine (2003).

Geographic Information System (GIS):

A computer system for capturing, storing, checking, integrating, manipulating, analysing and displaying spatial data related to positions on the earth's surface. Typically, a GIS is used for handling maps of one kind or another, which might be represented as several different layers where each layer holds data about a particular kind of feature, for example, roads. CRC for *Construction Innovation* (2006).

Global Positioning System (GPS)

Satellite system to provide information about any location such as the latitude, longitude, altitude or elevation of any location. Crawford et al. (2005).

Hoople Mobility Aid

Hoople Mobility Aid is a mobility aid developed by the Royal National College for the Blind, UK.

Illuminance

The luminous flux falling onto a unit area of surface. Building Code of Australia (2007).

Luminance contrast	Luminance contrast is seen when two adjacent areas differ in the intensity of light reflected or emitted from them. There is a difference between the light energy reaching the observer's eyes from the two areas and a boundary is perceived between the brighter and darker areas. The luminance contrast is obtained by measuring the luminance factor of the surfaces and comparing them under natural and artificial lighting conditions and all weather conditions. Luminance contrast is preferred to colour contrast alone. The use of luminance contrast is very helpful to assist people who are vision impaired locate important aspects of a building such as doorways, signs, handrails, shorelines, hazards and objects of interest. Luminance contrast can also be used to highlight potential hazards such as the edges of steps or a roadway. Adapted from AS1428.4:2002 part 4: Tactile indicators, Appendix F Laboratory and On-site Measurement of Luminance Contrast (Normative).
MoBIC	The MoBIC Travel Aid (MoTA) consists of two interrelated components: the MoBIC Pre-journey System (MoPS) to assist users in planning journeys and the MoBIC Outdoor System (MoODS) to execute these plans by providing users with orientation and navigation assistance during journeys.
Mowat Sensor	Mowat Sensor is a small hand-held device that uses high-frequency sound to detect objects within a narrow beam. The entire sensor vibrates if an object is present.
NOMAD	NOMAD is an audio tactile tool (interface) for using and managing spatially distributed information by people who are blind or vision impaired.
Nottingham Obstacle Detector	The Nottingham Obstacle Detector (NOD) is a hand-held sonar device that provides an auditory feedback that indicates eight discrete levels of distance by different musical tones.
Shoreline or trail	A shoreline is a detectable outline along, or around, part, or all, of a building. A trail is a linear path of travel or designated corridor such as building frontages and pathways. CRC for *Construction Innovation* (2006).
Sonic Guide	The Sonic Guide is an eyeglass-configured sonar-type device available for the orientation and mobility of people who are blind. It operates by emitting towards target objects and receiving modulated stimuli whose intensity and frequency components directly result from the distance and physical properties of the target.
Tactile	Tactile means information and interpretations derived from the sense of touch. This involves sensory transfer through physical contact of the hands or feet with other surfaces, as well as sensory transfers received by contact with non-physical elements such as pressure, wind and temperature. Adapted from CRC *Construction Innovation* (2006).
Tactile signs (Refer also to Braille Signage)	Tactile signage incorporates raised text or symbols to enable touch reading by people who are blind, and touch enhancement of visual perception for people who are vision impaired.
Tactile Ground Surface Indicator (TGSI)	TGSI are areas of raised ground surface texture treatment, designed to provide people who are blind or vision impaired with warning and directional orientation information. Typically, square tiles with regular, raised patterns are laid in various patterns at key points to indicate where ground levels or directions change. TGSIs should be provided at the following locations: (a) stairways, escalators, ramps and travelators (b) kerb ramps and step ramps (c) pedestrian crossings at roadways

(d) pedestrian crossings in high-use vehicular areas, e.g. car parks
(e) vehicle pick-up and drop-off areas
(f) railway platforms
(g) passenger wharves
(h) car park crossings
(i) bus stops
(j) trams/light rail
(k) level path/carriageway junctions
(l) projecting hazards in circulation spaces
(m) change of direction, directional indicators

Adapted from AS1428.2:1992 Design for access and mobility, part 2: Enhanced and additional requirements — Buildings and facilities and AS/NZ1428.4:2002 Design for access and mobility, part 4: Tactile indicators.

Universal accessway (refer Continuous accessible path of travel)

A universal accessway is a dedicated and marked route within the public domain that provides a continuous accessible path of travel:

- within the boundary of the site from transport stops, accessible parking, accessible passenger loading zones, public streets or walkways to building entrances
- that connects accessible buildings, facilities and spaces on the same site and connects building, entrances with all accessible spaces and facilities within a building, and connects the entrances of each building with exterior and interior spaces and facilities
- that minimises the distances travelled between all elements of buildings and spaces.

As a guideline dimension for an external universal accessway, the space should have an optimum minimum vertical and horizontal clearance of 2000 mm. Wherever possible, an all-weather cover is recommended to and from a building, but it is essential that an all-weather cover is placed at the building entrance.

Vision impairment

Vision impairment is any significant loss of sight. Adapted from AS1428.4:2002 part 4: Tactile indicators.

1 Wayfinding

Wayfinding is about effective communication, and relies on a succession of communication clues delivered through our sensory system of visual, audible, tactile and olfactory elements. There are four primary wayfinding elements: architectural, graphic, audible, and tactile communication. In addition, clues such as culinary aromas from coffee shops, restaurants and aromatic plants and flowers are useful as navigational aids for people who are blind or vision impaired.

In *Building Guidelines for Mental Health Facilities* (1996), Queensland Health notes wayfinding as:

> The ease with which one proceeds and is facilitated through an environment from one point of interest to another. Wayfinding systems include such components as basic layout of building and site, interior and exterior landmarks, views to outside, signs, floor and room numbering, spoken directions, maps, directories, logical progression of spaces, colour coding.

The US Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR) (2001) advises:

> Wayfinding refers to techniques used by people who are blind or visually impaired as they move from place to place independently and safely. Wayfinding is typically divided into two categories: orientation and mobility. Orientation concerns the ability for one to monitor his or her position in relationship to the environment; and mobility refers to one's ability to travel safely, detecting and avoiding obstacles and other potential hazards. In general terms, wayfinding is the ability to: know where you are, where you are headed, and how best to get there; recognize when you have reached your destination; and find your way out — all accomplished in a safe and independent manner.

Any visual wayfinding system is more than just signs — it encompasses architecture, landscape architecture, lighting, and landmarks and orientation points. The design of spaces should assist users with spatial problem-solving by providing consistent clues.

Wayfinding systems are measured by how users experience an environment and how the communicative elements facilitate getting from point A to point B. Wayfinding systems should reassure users, create a welcoming and enjoyable environment and, ideally, provide answers to potential queries before users have to ask for assistance. Wayfinding systems can also indicate where users should not go.

A successful wayfinding system should provide information for users to:

- confirm they are at the correct start or finish point of an individual journey
- identify their location within a building or an external space
- reinforce they are travelling in the right direction
- orient themselves within a building or an external space
- understand the location and any potential hazards
- identify their destination on arrival
- escape safely in an emergency.

The four main categories of graphic wayfinding elements are:

- identification
- reinforcement
- orientation
- destination.

The four main criteria in wayfinding design are:

- architectural clues
- graphic communication
- audible communication
- tactile communication (Muhlhausen, 2000).

Wayfinding elements, combined with wayfinding design provide a successful wayfinding system that caters for all users (CIDEA, 2001).

Inclusive design and environmental access

The Center for Inclusive Design and Environmental Access (CIDEA, 2001), New York, states:

- Wayfinding is the organization and communication of our dynamic relationship to space and the environment.

CIDEA (2001) discusses the importance of structuring a wayfinding system around the design of spaces. Wayfinding requires designers to organise and communicate the dynamic relationships of space and the environment to allow people to:

- determine their location within a setting by identifying and marking these spaces
- identify their specific destination by grouping and linking similar spaces
- develop a plan that will take them from their location to their destination by linking and organising spaces through both architectural and graphic means in a safe barrier-free direction of travel.

Applying design principles that are largely inherent to the way people visualise the physical world helps identify cues within the built and natural environments. The language used to describe environmental cues for wayfinding is derived from many design disciplines such as architecture, landscape architecture, town planning, surveying, geography and the now recognised profession of 'access consulting'.

Lynch (1960) is credited with coining the term 'wayfinding' in *The Image of the City*, where he referred to maps, street numbers, directional signs and other elements as 'wayfinding devices'. The terminology has developed into five main architectural wayfinding elements:

- paths and circulation
- landmarks or markers
- nodes
- edges
- zones or districts (Lynch, 1960).

These architectural wayfinding elements and the graphic wayfinding elements, together with the criteria for design and organisation of landscape, urban amenities and buildings are largely responsible for a highly legible and comprehensible urban environment.

Wayfinding systems need to take account of the way people with varying abilities negotiate the built environment. An understanding of the 'Principles of Universal Design' is necessary so that built spaces are accommodating for everyone.

Principles of Universal Design

The Principles of Universal Design were developed by The Center for Universal Design (1997) in collaboration with a consortium of universal design researchers and practitioners from across the United States. The US Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR) funded the project. Appendix A contains the Principles of Universal Design and guidelines of key elements that should be present in a design that adheres to the principles, as shown on The Center for Universal Design's website.

The Principles of Universal Design show that inclusive design can accommodate people with varying abilities.

> The seven principles may be applied to evaluate existing designs, guide the design process and educate designers and consumers about the characteristics of more usable products and environments[1]

Following these principles leads to a non-discriminatory design approach and provides increased usability for everyone without the need for adaptation or specialised design.

[1] Center for Universal Design. (1997). Compiled by Connell, B.R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., Sanford, J., Steinfeld, E., Story, M., Vanderheiden, G. The Principles of Universal Design. Version 2.0. Raleigh, NC: North Carolina State University. Retrieved 20 March 2007 from: www.design.ncsu.edu/cud/about_ud/udprinciplestext.htm www.design.ncsu.edu/cud/about_ud/docs/use_guidelines.pdf

Principles of Universal Design
Principle 1: Equitable use The design is useful and marketable to people with diverse abilities.
Principle 2: Flexibility in use The design accommodates a wide range of individual preferences and abilities.
Principle 3: Simple and intuitive use Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills or current concentration level.
Principle 4: Perceptible information The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
Principle 5: Tolerance for error The design minimises hazards and the adverse consequences of accidental or unintended actions.
Principle 6: Low physical effort The design can be used efficiently and comfortably and with a minimum of fatigue.
Principle 7: Size and space for approach and use Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility.

2 Wayfinding design principles

Wayfinding design principles provide a structure to organise the environment into a spatial hierarchy capable of supporting wayfinding tasks.

The basic wayfinding design principles are as follows.

- Analyse the building or site for access points, taking into account the physical and aesthetic characteristics of the building or site. How will the site be accessed?
- Divide the large-scale site into distinctive smaller parts, or zones of functional use, while preserving a 'sense of place' and connectivity between spaces.
- Organise the smaller parts under a simple organisational principle, such as 'use'. Devise a zonation plan with a logical and rational structure.
- Provide frequent directional cues throughout the space, particularly at decision points along journeys in both directions.
- The design of decision points must be logical, rational and obvious to a sighted user, ensuring the directional cues relate directly to a building or landscape space. Ensure sequencing and that the priority and grouping of message signs is unambiguous.
- Design and implement a 'naming protocol' by choosing a theme for segregating places and spaces. Use names and symbols that can be easily remembered by users from diverse cultural backgrounds. Any naming protocol must be flexible enough to be adapted to changing functions in a building or throughout a landscape or public space.
- Use a sequential, logical, rational and consistent naming protocol for places such as hospitals or educational institutions where buildings have been master planned and organised into a logical arrangement.
- When considering a naming protocol of an alpha-numeric coding system such as 'Room B3.7', provide consistency within the coding system. For example:
  - Room B3.7 reads Building 'B', Level 3 Room 7
  - Room C4.6 reads Building 'C', Level 4 Room 6
  - Block BS1 reads Building 'B' South, Entry 1
  - Block MN2 reads Building 'M' North, Entry 2.
- Consider incorporating information in multiple languages or incorporating pictograms when devising a naming protocol.
- Ensure the physical placement, installation and illumination of signs is suitable for all users.

Wayfinding maps

Although maps are not appropriate for every situation, being able to quickly extract spatial information makes them a powerful navigation aid.

Ideally, this information should be flexible, as if the user has obtained it from direct experience. Therefore, map design principles should present spatial information and represent the environment in a flexible and orientation-independent way.

Map design principles

1. Organise the environment into clear spaces either by abstraction or inclusion.
2. Show all organisational elements (paths, landmarks, districts) and use the organisational principle of only including important and memorable connections.
3. Show the user's position.
4. Orient the map to the user, applying the 'forward-up equivalence principle[2]'.

[2] Forward-up equivalence principle': The upward direction on a map that must always show what is in front of the viewer. Levine (2003)

5. Ensure graphic communication is unambiguous and lettering is proportional to the layout so the map remains uncluttered.
6. Use a consistent form of communication e.g. colour coding or place names. Avoid alphanumeric coding because it is less memorable than place names.
7. Limit the information and ensure it is readable.
8. Provide sufficient information to lead the user to the next wayfinding map or directional sign.
9. Incorporating electronic touch-screen directories can be very useful, particularly if a map can be printed. This type of directory can be easily updated. However, interactive touch-screen directories are mostly designed for sighted users, unless purpose-designed software is available (Disability Rights Commission, UK, 2006 [3]).
10. Ensure that the map design and signage in general provides three major functions:
    - orientation and direction (connectivity between present location and desired location)
    - identification of locations
    - relevant information for further decision making.

[3] This document provides information about touch-screen directories that are able to change text size, have colour contrast, text-to-speech systems and navigational access keys. Retrieved 20 March 2007 from www.equalityhumanrights.com/pages/eocdrccre.aspx

3 Wayfinding devices, systems and technologies

Wayfinding is the *'…ease with which one proceeds and is facilitated through an environment from one point of interest to another…'* and the *'…techniques used by people who are blind or visually impaired as they move from place to place independently and safely'* (Queensland Health, 1996).

The aim of these design guidelines is to help developers, designers, property owners and managers identify viable, practical and cost-effective solutions to assist people who are blind or vision impaired and other people who require mobility assistance. This can be achieved by understanding the barriers that restrict safe travel paths and the techniques employed by users to find their destinations.

These guidelines are based on current understanding in cognitive psychology, linguistics and best practice in orientation and access as identified in the literature and in practice throughout the world (Jacobson, 1998).

Appendix C contains a matrix of devices, systems and technologies that provide useful, on-demand navigation information and aids for people who are blind or vision impaired, describing the environment and assisting them plan to reach their destinations.

Many assistive devices are discussed in the Cooperative Research Centre for *Construction Innovation* project *Wayfinding in the built environment (Stage 1, Stages 2 and 3* — Final reports, 2004–06*)*. Where possible, these reports should be consulted. It is generally agreed that when Tactile Ground Surface Indicators (TGSIs), raised tactile signage and braille signage are appropriately placed and designed, they are reliable, cost-effective assistive devices for people who are blind or vision impaired. They are also recognisable to sighted people.

The assistive devices in Table 1 are currently available for people who are blind or vision impaired. However, sophisticated electronic devices have advanced rapidly, leading to smaller, wearable devices, which are less obtrusive but, in some cases, expensive.

Equally, the degree of sophistication of innovative devices maybe a psychological barrier, as well as an economic barrier, for many people. This issue means greater emphasis should be placed on the design of the built environment.

Table 1 Assistive devices for people who are blind or vision impaired
Long cane
Hoople
Guide dog
Human assistant
Laser cane
Mowat sensor
Sonic guide
Nottingham obstacle detector
NOMAD
Tactile displays, maps, arrays
Personal guidance system
MoBIC
Atlas Strider
Talking signs
Auditory beacons
Electronic strips
Motion detectors
Pressure detectors
Barcode readers
Beacons
Braille or auditory compass
Vision enhancing devices (monocular)
Infrared detectors
(adapted from Golledge and Stimpson, 1997, p. 499).

Table 2 identifies physical and psychological barriers that can occur in the design of the built environment. These barriers should be removed to provide a safe passage of travel.

Table 2 Physical and psychological barriers to navigating through the built environment for people who are blind or vision impaired
Pavement furniture
Cars parked on pavement (sidewalk)
Inability to read visual cues (e.g. street signs)
Construction and repair
Irregular, uneven or broken surface
Crowds of people
Steps
Traffic lights without audible or pedestrian sequence
Weather
Lack of railings
Imperceptible kerb cuts (dropped kerbs)
Elevators
Distance
Door location
Door handles
Nonstandard fixtures (shop front rails, baskets and stalls)
Traffic hazards
Surface textures (lack of)
Overhead obstructions (overhanging signs, cables, vegetation)
Lack of cues (e.g. uniform open space)
Gradient
(adapted from Golledge and Stimpson, 1997, p. 493).

These guidelines do not recommend prescriptive design standards; instead they provide universal design solutions and strategies that broaden and enhance the usability of buildings and sites for everyone, including people who are blind or vision impaired or people who are mobility impaired.

Wayfinding requires designers to organise and communicate the dynamic relationships of space and the environment to allow people to:

- determine their location within a setting by identifying and marking these spaces
- identify their specific destination by grouping and linking similar spaces
- develop a plan that will take them from their location to their destination by linking and organising spaces through both architectural and graphic means in a safe barrier-free direction of travel.

4 Design solutions and strategies

These suggested design solutions and strategies include wayfinding design criteria and design principles for critical decision-making points within the built environment. The suggested design solutions and strategies are additional to any requirements of the *Building Code of Australia* for wayfinding.

Communicating spatial information

At a perceptual level, the sensory impairment of people who are blind or vision impaired limits information gathering from both primary and secondary sources. Although there are sophisticated sight-compensating technologies, most technical aids only add environmental cues to the information already gathered through auditory, tactile, olfactory and kinaesthetic means. The extent to which a person who is blind or vision impaired has an understanding of place with spatial reference is unclear. The environment they are able to perceive in their mind has relatively few unique locational cues — tactile cues like kerb and building lines are often repeated and auditory or olfactory cues may be temporal and ephemeral. There is a need to develop effective methods of communicating spatial information by non-visual means to improve quality of life through increased mobility and independence (Jacobson and Kitchin, 1997).

The literature reveals a number of issues for people who are blind or vision impaired that can be easily addressed through wayfinding systems.

Issue: informative material

Consider producing information such as locational maps, bus and train timetables and schedules in braille or large print.

Ensure signs on entries to buildings, complexes and public transport vehicles are large.

Where possible, provide an information desk with informed staff to assist people locate a destination. The literature reveals that touch-tone access to pre-recorded messages, voice-mail or computerised query systems are universally disliked (Jacobson and Kitchin, 1997).

Issue: arrival point or address of the facility or building

All buildings and facilities have a number of entries or arrival points. However, the address of a building or facility provides its identity or arrival point for occupants and visitors.

Clearly identify the address of the building or facility with its name, street address and an appropriate marker or landmark.

Design the arrival point as the main entry, not as a secondary entry.

Issue: unidentified main entry or arrival point

For many buildings and facilities, the arrival point is not easily distinguishable because of competing infrastructure such as bus stops, taxi ranks, adjacent businesses or 'A' frame signage; however, what may be seen as clutter is also business infrastructure.

Ensure that entry points to all buildings and facilities have direct access with clearly marked boundaries for pedestrians, are free of clutter and are separated and protected from roads and bicycle or skating paths.

Directory systems should provide visitors and occupants with sufficient information to ensure a successful arrival point and ease of access to further destination points.

Provide a directory system using the 'forward-up equivalence principle[4]' that incorporates sensory elements for people of all abilities. A directory system should include tactile elements such as braille, surface finishes and raised character signage; graphic elements such as pictograms; and audible elements, which may include integrating both audio-tactile maps, visual and other forms of communication triggered by infrared light or movement sensors.

Where suitable, an audible directory system should consist of short, simple and straight-forward messages, unique to the building or site. Repeated messages should only provide key reference points such as 'You are entering the

[4] 'Forward-up equivalence principle': The upward direction on a map that must always show what is in front of the viewer. Levine (2003).

foyer of the building'; 'Information desk forward three metres'; or 'Lifts three metres forward, then turn right'.

Ensure that all access points to all buildings and facilities entrances have direct access with clearly marked boundaries for pedestrians, free of clutter and are separated and protected from vehicular roadways and bicycle/skating pathways.

A route within the public domain should be declared and referred to as a 'universal accessway' (PROWAAC, 2001) to distinguish its importance as a public right of way.

The universal accessway should be clearly marked using surface-level markers at a nominal distance determined by site context and design, with at least two surface-level markers at either end of the accessway labeling it as a 'universal accessway' with directional arrows indicating the direction of the 'universal accessway' from the marker.

Surface-level markers are not tactile ground surface indicators (TGSI). Discreet surface-level markers include, for example, 75 mm diameter brass inscribed plates or ceramic plates laid on the pavement surface. The universal accessway should also be labelled with directional arrows.

As a guide, an external universal accessway should have an optimum minimum vertical and horizontal clearance of 2000 mm. Wherever possible, an all-weather cover is recommended to and from a building. It is essential that an all-weather cover is placed at the building entrance.

The width of pedestrian pathways, roads and bicycle or skating paths is governed by the expected volume and direction of traffic flows and codified building standards. Wherever possible, provide separate pedestrian access paths to ensure safety from all other path users.

All paths should be accessible unless users can be directed to alternative paths. Clearly indicate any potential hazards and the destination point with TGSIs or audible warning or directory systems with details about distance to travel for example, 'Building entry 40 metres in direction of travel'.

Clearly marked boundaries can be defined by unobstructed edges of pathways with continuous upright kerbs, low walls, building faces, continuous handrails, raised planters, hedges, a continuous planting strip, luminance contrasting colours or textures and materials.

Wherever possible, maintain an uninterrupted shoreline[5] to at least one boundary edge, for example a building face, raised planters or a glass barrier.

These measures assist people who are blind or vision impaired and can be detected by a person using a long cane.

Consider incorporating sensory design elements such as perfumed plants, moving water or electronically triggered audible locational messages.

Obstructions and hazards that may intrude into the path of travel include drainage grates, signs, overhanging trees, access holes, light fixtures, smokers' wall ashtrays and benches. These obstructions should not be within the universal accessway.

Ensure that all potentially hazardous obstacles are marked. Hazardous obstacles include grade changes at stairs, escalators, travelators, ramps and transition areas. Mark these areas with luminance contrasting colours, textures, tactile devices or other materials to alert users to the potential hazards.

Internally, the use of contrasting skirting boards, border edging to carpet, and contrasting wall–floor interfaces are examples of defining marked boundaries (edges) for the path of travel.

Using contrasting edges (luminance and texture) of pathways, corridors and rooms will assist people who are blind or vision impaired maintain a straight direction of travel. Handrails along pathways act as a physical guide for people to travel confidently to their destination.

People who are blind or vision impaired use multiple senses to navigate spaces. Therefore, reducing excessive noise by locating service and maintenance functions away from public areas can assist navigation.

Public safety and emergency assistance is also important. Ensure emergency communications equipment is positioned at strategic locations. These devices can act as significant landmarks and enable emergency staff to quickly locate people. Use video camera surveillance as a deterrent in high-risk areas.

[5] Shoreline and trails: A shoreline is a detectable outline along, or around, part or all of a building. A trail is a linear path of travel, or designated corridor, such as building frontages and pathways.

Ensure accessible parking spaces are provided close to the main entry of buildings and are located adjacent to a universal accessway.

Issue: internal arrival point

The entry to any building should provide a safe, equitable and dignified access for all users. Automatic opening doors at a building entry are welcoming and directional elements, especially for people who are blind or vision impaired.

Buildings should be welcoming to all visitors. The layout of foyers and reception and information desks plays an essential part in informing and directing enquiries. Reception and information desks should be oriented so that arriving visitors can be seen and are within close proximity to 'You are here' building maps and internal directories so attendants can assist visitors with directions.

Information desks should be attended by people with knowledge of the building's occupants and facilities. Regardless of whether there is an attendant at the information desk, a self-help telephone should be available for periods when the desk is unattended.

Interior colour schemes, consistent lighting, contrasting wall–floor covering and architectural finishes are important design elements that can define a space and offer directional guidance for people who are blind or vision impaired to find their way around the building.

Issue: graphic communication

Signs, maps, colour coding, banners, websites, directional information, identification and regulatory information are all examples of graphic communication.

Signs that assist wayfinding include directory boards and reference maps, identification, directional, information, safety and regulatory signs.

The consistent physical placement, installation and illumination of signs must be suitable for people who are blind or vision impaired.

Many signs are not legible when viewed from a distance. The following recommendations can assist in the optimal readability of signs.

- Colour contrast on the sign.
- Luminance contrast between the background and the letters and graphics.
- Clear definition of buildings, roads, pathways, bridges and other built elements such as landmarks or prominent site features.
- Sufficient detail of the building form or layout, maintaining the hierarchy of form and layout.
- Informative content providing unambiguous directions.
- Combination of pictograms, raised tactile signage letters and numbers, and braille signage. Raised tactile signage and braille signage should be positioned between 1200 mm and 1600 mm above ground or floor level, outside the swing of doorways or other fixtures, so it can be read without physical discomfort to the reader.
- Suitable font style and spacing between letters and words. For example, a combination of uppercase and lowercase letters is easier to read than all uppercase. The size, type and layout of lettering on signs should be clearly legible and easily understood. Typeface should be Sans Serif — Arial, MS Sans Serif, Tahoma, Futura, Geneva and Helvetica Medium are preferred. The size and spacing between letters and words should be in proportion to the size of the sign and amount of information provided.
- Avoid reflective surfaces which will hinder visibility and comprehension.
- Position lighting to reduce glare on signage with reflective surfaces.

Issue: restrooms and toilet facilities

Wherever possible, maintain an unobstructed path of travel to restrooms and toilet facilities. Clearly identify public facilities by using accessible signage including pictograms, raised tactile signage and braille signage on the wall adjacent to doorway.

Locate directional signage and pictograms for restrooms and toilet facilities at all key travel decision points, in the most visible location and perpendicular to the path of travel.

Issue: lifts

Locate reception and information desks near lifts so that attendants can assist visitors with directions.

Fit lifts with backlit, large tactile buttons with raised tactile signage letters and numbers and braille signage. Audible outputs should indicate floor levels.

Issue: signage

Place signs in transitional areas to reassure people they are on the correct route. The maximum distance between information or directional signs in long corridors should be no greater than 30 metres.

Maps can be used to supplement directional information at key decision points to reduce the amount of directional signage needed.

Issue: viewing distance to signage

Viewing distance is a concept printing and signage industries use to capture attention for an image on display. Viewing distance is also closely related with the resolution and size of an image.

The concept of viewing distance requires an understanding of perspective theory as the resolution of the image, and its detail, is always taken from where the viewer is positioned and whether the viewer is standing, walking, sitting or viewing from a moving vehicle. The clarity of atmospherics such as light and shade and weather conditions also plays a part in viewing distance. Construction materials and the position of signs are also important.

The simple rule of viewing distance is that the closer a person is to an object, the higher the resolution of the image needs to be. The perception of the human eye varies from person to person, and some people are vision impaired, so the only true viewing distance comparison is the distance at which most people can see the image or sign.

Lettering height depends on the importance of the sign, the architectural detail at the building entrance, the size of sign for its location and placement, as well as the distance from which it should be read.

The literature varies on recommended minimum letter heights and viewing distances. However, it is suggested that for sighted people, 50 mm minimum height is an acceptable standard for visual legibility at a maximum of 15 metres.

Other suggested minimum letter heights for various sign types include:

- vehicular direction signs, internal roads, carparks and service areas: 60 mm
- external pedestrian direction signs: 60 mm
- internal direction signs: 30 mm
- building directory listings: 20 mm
- door signs: 17 mm
- tactile lettering: 15 mm (55 mm maximum)[6].

For road signs, the speed of travel and the number of letters in the message bring in other factors; however, for lower road speed environments such as university campuses and hospitals, the letter height used for public roads is acceptable. Direction signs require a greater letter height than information signs (Greg and Signcorp, 2003). Refer to Appendix B for more details on suggested letter heights.

[6] For tactile lettering, the width of the character should allow for both sides of the embossed shape to be felt.

5 Signage hierarchical structure

Each sign has a hierarchal structure that communicates meaningful content for individual readers. The hierarchical structure is:

- the colour scheme and general layout as the base, or background, layer
- specific logos, maps, pictograms and other symbols or artwork layered on top of the base
- textual information and directional arrows providing specific details.

The signage hierarchy is depicted in Table 3.

Table 3 Signage hierarchy

Design elements	Meaning and content
Background colour Marketing image or overall presentation Text colours Luminance contrast Colour contrast	Corporate or organisation's image Corporate colour scheme and style Sign system hierarchy Colour consistency as established by design protocol
Maps, logos, pictograms, symbols and artwork	Corporate or organisation's image International symbols or pictograms Facility or building layout
Text and directional arrows Tactile information Braille Signage information in multiple languages	Tactile signage incorporates raised text and symbols to enable touch-reading by people who are blind and allow touch enhancement of visual perception for people who are vision impaired. Braille signage is a specialist wayfinding device that incorporates Unified English Braille Code (UEBC) Grade 1 braille as a primary source of information for people who are blind or vision impaired and may be supplemented by raised tactile lettering, maps or pictorial images.

◀ **Figure 1** Signage hierarchy example

This Metlink sign incorporates a number of design elements that provide meaning and content when read together. The signage hierarchical structure provides a layering of information that is easily understood and provides simple directions and messages for individual readers.

Sign legibility

Effective signs should communicate a clear message. While words and phrasing are important elements of effective signs the most significant influence on legibility is typeface. Arial, MS Sans Serif, Tahoma, Futura, Geneva and Helvetica Medium typefaces are some examples that people who are vision impaired find easier to read. Title case (lower case with an initial capital) or lower case are also easier to read.

System design criteria

Interior signage systems should be designed to meet the following criteria:

- uniformity throughout all buildings and external spaces
- consistency in sign types to identify and recognise signage, for example, consistent materials and construction; consistent typeface, colours and logos; consistent graphic layouts and consistent overall appearance
- standardised message design, nomenclature and application protocols for each sign type
- standardised graphic protocols applied to typeface (font), colours, logos, arrows and pictograms[7]
- standardised room numbering and naming system protocol
- message legibility, considering the information from the perspective of a variety of users: occupants, visitors, service people and people who are vision impaired or mobility impaired
- standardised signage placement protocol for each sign type considering the placement of signs for people with disabilities.

Types of signs

There are four types of signs:

- identification
- information
- directional
- safety or regulatory, prohibition and advisory (ADAS, 1999).

Identification signs

Identification signs, also referred to as 'destination signs', typically identify entrances, street addresses, buildings, rooms, facilities, places and spaces.

Information signs

Information signs inform users about the features and facilities of a place or space. Information signs include directories, maps, building identification signs, notices and interpretative signs. Orientation maps provide a graphic layout of a building or space with text indicating current location, landmarks, features, routes and other amenities. Directory boards guide visitors to specific destinations, facilities and amenities. Interpretative signs provide users with more detailed information about the their surroundings by explaining the significance of what they may be feeling, touching, seeing and hearing.

Directional signs

Directional signs are typically wall-mounted or overhead signs and include directional arrows.

Safety, regulatory, prohibition and advisory signs

Safety, regulatory, prohibition and advisory signs are used to help control movement and activity for user safety, comfort and site management by providing information about known dangers and warning against unsafe behaviours. Examples include fire exits, disability car parks and clearway areas.

[7] For guidance refer to BS8501:2002, the withdrawn AS2899.1:1986 and ISO 7001:2007.

Figure 2 Map design and signage

Location: State Library of Queensland and Gallery of Modern Art (GoMA) at Stanley Place, South Brisbane

This map design and signage provides the three major functions of basic map design principles: orientation or direction (connectivity between present location and desired location); identification of locations; and relevant information for further decision making. Note the use of raised tactile lettering and braille, the 'You are here' graphics and the identification of major attractions and public facilities. The physical placement, installation and illumination of signage must be suitable for everyone.

This sign was developed in 2006 as part of the Millennium Arts Project at the Cultural Centre, an initiative of the Queensland Government through Arts Queensland. The Millennium Arts Project at the Cultural Centre included the construction of the new GoMA, redevelopment of the State Library of Queensland and construction of associated infrastructure. Project Manager: Department of Public Works

State Library of Queensland
Architects: Designed in association with Brisbane-based architectural firms Donovan Hill Peddle Thorp architects. The design was selected from the Millennium Library Project Architects Selection Competition (2001).

Gallery of Modern Art (GoMA)
Architects: Architectus Sydney (Kerry and Lindsay Clare, 2002) were the Design Directors for the winning entry of the Queensland Gallery of Modern Art International Design Competition.

Access Consultant: Disability Access Consultants Pty Ltd (Trevor Beardsmore)
Environmental Graphic Designer: Dot Dash, Brisbane
Sign Contractor: Albert Smith Group, Brisbane
Managing Contractor: Bovis Lend Lease
Photography by: Amanda McLucas 30 March 2007

▲ **Figure 3** The Arbour — universal accessway

Location: Southbank Parklands, South Brisbane

The Arbour, covered in vibrant magenta bougainvillea plants, acts as a spine through the centre of the parklands for one kilometre, leading the way to the parklands' many attractions. This environmental design guidance feature (horticultural and landscape architectural design feature) enables visitors to orientate themselves from many locations within the parklands. Although not marked as a universal accessway, it is a clearly dedicated and marked route within the public domain that distinguishes its importance as a public right of way.

Master Planner: Denton Corker Marshall, Architecture and Urban Design, Melbourne
Photography by: Amanda McLucas 30 March 2007

▼ **Figure 4** Arbour and canopy — universal accessway

Location: Southbank Parklands, South Brisbane

Along the Arbour, amid the canopy of the bougainvillea, is a ribbon of yellow steel that provides shade and weather protection, but also acts as a recognised landmark (marker), identifying the adjacent places of the riverside restaurants, cafes and Suncorp Piazza. Shade and shelter are important environmental design guidance features.

Master Planner: Denton Corker Marshall, Architecture and Urban Design, Melbourne
Photography by: Amanda McLucas 30 March 2007

Figure 5 Landmark (marker) and tactile wayfinding trail

Location: Brisbane Square, George and Adelaide Streets, North Quay

This sign acts as a recognised landmark (marker) within the streetscape, identifying one of the entries to Brisbane Square and the community assets of the Brisbane City Council Library and Brisbane City Council Customer Service Centre. The marker provides important information for visitors to the square. The map design uses raised tactile lettering and braille, 'You are here' graphics and shows the direction of the major building attractions. Note the use of TGSIs at the base on the sign. The TGSIs form part of a designed tactile wayfinding trail, also referred to as a 'tactile guide pathway'.

TGSIs are important to assist in safe wayfinding; however, they should not be over-used or over-prescribed. Designers should make full use of the range of environmental guidance features available to minimise inconvenience to other members of the community.

Brisbane Square Architect: Denton Corker Marshall Architecture and Urban Design, Melbourne
Access Consultants (External): Andrew Sanderson of Blythe-Sanderson Group, Melbourne
Access Consultants (Internal and Brisbane City Council External Adviser): John Deshon of John Deshon Pty Ltd
Environmental Graphic Designer: Dot Dash, Brisbane
Signage Contractor: K-Vee Signs, Brisbane
Design and Construct Contractor: Baulderstone Hornibrook
Photography by: Amanda McLucas 30 March 2007

Figure 6 Tactile wayfinding trail and shoreline

Location: Brisbane Square, North Quay

This arrangement of tactile ground surface indicators (TGSI), directional and warning (decision-making) tactile tiles, provides a direction of travel to what is commonly referred to as a 'shoreline', the building's edge or a physical property edge. Note the unobstructed space along the length of the wall. Where the TGSI is an integrated unit, it should have a minimum luminance contrast of 30% compared to the amount of light reflected from the surface of the adjacent path of travel. A shoreline must be free of obstacles that could interrupt the continuous path of travel. A minimum obstacle-free space should be 2000 mm x 1500 mm (height x width) adjacent to the shoreline.

Brisbane Square Architect: Denton Corker Marshall Architecture and Urban Design, Melbourne
Access Consultants (External): Andrew Sanderson of Blythe-Sanderson Group, Melbourne
Access Consultants (Internal and Brisbane City Council External Adviser): John Deshon of John Deshon Pty Ltd
Environmental Graphic Designer: Dot Dash, Brisbane
Signage Contractor: K-Vee Signs, Brisbane
Design and Construct Contractor: Baulderstone Hornibrook
Photography by: Amanda McLucas 30 March 2007

Figure 7 Tactile wayfinding trail and shoreline

Location: Brisbane Square, North Quay

A shoreline is a very effective device that can be easily accommodated by not placing street furniture such as seats, rubbish bins, and signage or drink fountains within the dedicated accessway. This zone can easily be marked as a universal accessway, reminding users of the importance of an unobstructed space along the length of the path of travel.

Brisbane Square Architect: Denton Corker Marshall Architecture and Urban Design, Melbourne
Access Consultants (External): Andrew Sanderson of Blythe-Sanderson Group, Melbourne
Access Consultants (Internal and Brisbane City Council External Adviser): John Deshon of John Deshon Pty Ltd
Environmental Graphic Designer: Dot Dash, Brisbane
Signage Contractor: K-Vee Signs, Brisbane.
Design and Construct Contractor: Baulderstone Hornibrook
Photography by: Amanda McLucas 30 March 2007

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Appendix A

Principles of Universal Design

Following are the Principles of Universal Design and guidelines (1997) as displayed on The Center for Universal Design website, Raleigh, NC: North Carolina State University.

Version 2.0 – 4 January 1997.

Compiled by advocates of universal design, listed in alphabetical order:

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Universal Design: The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

The authors, a working group of architects, product designers, engineers and environmental design researchers, collaborated to establish the following Principles of Universal Design to guide a wide range of design disciplines including environments, products, and communications. These seven principles may be applied to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments.

The Principles of Universal Design are presented here, in the following format: name of the principle, intended to be a concise and easily remembered statement of the key concept embodied in the principle; definition of the principle, a brief description of the principle's primary directive for design; and guidelines, a list of the key elements that should be present in a design which adheres to the principle. (Note: all guidelines may not be relevant to all designs).

PRINCIPLE ONE: Equitable Use

The design is useful and marketable to people with diverse abilities.

Guidelines:

1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.

1b. Avoid segregating or stigmatizing any users.

1c. Provisions for privacy, security, and safety should be equally available to all users.

1d. Make the design appealing to all users.

PRINCIPLE TWO: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines:

2a. Provide choice in methods of use.

2b. Accommodate right- or left-handed access and use.

2c. Facilitate the user's accuracy and precision.

2d. Provide adaptability to the user's pace.

PRINCIPLE THREE: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Guidelines:

3a. Eliminate unnecessary complexity.

3b. Be consistent with user expectations and intuition.

3c. Accommodate a wide range of literacy and language skills.

3d. Arrange information consistent with its importance.

3e. Provide effective prompting and feedback during and after task completion.

PRINCIPLE FOUR: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:

4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.

4b. Provide adequate contrast between essential information and its surroundings.

4c. Maximize "legibility" of essential information.

4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).

4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

PRINCIPLE FIVE: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:

5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.

5b. Provide warnings of hazards and errors.

5c. Provide fail safe features.

5d. Discourage unconscious action in tasks that require vigilance.

PRINCIPLE SIX: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:

6a. Allow user to maintain a neutral body position.

6b. Use reasonable operating forces.

6c. Minimize repetitive actions.

6d. Minimize sustained physical effort.

PRINCIPLE SEVEN: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Guidelines:

7a. Provide a clear line of sight to important elements for any seated or standing user.

7b. Make reach to all components comfortable for any seated or standing user.

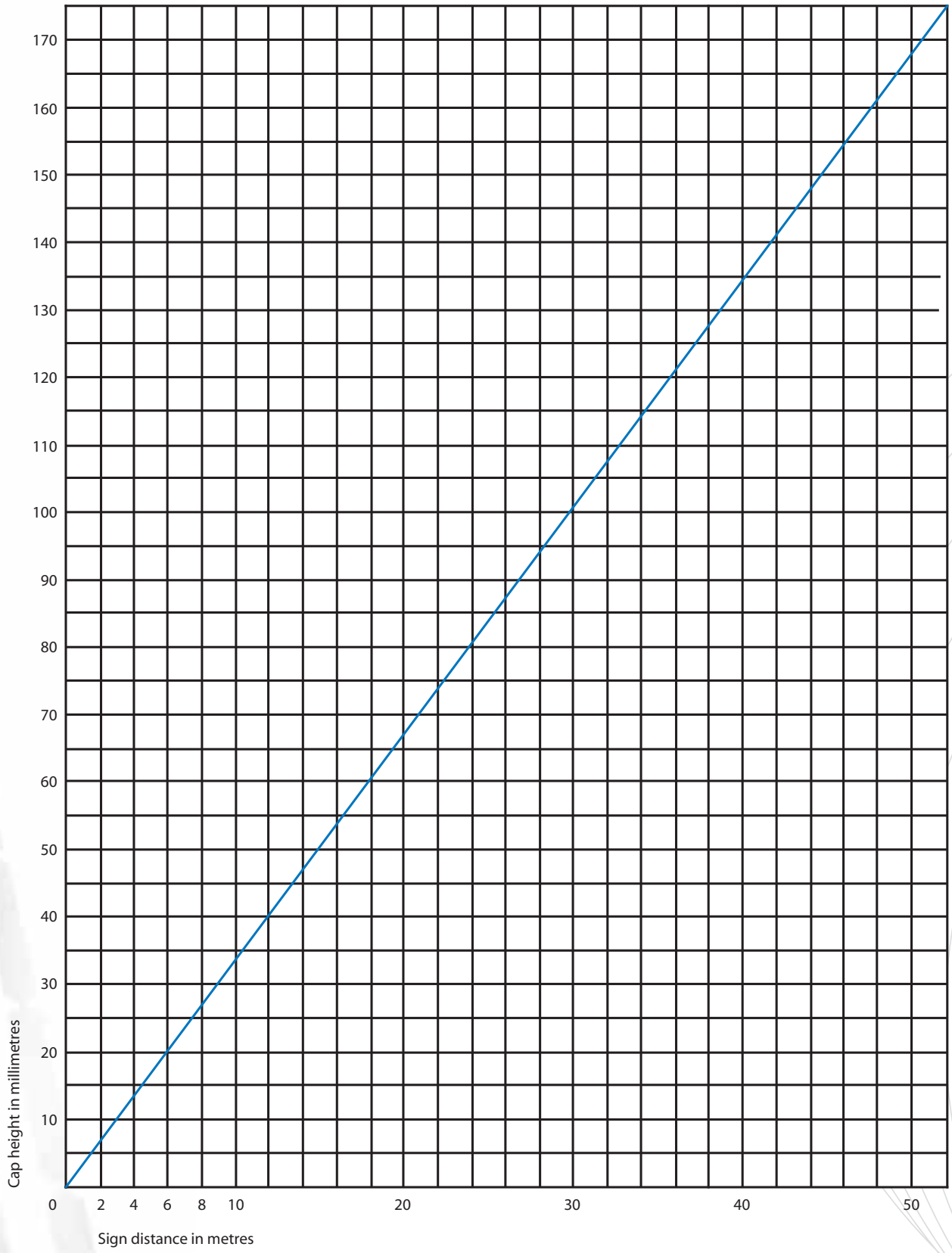
7c. Accommodate variations in hand and grip size.

7d. Provide adequate space for the use of assistive devices or personal assistance.

Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.

Appendix B

Suggested letter height



Suggested letter height as per viewing distance.

Extracted with permission from University of New South Wales (n.d.)

Appendix C

Wayfinding systems matrix

The following matrix provides a succinct summary of wayfinding options for people who are blind or vision impaired in and around a building complex, typically a commercial building or institution such as a university. The matrix details scales, spaces, paths and options. 'Scale' or 'range' refers to part of a journey within the overall wayfinding journey, rather than the usual definition of the distance between sequential wayfinding cues. The costs of wayfinding systems are not detailed in the matrix as they vary enormously depending on the type of system used and the physical aspects of the built environment. Planning scales also vary depending on location. The choice of wayfinding options can also be influenced by factors such as weatherproofing equipment, power availability and the system's ability to withstand malicious damage. Inside buildings, factors such as the availablility of power or computers, or perceived disruption to other building users may also affect the choice of wayfinding options.

The terms 'pedestrians' or 'travellers' used in the matrix refers to passing foot traffic, building occupants, visitors, staff or anyone accessing the building on foot or with limited mobility. The matrix consists of a description of the wayfinding system, how and where it may be applied and other comments for each 'scale' of the built environment. The matrix refers to a number of different 'scales' — neighbourhood, building precinct, building entrance, inside building and floor level.

Note: Cross-references to reports in the matrix refer to outcomes from the Cooperative Research Centre for *Construction Innovation* project *Wayfinding in the built environment (Stage 1, Stages 2 and 3* — Final reports, 2004–06). These are available for download at http://www.construction-innovation.info/index.php?id=59 (Stage 1) and http://www.construction-innovation.info/index.php?id=956 (Stages 2 and 3).

1.0 Neighbourhood scale	Journeys of, say, 30–200 m for example, malls, arcades, 'pocket' parks and urban open space
2.0 Building precinct scale	Journeys of, say, 30 m for example, forecourts, podiums, plazas and piazzas
3.0 Building entrance scale	Journeys of, say, 5 m for example, immediate vicinity journeys or entering a building entrance
4.0 Inside building scale	Journeys of, say, 1–20 m for example, across lobbies, reception areas, lift lobbies, corridors and to information desks
5.0 Floor-level scale	Journeys of, say, 1–20 m for example, corridors, offices, fire exits, classrooms, meeting rooms, toilets and storage rooms

1.0 Neighbourhood scale

Journeys of, say, 30–200 m, for example, malls, arcades, 'pocket' parks and urban open space

	Wayfinding system	Description	Application	Comments
1.1	**Tactile ground surface indicators (TGSIs) including directional indicators** See 3.1 of Stage 1 Report	A system of raised domes and stripes placed in patterns on the ground to provide tactile information. The colour and luminance contrast of the TGSIs provide information to people who are blind or vision impaired about direction and potential hazards.	TGSIs provide information about changes in the direction of the path of travel and indicate potential hazards such as platform edges, stairs and overhead obstacles. TGSIs assist negotiating difficult environments such as open or busy spaces and finding specific locations such as building entrances and exits.	Two types of TGSI tiles — warning and directional — are used under AS1428.4. Local governments or venue and building owners, as required by the *Building Code of Australia* provide TGSIs.
1.2	**Directional compass** See 4.1 of Stage 1 Report	Hand-held aid designed to assist orientation and navigation by people who are blind or vision impaired.	Usually used in conjunction with a traditional long cane or guide dog to navigate about the built environment at a broader scale.	Assists with navigation at a broad urban physical scale.
1.3	**Obstacle locator** See 4.2 of Stage 1 Report	Hand-held navigation aid to help vision-impaired people detect potential obstacles.	Assists navigation around the built environment by providing feedback on potential obstacles such as trees, rubbish bins, chairs, tables, pot-plants and A-frame signage.	Assists with independent wayfinding, movement and navigation.
1.4	**Enhanced or specialist cane** See 4.3 of Stage 1 Report	Relatively new navigation aid or cane to assist people who are blind or vision impaired avoid obstacles.	Used as an alternative to a traditional long cane, to navigate about the built environment, providing aural and tactile feedback about the position of nearby obstacles.	Assists with independent wayfinding, movement and navigation.
1.5	**Personal Digital Assistants (PDAs) and note takers** See 4.5 of Stage 1 Report	Generally small hand-held computers or portable electronic note takers to store and process spatial and other information that may assist in wayfinding.	Can easily capture and playback detailed audio and video information about locations or paths between facilities that a person who is blind or vision impaired may wish to record for future reference.	Assists with recall and independent wayfinding, movement and navigation.

	Wayfinding system	Description	Application	Comments
1.6	**Global Positioning System (GPS) position locator** See 4.4 and 4.6 of Stage 1 Report	Based on data from publicly available earth satellite systems, an electronic receiver that calculates positions or locations to within several metres. Most suitable in open-air locations without interference.	Wayfinding systems incorporating GPS information can provide pedestrians with audio or visual information about surrounding locations at a broad scale. Combined with other software, they can be used for locating current position and landmarks such as major buildings, concert halls, churches, stadiums, transport interchanges, parks or lakes.	Pedestrians must have a suitable GPS receiver unit used in conjunction with specialist software plus electronic data depicting local streets and landmarks provided by a commercial data supplier.
1.7	**Talking digital map systems** See 4.6 of Stage 1 Report	A blend of a PDA and GPS information to provide audible information at the broader urban scale to a person who is vision impaired.	Similar to PDAs and note takers, but can use a digital map-base of GPS coordinates to find street names, intersections, addresses and major landmarks or features and uses speech applications to relay information to the user.	Talking digital map systems require a GPS receiver unit used in conjunction with specialist software plus electronic data covering local streets and landmarks for a particular area.
1.8	**Tactile map systems** See 4.7 of Stage 1 Report	Printed maps can be produced in tactile or embossed form on specialised paper to assist with wayfinding. Tactile maps can be provided directly appropriate authorities or accessed via the internet.	Braille or tactile raised maps outlining access routes to certain facilities can assist in planning and undertaking journeys.	Any key facilities likely to be accessed by a user would need to be known in advance with maps then produced before the trip, unless they are made available at a venue.

	Wayfinding system	Description	Application	Comments
1.9	**Mobile phones and communicators** See 4.8 of Stage 1 Report	Sophisticated, yet widely available portable devices that receive and transmit signals via commercial mobile telecommunication networks.	Because SIM cards are tracked and automatically 'located' by the network, these devices are increasingly being used to provide location-specific information to users via the 3G or 'next-generation' mobile networks.	Increasingly, these devices, with long-life battery power, can provide users with a range of information about facilities in an area; however, the user must be a customer of a mobile phone network to receive general data and information.
1.10	**Accessible pedestrian signals** See 5.1 of Stage 1 Report	Infrastructure provided primarily at pedestrian crossings and street intersections to assist users determine when it is safe to cross the street.	Generally linked to traffic signals, they are designed to provide recognisable audio signals to pedestrians in guiding them across intersections.	Fixed local and state government infrastructure for pedestrian crossings and street intersections.
1.11	**Press and listen signs or press-button audible signage** See 5.2 of Stage 1 Report	Fixed infrastructure installed at selected locations to provide spoken information about that location when the button is pressed.	Able to provide specific audio information about a location (e.g. tourist site) and widely used to provide public transport departure information to travellers.	People who are blind or vision impaired may not realise the 'sign' is available unless other means are used to draw their attention to the availability and location of the 'press and listen' sign.

	Wayfinding system	Description	Application	Comments
1.12	**Printed signage (location signs) featuring words, or words and symbols** See 2.3.2 of Stage 2–3 Report	Conventional fixed signage of a concise nature featuring words, or words and symbols, to help sighted and literate pedestrians confirm their location or indicate the general direction of other destinations.	Usually constitutes a traditional printed location board accompanied by arrows indicating the general direction of specific destinations for example, toilets, lifts, taxis and bus stops, automatic teller machines, major facilities and particular shops.	Not suitable for people who are blind (see 'raised tactile and braille signage'). However, if designed correctly using suitable fonts, colours and background contrasts and well-positioned, this system may be suitable for people who are vision impaired, as well as people with other disabilities. Using symbols rather than just words can assist both illiterate and non-English-speaking pedestrians. For example, replace 'EXIT' with the running man symbol on building exit signs.
1.13	**Raised tactile and braille signage** See 3.2 of Stage 1 Report	Specialised tactile signage that incorporates raised lettering or graphics or braille beneath each line of the printed signage.	Applications for this system are the same as conventional printed signage with the added benefit of assisting people who are blind or vision impaired to identify their current location and indicate the direction of other possible destinations.	Must be used for people who are blind, but must be correctly positioned and have optimum accessibility, that is be easily approached and within comfortable reach, for people who are vision impaired or mobility impaired.

	Wayfinding system	Description	Application	Comments
1.14	**Remote (infrared) audible signage — motion-activated** See 5.5.1 of Stage 1 Report	Information about a location can be obtained at a distance rather than by touching the sign. Has some similarity to a press-button system, except the recorded information playback is triggered by any person passing the sign, rather than by a particular pedestrian finding and pressing the button.	Useful at key travel decision points or to provide additional information about the immediate surrounding area. Time-sensitive messages can also be replayed by a centralised system.	Supplement to building locational signage; however, everyone nearby may hear the (repeated) brief information as all passing pedestrians will trigger the message. Orientation issues must be considered in the design to ensure the user is located and aligned appropriately for the message being delivered.
1.15	**Remote (infrared) audible signage — speaking signs** See 5.5.2 of Stage 1 Report	Information is provided remotely rather than by pressing a sign. Single or multiple transmitters are installed as building infrastructure (usually above head-height) at key travel decision points, while individual portable receivers (purchased or on loan from the venue) must be either worn or carried about the venue by users.	Messages are triggered by the user's handheld, or worn, device and relayed to them via a receiver or speakers. Information can be provided from different directions as the trigger device is slowly moved around. Messages can be tailored to the specific location and considered as the audio equivalent of a printed directional sign.	Can indicate and confirm which direction a visitor should travel in to find various facilities. Useful in train and bus stations, airport halls, malls and similar large building complexes. This system may be used at, for example, outdoor bus terminals when transport vehicles have transmitters fitted, but it is not usually used in a completely open space where the location of key facilities are less well defined.

	Wayfinding system	Description	Application	Comments
1.16	**Remote radiofrequency audible signage** See 5.6 of Stage 1 Report	Outdoors system designed to provide varying audible information to travellers. Messages are customised to the individual location and have similar brief content to a printed directional sign.	The user's handheld, or worn, device triggers the sign and information is then wirelessly relayed via a receiver and earpiece or speakers. Information can be provided in different languages.	Useful in outdoor settings to confirm the direction of travel for various key facilities. Lack of a common trigger device with interoperability between alternative systems is likely to impede progress towards widespread adoption.
1.17	**Moving illuminated signage — single and multi-line** See 3.4.4 of Stage 2–3 Report	Moving (rolling) LED signage consisting of one or several lines of text to provide more information about the location or provide directions to a nearby building or destination.	Similar function as a printed location board, but with flexibility to provide information beyond static location signage for people who are vision impaired.	Must be well positioned for people who are vision impaired, as well as people with other disabilities, and suitable fonts, colour and background contrast must be used. Not suitable for people who are blind or who read tactually.

	Wayfinding system	Description	Application	Comments
1.18	**Enhanced location maps (raised tactile and braille)** See 2.3.2 of Stage 2–3 Report	Simplified and scaled location map incorporating raised building outlines, raised lettering or braille beneath, or within, each area to designate the name or purpose of that area on the map.	The small-scale outlines of buildings or corridors can be traced by touch by people who are blind or vision impaired to help identify their current location within the context of the surrounding area, while other travellers may also use the map in the usual way.	Must be well-positioned and accessible and within reach for people who are blind or vision impaired or people who are mobility impaired. However, some travellers can have difficulty interpreting maps and may prefer aural or printed directions. Enhanced maps, similar to signage that uses symbols, can be valuable for illiterate or non-English speaking travellers.
1.19	**Trail between one location and another** See audit checklist	Series of easily recognisable pathways characterised by directional tiles, handrails, stepping-stones or a distinctive trail for example, using particular plants or water features.	People who are blind or vision impaired often use a series of discernible vertical surfaces to 'shoreline' along by using a long cane, but clearly marked and distinctive pathways or handrails can provide other options for wayfinding across open areas.	A 'trail' should be designed to lead a traveller from one key destination to another relatively close destination.
1.20	**On-line digital information and maps** See 5.7 of Stage 1 Report	Computer-based systems designed to provide detailed spatial and location information to users.	Detailed information generated from user queries on a spatial database. This system needs to be used before the journey.	This area is changing rapidly with new advances in mobile internet technology. See 'mobiles and communicators'.

	Wayfinding system	Description	Application	Comments
1.21	**Computer directory information system** See 3.4.5 of Stage 2–3 Report	Usually located indoors, this type of infrastructure can provide visitors with simple screen-based or audio directions to assist them find key facilities nearby. In the absence of a staffed reception area or desk, it provides 'do-it-yourself' assistance to any visitors.	With large fonts or audio outputs via speakers, this system should provide both limited or detailed listings of public facilities such as meeting areas or toilets and provide instructions on how to locate them. This system is more useful within an individual building complex.	Unless networked, each workstation must be individually updated with information specific to that location, and if making use of a keyboard or mouse, the system should be robust and sturdy, but simple to use. Since tactile output is not available from these systems, aural directions would assist people who are vision impaired, but not people who are hearing impaired.
1.22	**Talking lifts** See 3.4.6 of Stage 2–3 Report	A speaker system that provides pre-recorded messages to lift occupants and is triggered automatically when the lift arrives at a floor.	Audio in lift cars announces the floor level to travellers as the lift arrives and doors automatically open at any floor level. May be required in multi-storey situations but not appropriate for outdoor open spaces.	Audio system is also useful to broadcast or reinforce warning messages that travellers should not use the lifts in the event of fire or other situations as set out in the building's emergency evacuation procedures.

	Wayfinding system	Description	Application	Comments
1.23	**'Kiosk' (or network) of touch-screen or audio-based computer systems** See 2.4 of Stage 2–3 Report	Typically housed in a small kiosk, this computer-based system, with large TV-type screen, can provide information and directions for specific locations in the vicinity. The system may incorporate large screen fonts that assist people who are vision impaired or can produce audio through kiosk speakers or wirelessly to an individual receiving device.	An enhancement of the computer directory systems, it allows pedestrians to ask for and receive directions to specific locations for a particular destination or service. Should provide appropriate information and directions for specific locations in the vicinity such as bus or train stops, public toilets, theatres, restaurants and even timetable and ticket information.	Useful in local government infrastructure, for example as commissioned by Melbourne City Council for iHubs, or could be provided by owners of commercial venues. Orientation issues must be considered in the design to ensure the user is located and aligned appropriately for the message being delivered. Any screens should be at an appropriate height for use by people who are vision impaired or people who are mobility impaired.

2.0 Building precinct scale

Range of, say, 30 m, for example, building forecourts, podiums, plazas and piazzas

	Wayfinding system	Description	Application	Comments
2.1	**Tactile ground surface indicators (TGSIs) including directional indicators** See 3.1 of Stage 1 Report	See 1.1 above.		
2.2	**Directional compass** See 4.1 of Stage 1 Report	See 1.2 above.		
2.3	**Obstacle locator** See 4.2 of Stage 1 Report	See 1.3 above.		
2.4	**Enhanced or specialist cane** See 4.3 of Stage 1 Report	See 1.4 above.		
2.5	**Personal Digital Assistants (PDAs) and note takers** See 4.5 of Stage 1 Report	See 1.5 above.		
2.6	**Global Positioning System (GPS) position locator** See 4.4 and 4.6 of Stage 1 Report	See 1.6 above Most suitable in open-air locations without interference. Combined with other software, can be used for locating current position and other landmarks.	Providing information and locations of key landmarks such as major buildings, concert halls, churches, stadiums, transport interchanges, as well as parks and lakes.	Pedestrians must have a suitable GPS receiver unit, used in conjunction with specialist software plus electronic data depicting local streets and landmarks for that area.

	Wayfinding system	Description	Application	Comments
2.7	**Talking digital map systems** See 4.6 of Stage 1 Report	See 1.7 above.		
2.8	**Tactile map systems** See 4.7 of Stage 1 Report	See 1.8 above.		Tactile maps of specific venues should be made available by the venue's management.
2.9	**Mobile phones and communicators** See 4.8 of Stage 1 Report	See 1.9 above.	Starting to provide location-specific information to users via the 'next-generation' or 3G mobile networks, but service is aimed at the majority of users rather than adapted for niche users such as people who are blind or vision impaired.	Users must be a customer of a mobile phone network to receive information.
2.10	**Accessible pedestrian signals** See 5.1 of Stage 1 Report	See 1.10 above.		
2.11	**Press and listen signs or press-button audible signage** See 5.2 of Stage 1 Report	See 1.11 above.	If signs are networked, then time-specific messages (or 'live') information such as timetable details can be replayed when the button is pushed.	System acts as a supplement to locational signage. However, everyone near the sign hears the brief information repeated about that location.

	Wayfinding system	Description	Application	Comments
2.12	**Printed signage (location signs) featuring words, or words and symbols** See 2.3.2 of Stage 2–3 Report	See 1.12 above.		Allows pedestrians to confirm their location or indicates the general direction of other possible destinations. Not suitable for people who are blind or vision impaired because raised tactile and braille signage must be used to assist these pedestrians.
2.13	**Raised tactile and braille signage** See 3.2 of Stage 1 Report	See 1.13 above.		
2.14	**Remote (infrared) audible signage — motion-activated** See 5.5.1 of Stage 1 Report	See 1.14 above.		
2.15	**Remote (infrared) audible signage — speaking signs** See 5.5.2 of Stage 1 Report	See 1.15 above.		
2.16	**Remote radiofrequency audible signage** See 5.6 of Stage 1 Report	See 1.16 above.		

	Wayfinding system	Description	Application	Comments
2.17	**Moving illuminated signage single and multi-line** See 3.4.4 of Stage 2–3 Report	See 1.17 above.		
2.18	**Enhanced location maps (raised tactile and braille)** See 2.3.2 of Stage 2–3 Report	See 1.18 above.		
2.19	**Trail across forecourt or plaza** See audit checklist	See 1.19 above.	Clearly marked and distinctive pathways or handrails can provide options for wayfinding across open areas.	A 'trail' should be designed to 'lead' a traveller across the open space from one key destination to another relatively close destination.
2.20	**On-line digital information and maps** See 5.7 of Stage 1 Report	See 1.20 above.		
2.21	**Computer directory information system** See 3.4.5 of Stage 2–3 Report	See 1.21 above.	Can act as a directory board and supplement signage in the area.	Acts as an unattended information desk. However, it cannot be read by touching the board or screen so it is not suitable for people who are blind or who read tactually.
2.22	**Talking lifts** See 3.4.6 of Stage 2–3 Report	See 1.22 above.		

	Wayfinding system	Description	Application	Comments
2.23	**'Kiosk' (or network) of touch-screen or audio-based computer systems** See 2.4 of Stage 2–3 Report	See 1.23 above.	Acts as a directory board for the vicinity, but can supply additional information about particular locations on enquiry.	Can be used in local government or commercial infrastructure that acts as an unattended information desk. Orientation issues must be considered in the design to ensure the user is located and aligned appropriately for the message being delivered.

3.0 Building entrance scale

Range of 5 m, for example, the immediate vicinity and building entrances

	Wayfinding system	Description	Application	Comments
3.1	**Tactile ground surface indicators (TGSIs) including directional indicators** See 3.1 of Stage 1 Report	See 1.1 above.	Directional indicators can assist people who are blind or vision impaired to find their way unaided from the street to the building entrance where other shorelines do not exist.	
3.2	**Obstacle locator** See 4.2 of Stage 1 Report	See 1.3 above.		
3.3	**Enhanced or specialist cane** See 4.3 of Stage 1 Report	See 1.4 above.		
3.4	**Personal Digital Assistants (PDAs) and note takers** See 4.5 of Stage 1 Report	See 1.5 above.		
3.5	**Tactile map systems** See 4.7 of Stage 1 Report	See 1.8 above.		
3.6	**Press and listen signs or press-button audible signage** See 5.2 of Stage 1 Report	See 1.11 above.	When found and pressed, external audible sign announces address, building name and major tenant.	Other indicators or forms of signage are needed to alert people who are blind or vision impaired to the availability and specific location of the press and listen sign.

	Wayfinding system	Description	Application	Comments
3.7	**Printed signage (location signs) featuring words, or words and symbols** See 2.3.2 of Stage 2–3 Report	See 1.12 above.	Directory board providing listings of building tenants and the general direction of many significant amenities and services. Use of symbols rather than just words can assist illiterate and non-English-speaking pedestrians, for example ← and → rather than 'left and right'.	Must be well positioned and suitable for people who are vision impaired as well as people with other disabilities. Suitable fonts, colour and background contrast must be used. Not suitable for people who are blind or vision impaired. Raised tactile and braille signage must be used to assist these pedestrians.
3.8	**Raised tactile and braille signage** See 3.2 of Stage 1 Report	See 1.13 above.	As noted in 1.13, but enhanced with tactile aids for people who are blind or vision impaired.	
3.9	**Handrail systems** See 3.4.1 of Stage 2–3 Report	Wooden or metal infrastructure provided to allow users to follow the handrail and find their way from one location to another relatively close location along paths, corridors or across open space.	Fixed to corridor and lobby walls to assist people who are blind, vision impaired or have limited mobility to find their way unaided from one location to another relatively close location.	Separate indication of the actual direction of the building entrance or the street may be necessary to confirm the user is travelling in the right direction.
3.10	**Remote (infrared) audible signage — motion-activated** See 5.5.1 of Stage 1 Report	See 1.14 above.	External audible sign announces address, building name or major tenants when triggered.	Additional to building locational signage but sign may be triggered by passing pedestrians.

	Wayfinding system	Description	Application	Comments
3.11	**Remote (infrared) audible signage — speaking signs** See 5.5.2 of Stage 1 Report	See 1.15 above. Audio equivalent of location sign.	When any transmitter is 'triggered' by a signal received from a nearby user's device, pre-recorded audio information such as the building name or a welcome message is then broadcast wirelessly by the transmitter to that user's receiver.	Distinct information can be provided for different locations but is audible only via an individual receiver held, or worn, by the user. Users may need different types of devices to receive information within different building complexes.
3.12	**Remote Radiofrequency Audible Signage** See 5.6 of Stage 1 Report	See 1.16 above.		
3.13	**Moving illuminated signage single and multi-line** See 3.4.4 of Stage 2–3 Report	See 1.17 above.	As noted in 1.17 but with more detail provided for location signs and directory boards.	Must be well positioned and suitable for people who are vision impaired as well as people with other disabilities. Suitable fonts, colour and background contrast must be used. Not suitable for people who are blind.
3.14	**Enhanced location maps (raised tactile, braille)** See 2.3.2 of Stage 2–3 Report	See 1.18 above.	Map of raised outlines of entrance or lobby can be traced by touch by people who are blind or vision impaired to assist their orientation and plan their journey.	Limited additional information in raised lettering or braille may further assist the traveller to locate their intended destination.

	Wayfinding system	Description	Application	Comments
3.15	**Trail between forecourt and street and building entrance** See audit checklist	See 1.19 above.		
3.16	**On-line digital information and maps** See 5.7 of Stage 1 Report	See 1.20 above.	Detailed information such as building floor plans have to be obtained or produced in appropriate form before the journey.	This area is changing rapidly with new advances in mobile internet technology. See mobiles and communicators.
3.17	**Computer directory information system** See 3.4.5 of Stage 2–3 Report	See 1.21 above.	System can provide both limited and detailed listings of building tenants and public facilities.	Suitable for unattended or 'faceless' receptions. Accessibility options for software can enhance the contrast, colours and size of fonts for on-screen information. May provide audible prompts. Not suitable for people who rely on tactual reading.
3.18	**'Kiosk' (or network) of touch-screen or audio-based computer systems** See 2.4 of Stage 2–3 Report	See 1.23 above.	Allows pedestrians to obtain appropriate information and directions for specific buildings, such as listings of building tenants and public facilities.	Could be provided by owners of individual buildings or venues, or as local government infrastructure. Orientation issues must be considered in the design to ensure the user is located and aligned appropriately for the message being delivered.

4.0 Inside building scale

Range of, say, 1–20 m, for example, lobbies, reception area, lift lobbies, corridors and information desks

	Wayfinding system	Description	Application	Comments
4.1	**Tactile ground surface indicators (TGSIs) including directional indicators** See 3.1 of Stage 1 Report	See 1.1 above.		
4.2	**Obstacle locator** See 4.2 of Stage 1 Report	See 1.3 above.		
4.3	**Enhanced or specialist cane** See 4.3 of Stage 1 Report	See 1.4 above.		
4.4	**Personal Digital Assistants (PDAs) and note takers** See 4.5 of Stage 1 Report	See 1.5 above.		
4.5	**Tactile map systems** See 4.7 of Stage 1 Report	See 1.8 above.	Braille, tactile or raised maps describing access to certain facilities at particular venues. These maps could be made available to those who can interpret them to assist in planning and subsequently undertaking travel.	Any key facilities likely to be accessed by a user would need to be known in advance and maps then produced, unless they are made available at venues.

	Wayfinding system	Description	Application	Comments
4.6	**Mobile phones and communicators** See 4.8 of Stage 1 Report	See 1.9 above.	Combining information about layouts with a sensor network throughout the building. Trial systems, based on adapted phones or communicators, have been used overseas to assist wayfinding within buildings.	Once the technology is further developed, proven and cost-effectively accessible, it may become a more widespread option. A development with real potential, but not yet ready for widespread use.
4.7	**Press and listen signs or press-button audible signage** See 5.2 of Stage 1 Report	See 1.11 above.	Provided in a lift lobby or building entrance. When pressed, the audible sign announces information about the nearby area such as location of key facilities on the floor.	Other indicators are needed to make sure people who are vision impaired know the specific location of the press and listen sign.
4.8	**Printed signage (location signs, directory boards, etc.)** See 2.3.2 of Stage 2–3 Report	See 1.12 above.	Directory board providing listings of the services and tenants on each floor level, plus the general direction of many key amenities and services.	Should be well positioned and designed for people who are vision impaired, but are not suitable for people who are blind. Raised tactile and braille signage must be used to assist these visitors.
4.9	**Raised tactile and braille signage** See 3.2 of Stage 1 Report	See 1.13 above.		
4.10	**Line-following guides** See 5.3 of Stage 1 Report	Robotic-type devices are being developed that will follow fixed paths within a building.	Within suitably fitted-out buildings, in the future, these devices may assist in guiding people who are blind or vision impaired.	These and other general types of robotic ‘guides’ are still under development.

	Wayfinding system	Description	Application	Comments
4.11	**Directional sound evacuation** See 5.4 of Stage 1 Report	Building infrastructure installed to alert occupants in an emergency and help guide them, using sound, towards an exit during an evacuation.	In an emergency, distinctive sound patterns with a directional emphasis are emitted along corridors to assist in guiding sighted and people who are blind or vision impaired towards an exit.	Most appropriate for assisting egress from a building in an emergency, but not for general wayfinding around and within a building complex under normal conditions. Not suitable for people who are hearing impaired.
4.12	**Handrail system** See 3.4.1 of Stage 2–3 Report	See 3.9 above.	Fixed to corridor and lobby walls to assist people who are blind, vision impaired or mobility impaired find their way unaided from one location to another relatively close location.	Supplementary tactile, audible or braille signage may be necessary to help confirm that the user is travelling in the right direction.
4.13	**Remote (infrared) audible signage — motion-activated** See 5.5.1 of Stage 1 Report	See 1.14 above.	When triggered by nearby movement, the audible signs plays pre-recorded messages, listing tenants and the location of key facilities.	Supplement to building location and directory board signage designed to assist people who are vision impaired, but not people who are hearing impaired.
4.14	**Remote (infrared) audible signage speaking signs** See 5.5.2 of Stage 1 Report	See 1.15 above.	Pre-recorded audio information such as the location of lifts, toilets and staffed reception desks is broadcast wirelessly by transmitter to a user's receiving device. Different message may be received from different directions allowing the user to discreetly choose the direction they want to travel in.	Distinct information can be provided for different locations but it is audible only via an individual worn, or hand-held, receiver. Currently, users may need alternative types of devices to receive information within different building complexes.

	Wayfinding system	Description	Application	Comments
4.15	**Remote radio-frequency audible signage** See 5.6 of Stage 1 Report	See 1.16 above.	Generally used in outdoor settings.	
4.16	**Moving illuminated signage single and multi-line** See 3.4.4 of Stage 2–3 Report	See 1.17 above.	Providing broad listings of the services and tenants on each floor level, plus the general direction of key amenities.	Not suitable for people who are blind.
4.17	**Enhanced location maps (raised tactile and braille)** See 2.3.2 of Stage 2–3 Report	See 1.18 above.	Map using raised outlines to highlight lift locations and other key facilities and the paths between them. Map and text can be traced by touch by people who are vision-impaired to assist their orientation and plan their journey.	Accompanying text in raised lettering or braille may further assist the user to locate their destination and help plan their path.
4.18	**Trail between building entrance and main tenant directory board** See audit checklist	See 1.19 above.	Pathways leading to, and from, key facilities such as reception, lift lobbies and toilets can be highlighted through contrasting textures and colours on wall and floor coverings.	Designed to help people who are vision impaired locate key facilities unaided — through architectural features and interior finishes.
4.19	**On-line digital information and maps** See 5.7 of Stage 1 Report	See 1.20 above.	Detailed information such as building floor plans have to be obtained or produced before the journey.	The availability of tactile maps at individual venues may eliminate the need to download directional and wayfinding information before attending a venue.

	Wayfinding system	Description	Application	Comments
4.20	**Computer directory information system** See 3.4.5 of Stage 2–3 Report	See 1.21 above.	System should provide individual listings of building tenants, public facilities and their locations within the building.	Suitable for unattended or 'faceless' receptions e.g. 'Take lift to Level 3 then turn left and proceed 20 metres directly along corridor. Offices are on your right'.
4.21	**Talking lifts** See 3.4.6 of Stage 2–3 Report	See 1.22 above.		Useful to reinforce warning messages that travellers should not use lifts in the event of fire or in other situations as set out in the building's emergency evacuation procedures.
4.22	**'Kiosk' (or network) of touch-screen or audio-based computer systems** See 2.4 of Stage 2–3 Report	See 1.23 above.	Allows pedestrians to obtain appropriate information and directions for specific buildings, such as listings of building tenants and public facilities.	Could be provided by owners of individual buildings or venues, or provided as local government infrastructure. Users' spatial orientation must be considered to ensure they are located and aligned appropriately for the message being relayed.

5.0 Floor-level scale

Range of, say, 1–20 m for example, corridors, offices, classrooms, meeting rooms, toilets, fire exits and storage rooms

	Wayfinding system	Description	Application	Comments
5.1	**Tactile ground surface indicators (TGSIs), including directional indicators** See 3.1 of Stage 1 Report	See 1.1 above.		
5.2	**Obstacle locator** See 4.2 of Stage 1 Report	See 1.3 above.		
5.3	**Enhanced or specialist cane** See 4.3 of Stage 1 Report	See 1.4 above.		
5.4	**Personal Digital Assistants (PDAs) and note takers** See 4.5 of Stage 1 Report	See 1.5 above.		
5.5	**Tactile map systems** See 4.7 of Stage 1 Report	See 1.8 above.	Braille or tactile and raised maps outlining key facilities at an individual floor level may assist people who are vision impaired, but other options seem more appropriate at this scale.	
5.6	**Mobile phones and communicators** See 4.8 of Stage 1 Report	See 1.9 above.	Other options appear more appropriate at this scale.	

	Wayfinding system	Description	Application	Comments
5.7	**Press and listen signs/ press-button audible signage** See 5.2 of Stage 1 Report	See 1.11 above.	Provided in a lift lobby or building entrance. When pressed, the audible sign announces information about the nearby area such as location of key facilities on the floor.	Other indicators are needed to make sure people who are vision impaired know the specific location of the press and listen sign.
5.8	**Printed signage (location signs, directory boards, etc.) featuring words or words and symbols** See 2.3.2 of Stage 2–3 Report	See 1.12 above.	Directory board providing listings of the services and tenants on each floor level, plus the general direction of many key amenities and services.	Should be well positioned and designed for pedestrians with low vision, but not suitable for people who are blind or vision impaired. Raised tactile and braille signage must be used to assist these travellers.
5.9	**Raised tactile and braille signage** See 3.2 of Stage 1 Report	See 1.13 above.		
5.10	**Line-following guides** See 5.3 of Stage 1 Report	See 4.10 above.		Still in development.
5.11	**Directional sound evacuation** See 5.4 of Stage 1 Report	See 4.11.		
5.12	**Handrail systems** See 3.4.1 of Stage 2–3 Report	See 3.9 above.		

	Wayfinding system	Description	Application	Comments
5.13	**Remote (infrared) audible signage — motion-activated** See 5.5.1 of Stage 1 Report	See 1.14 above.	Plays pre-recorded messages through speakers, listing services and the location of key facilities located on the floor.	Triggered by nearby movement, these signs are designed to assist people who are vision impaired, but not people who are hearing impaired.
5.14	**Remote (infrared) audible signage — speaking signs** See 5.5.2 of Stage 1 Report	See 1.15 above.	Normally located at travel decision points (e.g. lobby or corridor intersections), these signs wirelessly transmit pre-recorded audio, for example, the location of lifts, direction of toilets and staffed reception desks.	Messages are audible only via an individual receiver worn or held by the user. Messages can be transmitted and received from different locations allowing the user to decide their direction of travel.
5.15	**Remote radiofrequency audible signage** See 5.6 of Stage 1 Report	See 1.16 above.	Generally used in outdoor settings.	
5.16	**Moving illuminated signage — single and multi-line** See 3.4.4 of Stage 2–3 Report	See 1.17 above.	Providing broad listings of the services and tenants on each floor level, plus the general direction of key amenities.	Not suitable to assist people who are blind.
5.17	**Enhanced location maps (raised tactile and braille signage)** See 2.3.2 of Stage 2–3 Report	See 1.18 above.	Map using raised outlines to highlight pathways between key facilities. Map and text can be traced by touch by people who are vision impaired.	Adding text in raised lettering or braille on the map may further assist users to locate their destination and plan their path.

	Wayfinding system	Description	Application	Comments
5.18	**Trails between key locations such as reception, lift lobby, meeting rooms or tenant offices** See audit checklist	See 1.19 above.	Pathways leading to and from crucial facilities such as reception, lift lobbies and toilets can be highlighted through employing Principles of Universal Design.	Designed to help vision-impaired pedestrians to locate key amenities unaided.
5.19	**On-line digital information and maps** See 5.7 of Stage 1 Report	See 1.20 above.	Detailed information such as building floor plans have to be obtained or produced in appropriate form before the journey is undertaken.	The availability of tactile maps at individual venues may eliminate the need to download directional and wayfinding information before attending a venue.
5.20	**Computer directory information system** See 3.4.5 of Stage 2–3 Report	See 1.21 above.	System should provide individual listings of tenants and public facilities located on the floor.	Suitable for reception areas not always attended by staff. Not appropriate for people who rely on reading by tactual means.
5.21	**Talking lifts** See 3.4.6 of Stage 2–3 Report	See 1.22 above.		
5.22	**'Kiosk' (or network) of touch-screen or audio-based computer systems** See 2.4 of Stage 2–3 Report	See 1.23 above.	Systems should allow pedestrians to obtain appropriate information and directions for specific floor levels, such as listings of tenants as well as public facilities and conveniences located on the floor.	May be provided by owners of individual buildings or venues. Users' spatial orientation must be considered to ensure they are located and aligned appropriately for the message being relayed.

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Wayfinding design guidelines

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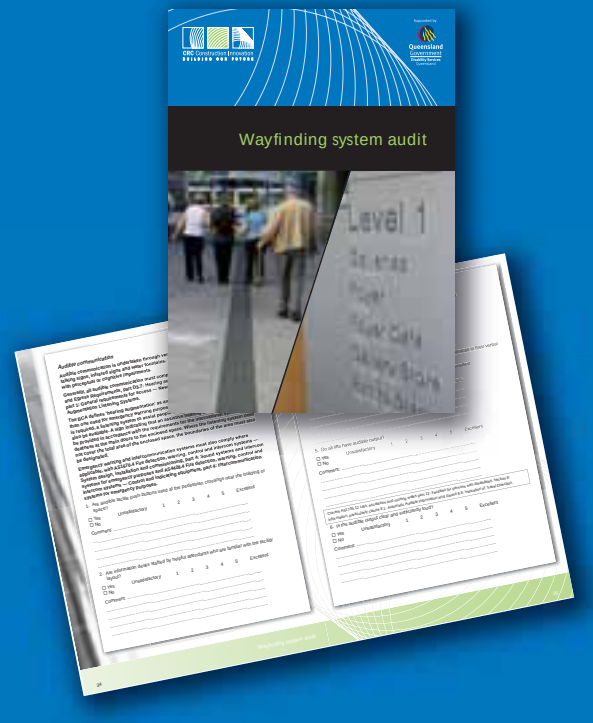

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