Introduction to

Inclusion and Access in the Built Environment

By LevelField Consultants and Disabled People's Association

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Part 1: About Us

About Disabled People’s Association

- Disabled People’s Association (DPA) is Singapore’s only cross-disability non-profit organisation.

- We represent the disability community, working to build a fairer society where everyone can participate in all aspects of life from education to employment and access to social integration. We help the disability community have a voice in society by working with decision-makers in political, commercial and educational institutions so that no decision that impacts us is made without us.

- We also provide training, consultancy and education for both people with disabilities and the public, so that we can work together to create an inclusive, accessible society we are all proud of.

Part 1: About Us

About LevelField Consultants

- LevelField Consultants advocates and promotes the need for an environment that is accessible, safe and inclusive for persons of all ages and abilities.

- We strive to improve the level of awareness about the need for a friendly and conducive built environment to promote the social inclusion of all in particular people with disabilities and the elderly.

- We conduct access audits and also provide consultancy services for developers, architects, town planners, facility managers, service providers and businesses to improve accessibility and achieve universal design while ensuring compliance of the Code on Accessibility in the Built Environment.

Part 2: Disability Awareness

Models of Disability

Medical Model

- Locates disability in the individual person.
- The goal is to cure the individual of their disability.
- Framing disability in this way leads to individualised treatment of those with disabilities, rather than standardised policies, which can result in marginalisation and alienation.

Charity Model

- Sees people with disabilities as victims of their impairment, deserving of pity and help.
- Disability is seen as a deficit, and persons with disabilities are not able to help themselves and to lead an independent life.
- When non-disabled people help disabled people, it is an act of charity.

Social Model

- Locates disability within social spaces and systems.
- Draws on the idea that it is society that disables people by designing everything to meet the needs of the majority of people who are not disabled.
- Society has a collective responsibility to create environments and social spaces that support full participation.

Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.

United Nations Convention on the Rights of Persons with Disabilities, Preamble and Article 1-Purpose

Part 2: Disability Awareness

Types of Disabilities

- **Deaf and Hard of Hearing**
  A deaf person is someone who is unable to hear sound in one or both ears. A hard of hearing can denote a person with a mild to moderate hearing loss. Some prefer to use the term 'people with hearing loss'.

- **Developmental Disabilities**
  Developmental disabilities are a group of conditions due to an impairment in physical, learning, language, or behaviour. These conditions tend to be picked up during the early developmental period and may impact the day- to-day functioning and/or physical, intellectual, and/or emotional development of a person with developmental disabilities.

- **Intellectual Disabilities**
  People with intellectual disabilities require support or accommodations in the area of intellectual functioning and in adaptive behaviour, which covers many everyday social and practical skills.

Part 2: Disability Awareness

Types of Disabilities

- **Physical and Mobility Impairments**
  Physical and mobility impairment may refer to a limitation in independent, purposeful physical movement of the body or of one or more extremities. This group includes wheelchair users and other mobility aid users.

- **Psychosocial Disabilities**
  Persons with psychosocial disabilities are persons who, regardless of self-identification or diagnosis of a mental health condition, face restrictions in the exercise of their rights and barriers to participation in their daily lives. The mental health condition does not cause the barriers, instead that is usually the result of society's lack of understanding or stigmatisation of mental health conditions.

- **Neurodivergence**
  Neurodivergence refers to the community of people who have atypical neurological development and experiences. It affirms a variety of diagnoses and differences, including autism, attention deficit hyperactivity disorder (ADHD), dyslexia, and more.

Part 2: Disability Awareness

Types of Disabilities

- **Visual Impairments**
  Visual impairment refers to a decreased ability to a degree not fixable by wearing glasses or medication. Some people with visual impairment may use the term ‘blind’ and others may use person with a visual impairment or disability.

- **Multiple Disabilities**
  A person may have multiple disabilities. For example, a person with Down Syndrome may also have an intellectual disability as well as be hard of hearing. Persons who are deafblind have both hearing and vision loss and may require alternative communication methods than those who are blind or deaf.

Disabilities can be visible and invisible to others. A wheelchair user has a visible disability and person who is Deaf has an invisible disability.

Part 2: Disability Awareness

Some ways to remove existing barriers

Deaf and Hard of Hearing

- Visual cues and feedback
- Closed-Captioning on videos
- Sign Language Interpretation

Developmental and Intellectual Disability

- Easy-read documents
- Use of clear symbols
- Audio output

Physical and Mobility Impairments

- Ramps
- Sheltered, step-free routes

Psychosocial Disabilites and Neurodivergence

- Calm spaces
- Use of sensory-friendly colours

Visual Impairments

- Tactile paving
- Auditory cues and feedback
- Audio output

Part 3: Fundamentals of Accessibility

Fundamentals of Accessibility

The how and why

Part 3: Fundamentals of Accessibility

Introduction

- Necessity of accessibility
- Different phases of accessibility
- Importance of an inclusive environment
- Understanding users and dimensions
- Accessible provisions in the built environment
- Man-made obstructions
- Areas for consideration
- Unauthorised changes and maintenance

Part 3: Fundamentals of Accessibility

Necessity of Accessibility

- Accessibility ensures that everyone, regardless of their abilities or disabilities, can access information, products, services, and environments where everyone has equal access and opportunities to participate fully. Accessibility promotes equal opportunities and inclusion, regardless of a person's abilities or circumstances

- In Singapore, accessibility in the built environment is governed by the Building and Construction Authority's (BCA) Code on Accessibility in the Built Environment, which establishes minimum requirements to enable everyone, in particular people with disabilities to be able to participate in the community. The built environment includes buildings, roads, pedestrian infrastructure, crossings, parks and open spaces as well as public transportation.

- In addition, BCA has also published the Universal Design Guide for Public Places 2016 which provides a good practice guide on the design of the built environment to make it safe and accessible for everyone.

Different Phases of Accessibility

1 Adaptable

It all started by overcoming existing barriers by deploying makeshift solutions.

2 Barrier-Free Access

This evolved to providing side entrances to overcome steps and staircases serving main entrances.

3 Access for All

Ramped access for everyone. While it is good, pushing up a ramp can take a lot of effort.

4 Universal Design

Levelled entry points for everyone to gain entry the same way.

Part 3: Fundamentals of Accessibility

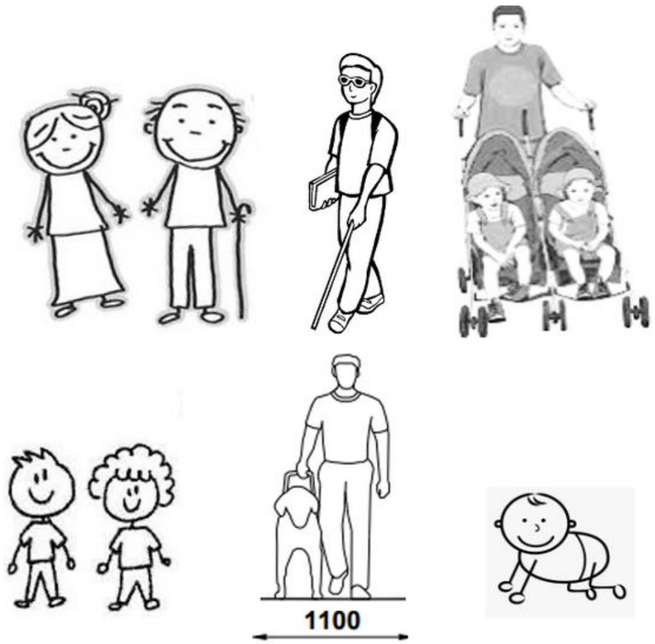
Importance of an Inclusive Environment

- Accommodates all persons with varying abilities; from infants, parents with prams, children and adults with and without disabilities to the elderly.
- Promotes participation and enables everyone to be able to move around freely whether as individuals or with families and friends.
- Ensures safety and encourages all persons to venture out without fear or apprehension.

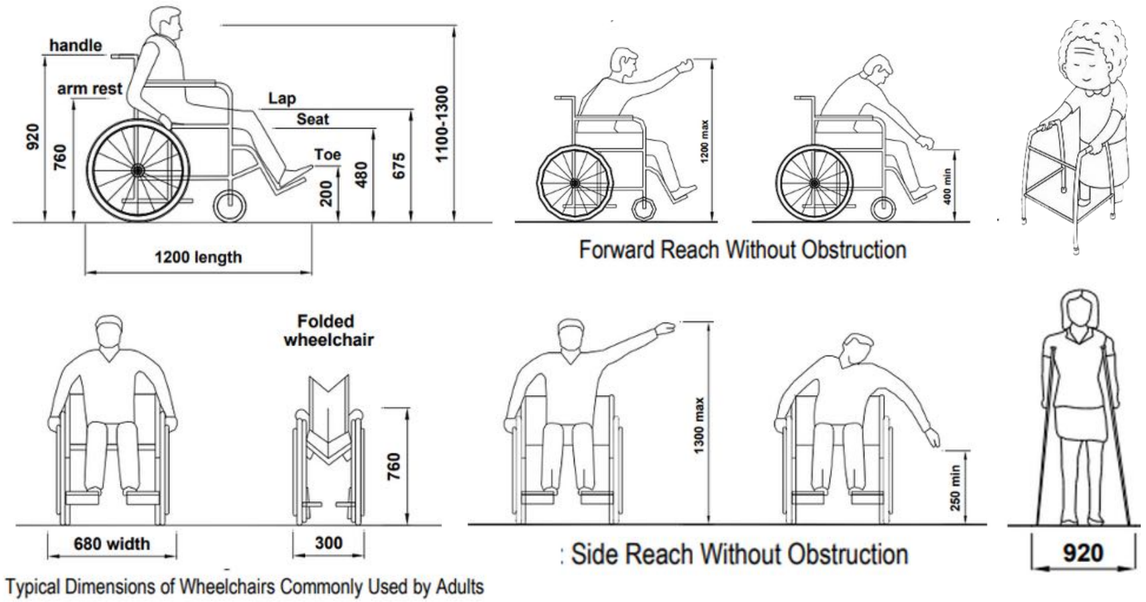
Part 3: Fundamentals of Accessibility

Understanding Dimensions

Dimensions are essential and considers the width, length, reaches and clear space needed by different users and their assistive devices as they interact in and around the built environment.



Anthropometric for wheelchair users extracted from BCA's Code on Accessibility



Typical Dimensions of Wheelchairs Commonly Used by Adults

Diagrams extracted from BCA's Code on Accessibility

Part 3: Fundamentals of Accessibility

Understanding Disability Groups

- People with **physical disabilities** depend largely on the physical accessibility of the built environment. They may depend on wheelchairs or walking aids for their mobility.

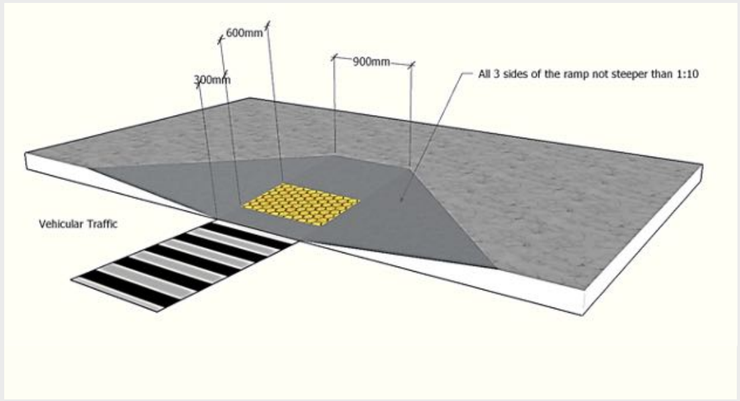
- People with **visual impairments** are those who have difficulty seeing or are blind. To ensure accessibility, high contrast between text and background, audio descriptions as well as large and clear fonts are essential. In the built environment, accessibility can be improved by providing braille signs, tactile maps, and audio descriptions.

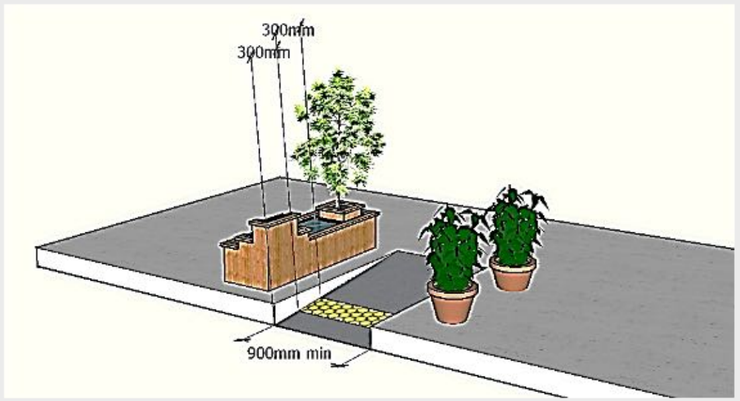
- Best practices to ensure accessibility for those who are **deaf or hard of hearing** includes closed captions and transcripts for audio and video content, visual cues for alarms and notifications as well as the provision of hearing enhancement systems.

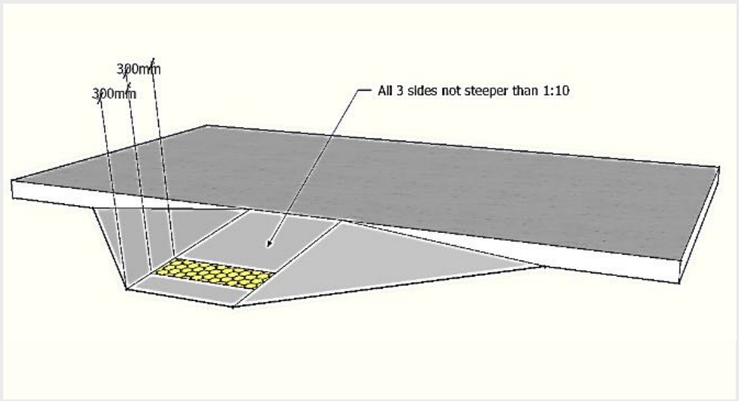
- People with **cognitive impairments** have difficulty with mental processes such as memory, attention, or problem-solving. It is therefore important to use easy to understand pictograms as well as using clear and simple language. In the built environment, this includes providing clear signage and wayfinding cues, and providing quiet and calm environments.

Part 3: Fundamentals of Accessibility

Types of Kerb Designs







Kerb Ramp with Flared Sides

- For road infrastructure
- Allows access from all sides
- High traffic walkway and footpath

Kerb Ramp with Continuous Kerb

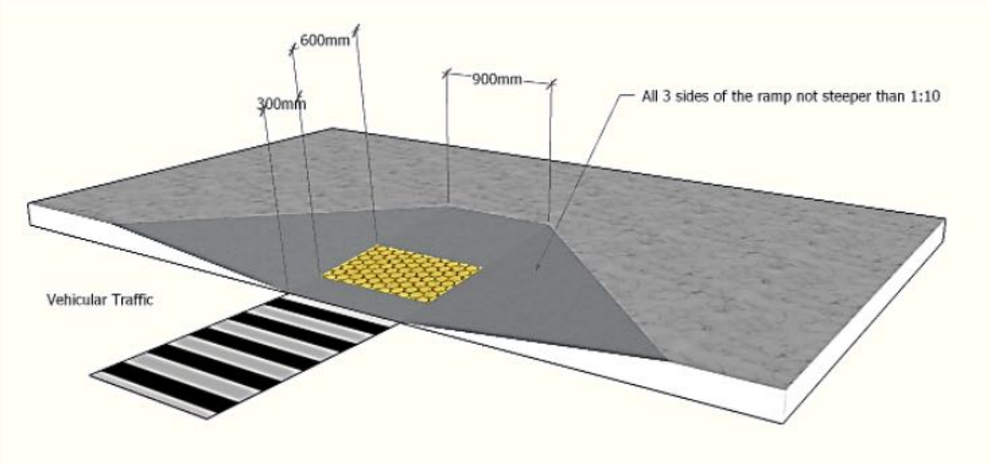
- Low traffic walkway and footpath
- Where there is no access from sides
- Usually within development

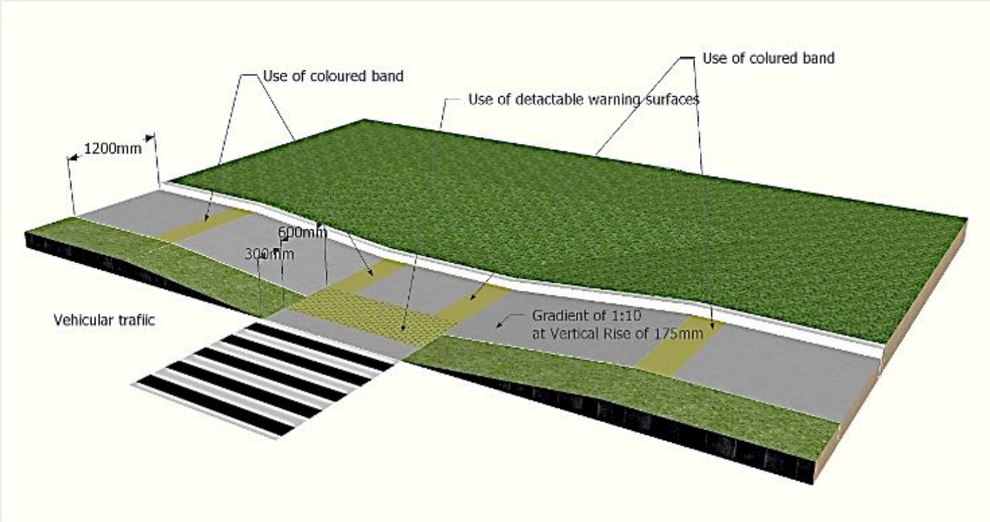
Built-Up Kerb Ramp

- Mostly external
- Projects into corridors and roads
- Not suitable for main road application

Part 3: Fundamentals of Accessibility

Kerb Ramp vs Inline Ramp





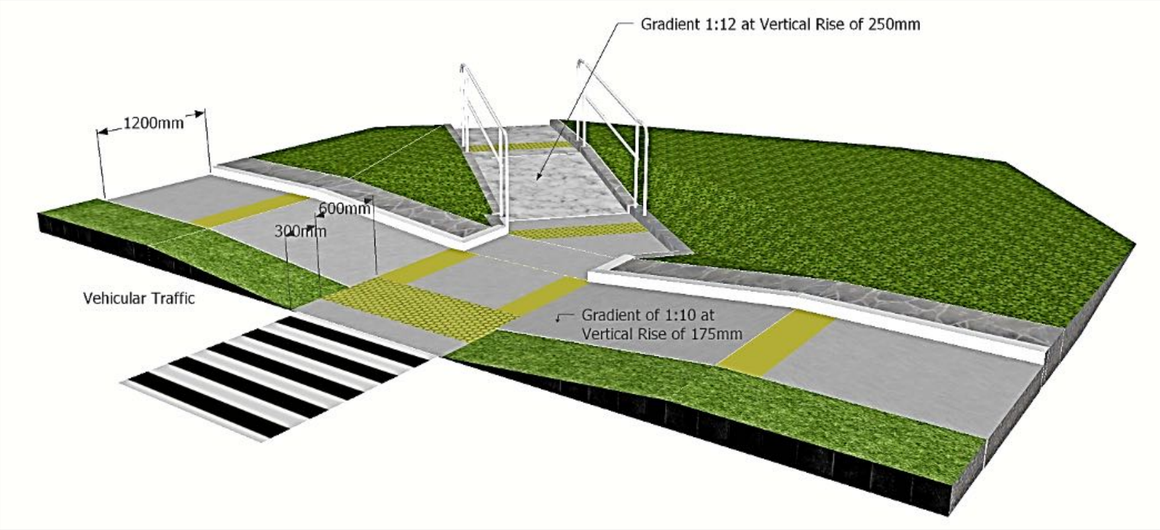
For pedestrian infrastructure, an Inline Ramp is preferred especially for narrow walkways as it provides the following benefits.

- Designated levelled resting space for pedestrian, user should not be an incline while waiting.
- A more seamless connection between walkway and road.
- No abrupt change in level for those walking along the walkway.
- Less slippery when floor is wet.

More space is needed to provide kerb ramps with flared sides.

Part 3: Fundamentals of Accessibility

Slope Ramp joining an Inline Ramp



- Construction of ramps coming from various directions is never easy as it entails a good understanding of a ramp design during construction stage.
- Such ramp designs usually end up with ramps with different gradients, multiple crossfalls and a ‘crown point’ – without a level landing, making it difficult and dangerous to negotiate.
- Having a level landing, preferably at road level to ensure a safe design.
- Warning tactile indicator set back by 300mm from edge of road (where ramp leads to road).

Slope Ramps

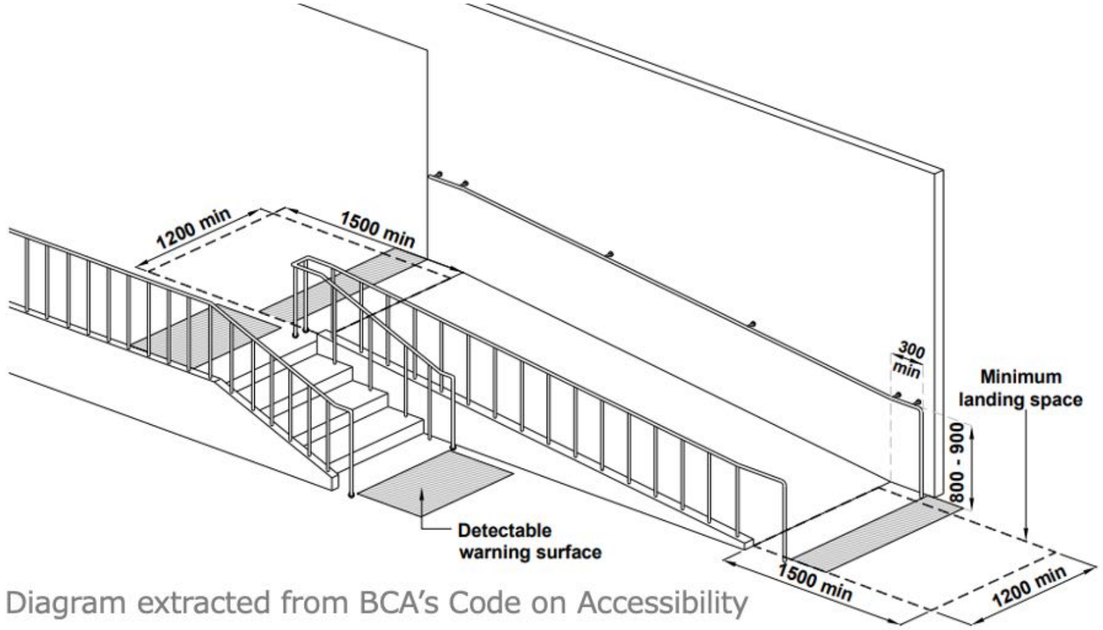


Diagram extracted from BCA's Code on Accessibility

Gradient and Length of Ramps

Gradient of ramp	1:12	1:14	1:15	1:20	not gentler than 1:25
Intervals (maximum length of horizontal run in metres)	6	9	11	15	18

Table extracted from BCA's Code on Accessibility

- Minimum ramp gradient 1:12 – should consider gentler ramps for ease of use wherever possible.
- Levelled landings are necessary to allow user to rest and catch their breathe. The number of landings required is determined by the height difference and gradient of ramp (refer to table).
- Handrails must be located on both sides of ramps and be continuous.
- Handrail extension must be closed or returned to the wall or floor.
- Consider providing handrails at two heights – where the lower handrail will cater to children and people with shorter stature.
- Placement of 300mm wide tactile with 300mm offset from edge of ramp (top and bottom of ramps).
- Edge protection prevents accidental trips.

What is wrong with these kerbs?

Steep gradient at sides of kerb ramp (arrowed) makes it dangerous to access from the sides of the ramp.

It is also a trip hazard, and slippery when wet. especially for those who are walking.

Sides flares need to be gentle to be safe for everyone.

Gradient of slope ramp is inconsistent making it challenging to overcome.

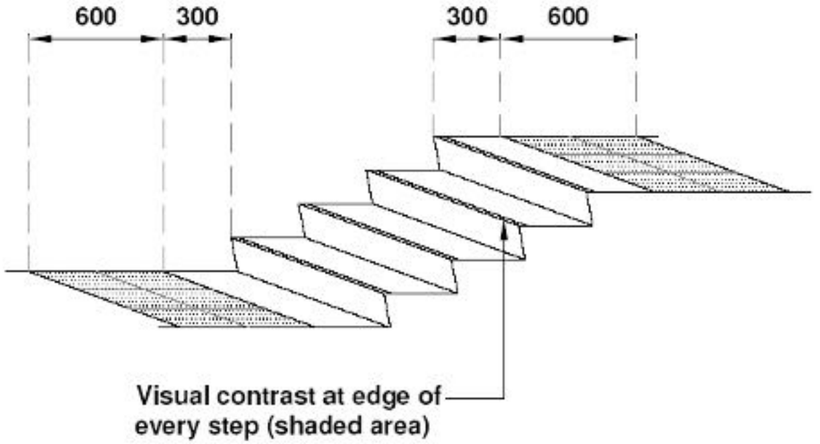
Ramps should not have concave or convex surfaces as these require additional effort and can be dangerous.

Ramps require handrails on both sides and levelled landings to allow for resting points.

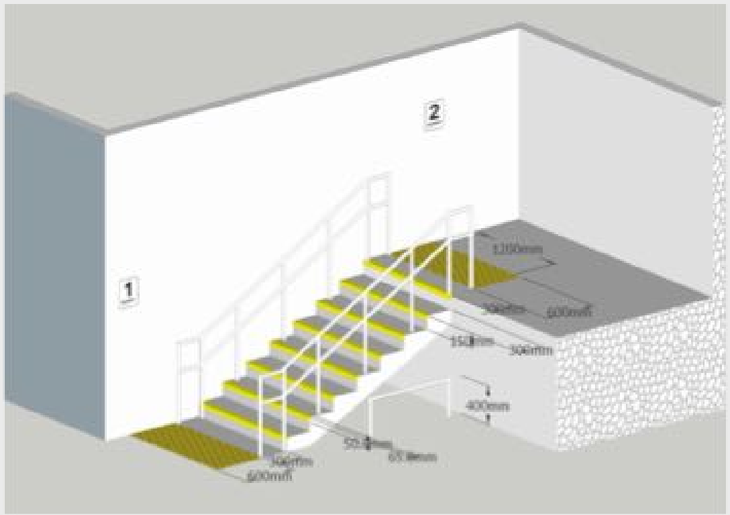
Part 3: Fundamentals of Accessibility

Staircase

Diagrams extracted from BCA's Code on Accessibility



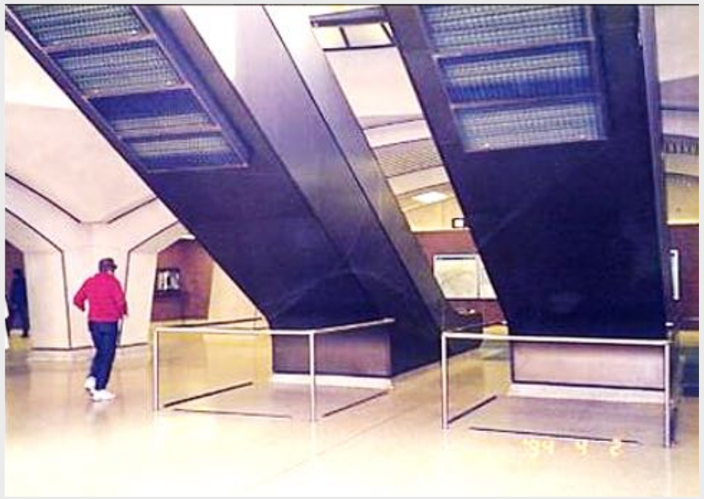
1. Handrails on both sides
2. 300mm horizontal extension of handrail (at top and bottom of staircase)
3. Handrail extension must be closed or returned to the wall or floor.
4. Additional handrail for children at height of 580mm from tread
5. Contrasting nosing with regular riser height (ensure nosings are not protruding)
6. Have closed risers
7. Warning tactile indicators of width 600mm to be set-back at 300mm and top and bottom of ramp
8. Braille at start and end of staircase's horizontal handrail extension
9. Underside of staircase to be protected

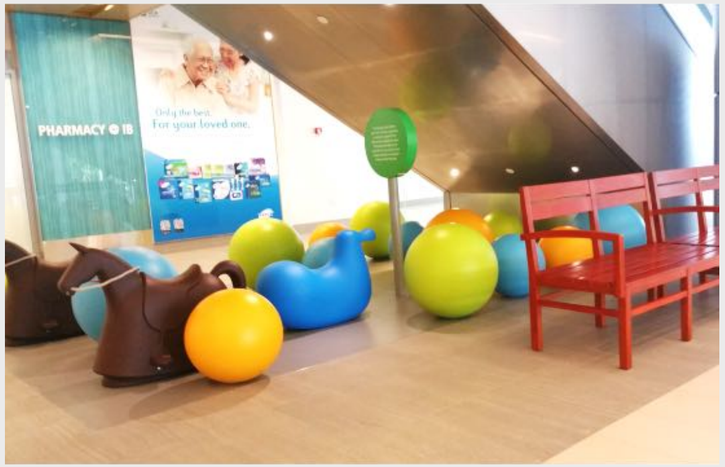


Part 3: Fundamentals of Accessibility

Protecting the underside of staircase and escalators

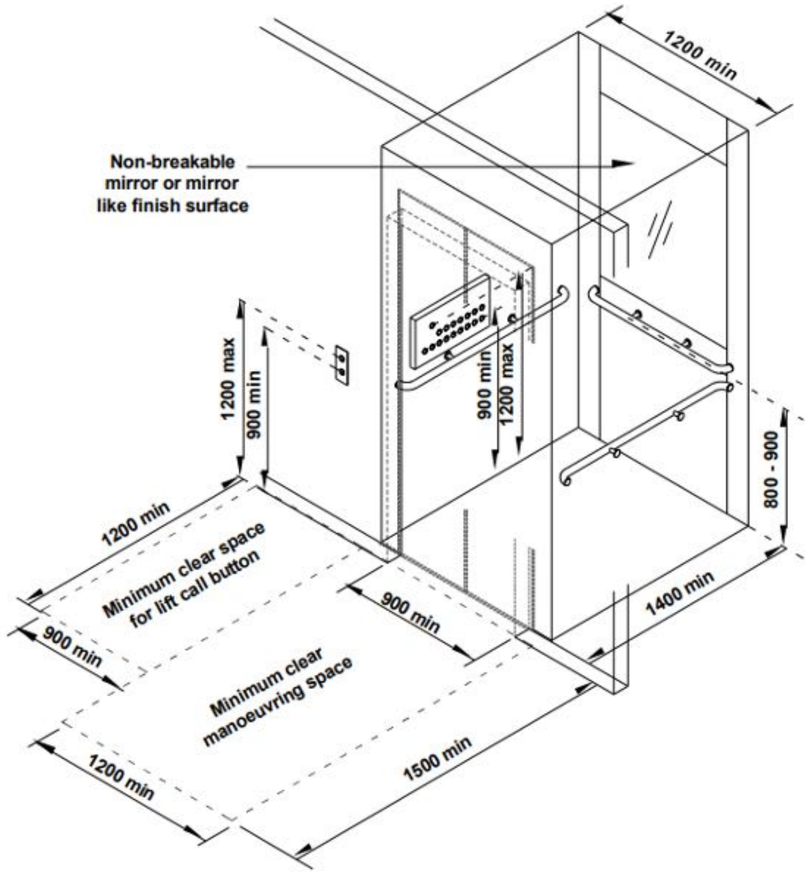
- There are many ways to ensure that the undersides of staircases and escalators (as well as low head rooms) are protected to prevent accidental walk-ins.
- Guardrails at 580mm (max) allows it to be detected by those using the white cane. If placed too low, these guardrails become trip hazards.
- Warning signs which are only visible to the sighted should be avoided.





Part 3: Fundamentals of Accessibility

Lifts



Lift for wheelchair user

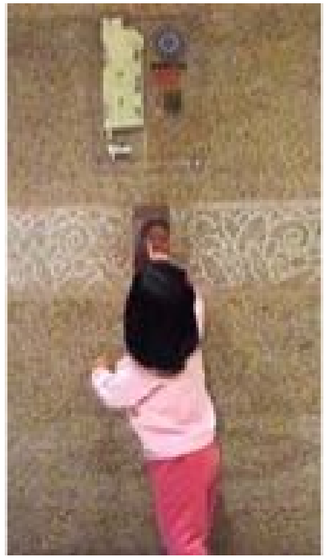
Diagram extracted from BCA's Code on Accessibility

1. Consideration should be given to the size of the lift to accommodate larger Personal Mobility Aid. Provision of a minimum of 2 numbers for each bank of lifts would be helpful in the event of maintenance or failure.
2. Provide 2 control panels - vertical (left/right side of door and horizontal so that it is easily reachable by everyone
3. Have large, embossed and contrasting font as well and braille on panels.
4. Alarm button to be placed away from door open and door close buttons.
5. Audio and visual feedback for floor numbers, cues and visual alarm.
6. Have grab bars along 3 sides of the lift car.
7. Be sufficiently bright.
8. Sensors to ensure that lift door does not close on the passengers.
9. Have a mirror at rear of lift car to enable rear facing passengers to see floor number and assist with reversing.
10. Lift lantern in lift lobby to indicate which lift will be arriving.
11. Sufficient manouvering space within lift car.

Part 3: Fundamentals of Accessibility

Lifts

1. Call buttons placed at 1000mm makes it reachable for most persons including children.
2. Dustbins and flower pots should not be placed in front of call buttons as these will cause obstructions.
3. Having seats at lift lobby enables those who unable to stand for too long to take a seat.


Examples of call button placement


Examples of control panels and lift buttons

Buttons with insufficient contrast

Difference between handrails and grab bars

Handrail

- A handrail is used to give stability and support in circulation areas such as corridors, passageways, ramps and stairways.
- Good colour contrast against surroundings.
- Continuous to assist in moving from point to point.
- Type of material used will depend on the environment and exposure to the elements.

Grab Bar

- A grab bar is used to maintain balance and to give steadying, stabilising assistance or provide support in locations such as bathrooms, toilet, lift, etc.
- Non-slip surface on grab bars is preferred.

Shape of both handrails and grab bars should preferably be circular to make hand holding comfortable.

Part 3: Fundamentals of Accessibility

Doorways

What makes opening a door challenging or difficult to overcome?

- Each door leaf is less than 850mm – it is impossible to open both door leaves and push ones wheelchair through the doorway.
- Weight of door – aggravated by adjustment of door closers.
- Ramped or uneven surface at door entrance – makes holding the door open while trying to pass through the doorway impossible.
- Threshold or hump at doorway – makes it impossible to enter.
- Insufficient clear space at pull and push side.
- Does not have door handle or horizontal bar to assist.
- Lack of a vision panel - to detect people at either side of the door (especially if the door opens into the corridor).
- Placing 'Push to Open' button on doors make it difficult to stop and press the button – preference is for an automatic door.

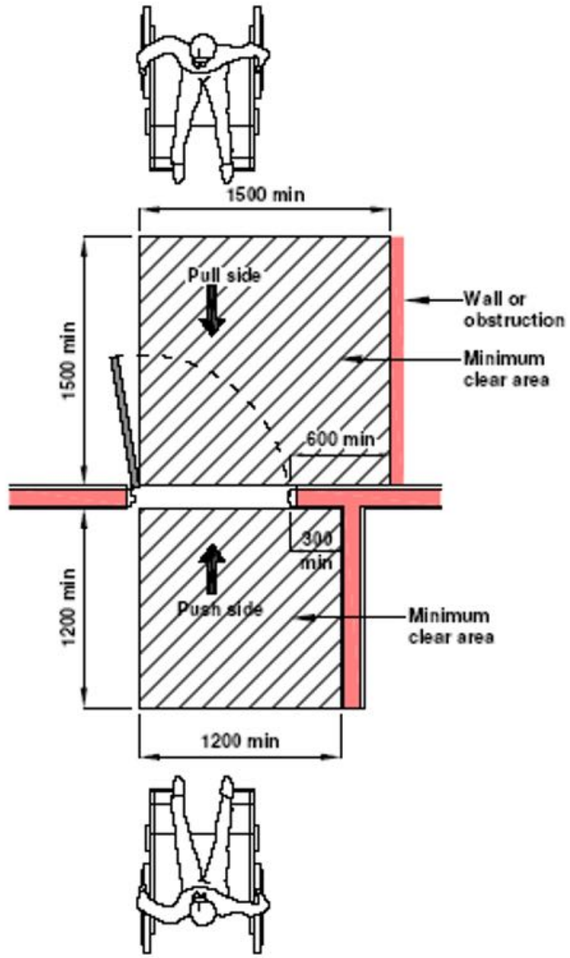


Diagram extracted from BCA's Code on Accessibility

Part 3: Fundamentals of Accessibility

Glass Doors and Walls

- Have you walked into a glass door or wall before?
- Have you stopped in front of a glass wall and wondered where the opening for the door is located?
- Glass doors should be framed – to make it easier to locate and identify.
- Colour contrasting motifs (at 2 heights) would be necessary to prevent people (including children) from walking into glass doors and walls.

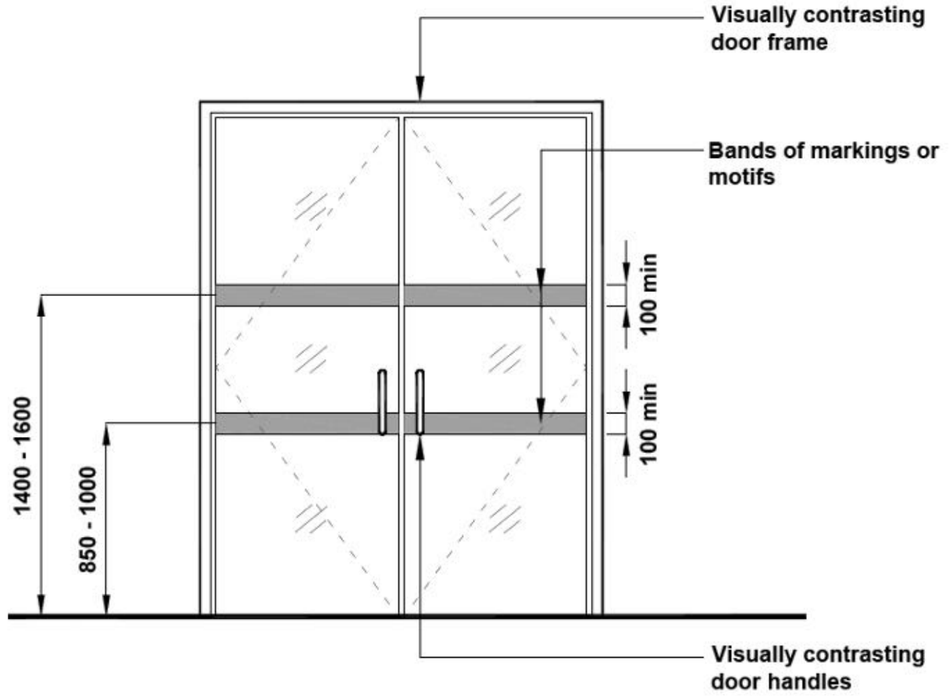
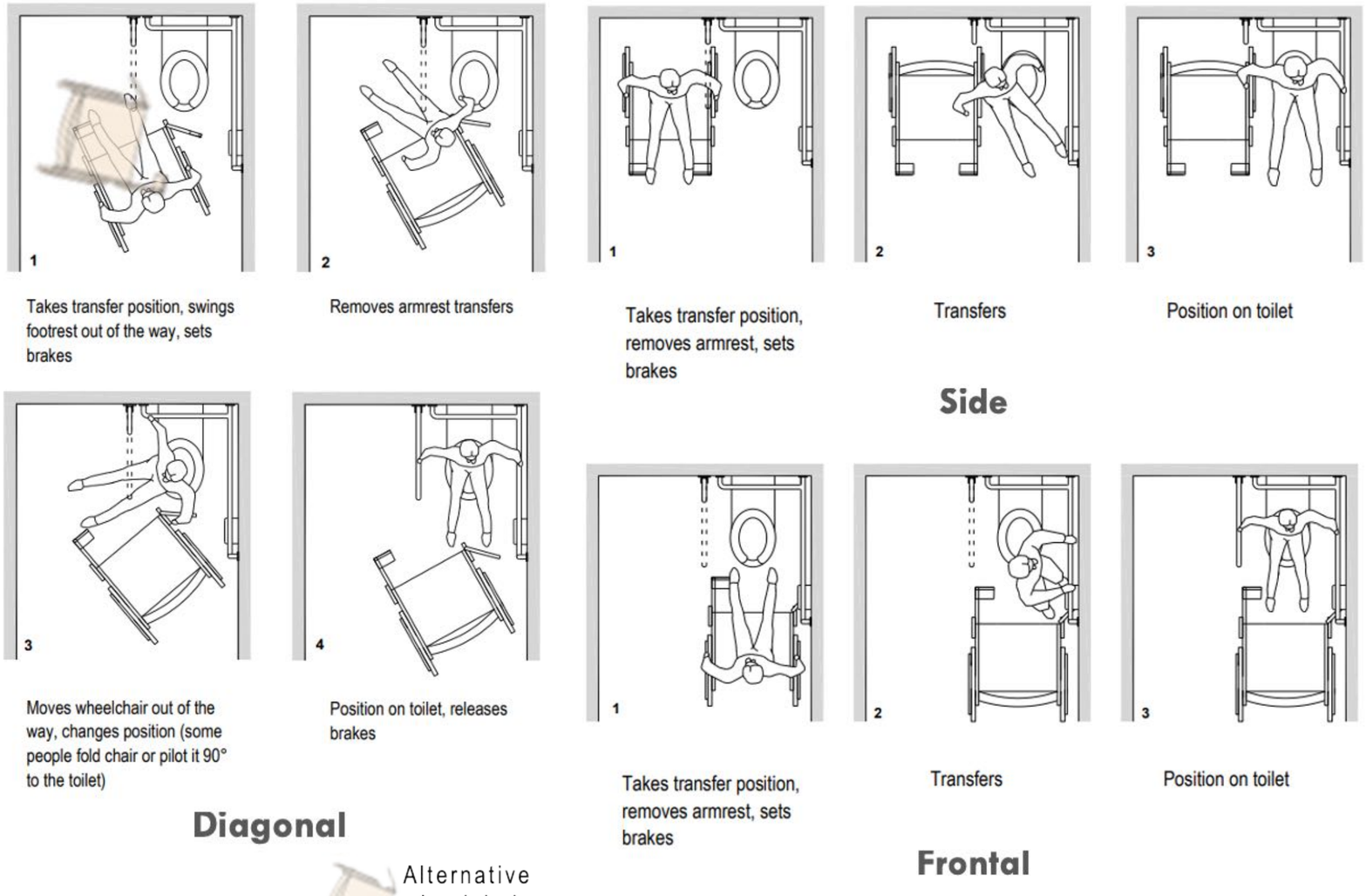


Diagram extracted from BCA's Code on Accessibility

Types of Transfer



Diagrams extracted from BCA's Code on Accessibility

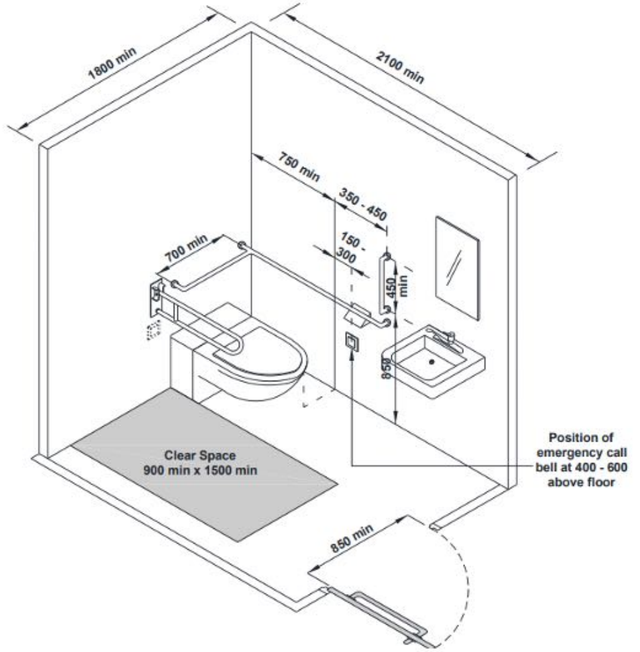
Understanding spaces needed to turn and transfer to and from a wheelchair helps to appreciate how the essential dimensions and placement of grab bars are used in an accessible washroom.

Depending on the individual's ability – strength and reach, transfer techniques will differ. Some individuals may need the assistance of caregiver(s).

Clear space within the washroom allow all transfer types to be achieved.

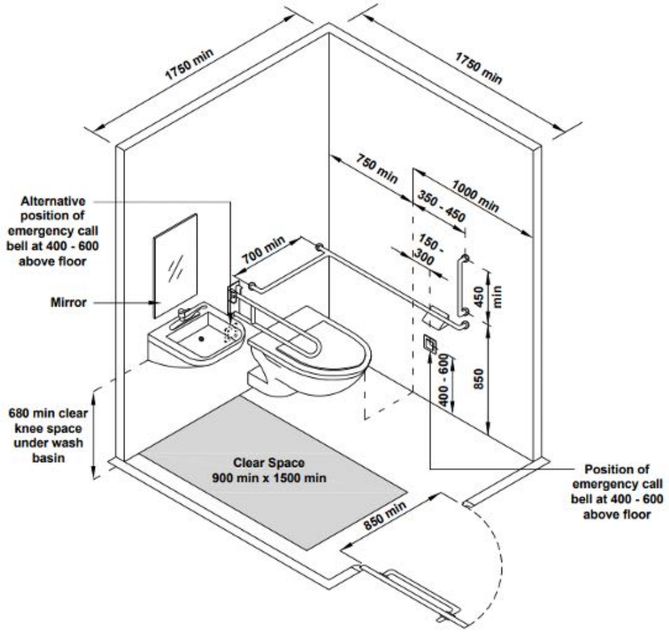
Accessible Washrooms

Individual washrooms are standalone washrooms to allow for use by both genders as well as caregivers of a different gender – Preferred options.



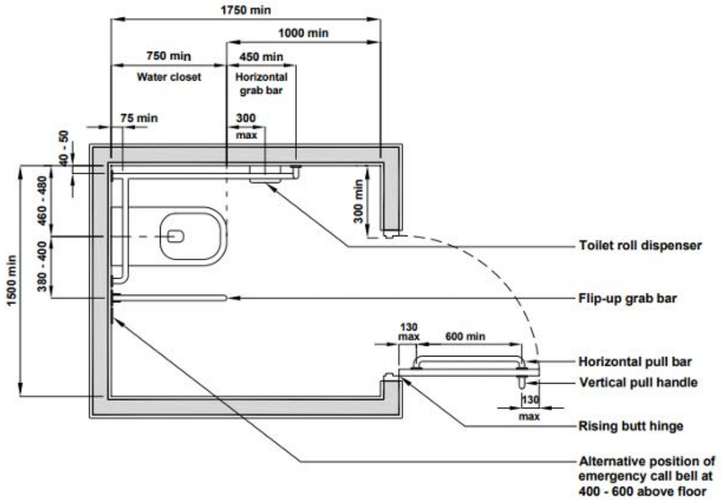
Larger Accessible Individual Washroom

At least one individual washroom to be provided at every toilet cluster.



Accessible Individual Washroom

Accessible water closet compartment is provided within the male and female toilet clusters – though not preferred unless it is in addition to an accessible individual washroom in the same toilet cluster.

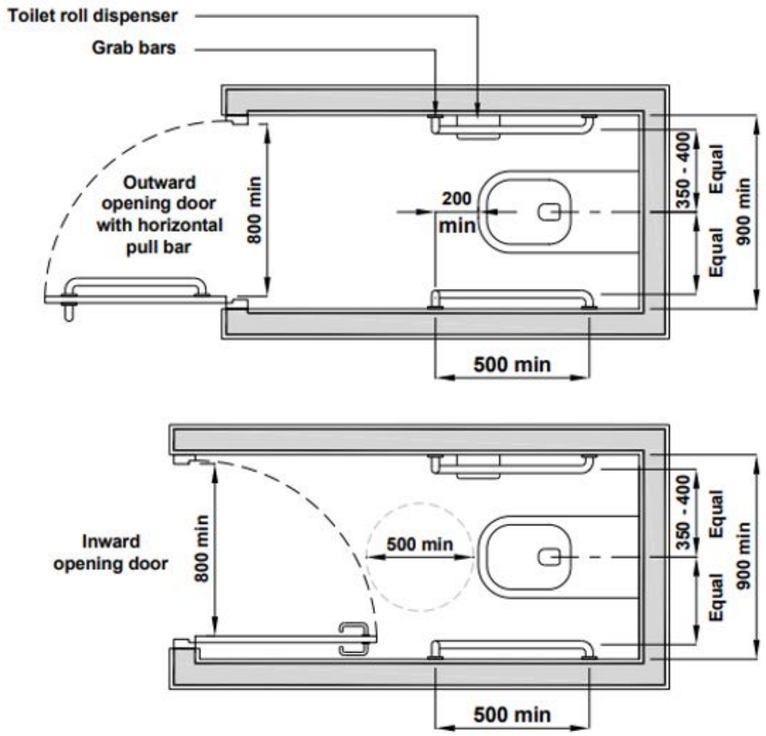


Accessible Water Closet Compartment

Urinals for the ambulant is fitted with grab bars on both sides to allow individuals (incl older persons) who need to rely on grab bars to steady themselves.
A lowered urinal rim can also be used by children.

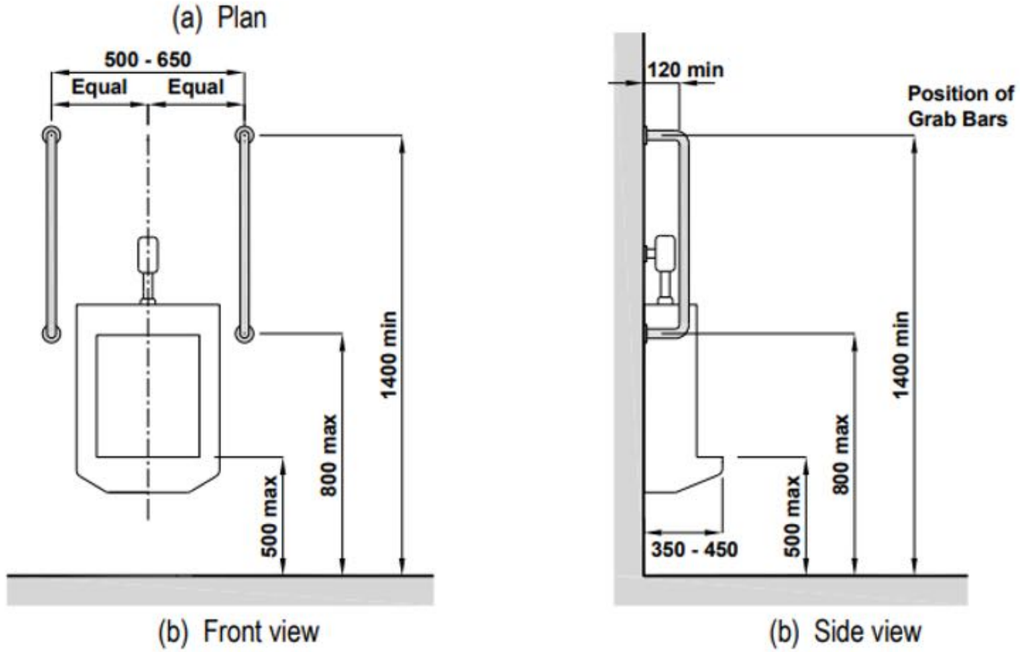
Diagrams extracted from BCA's Code on Accessibility

Washroom for Ambulant



Water closet compartment for Ambulant

With grab bars located on both sides of the water closet, these ambulant compartments are located within toilet clusters to enable individuals (incl older persons) who need to rely on grab bars, to get into a standing position.

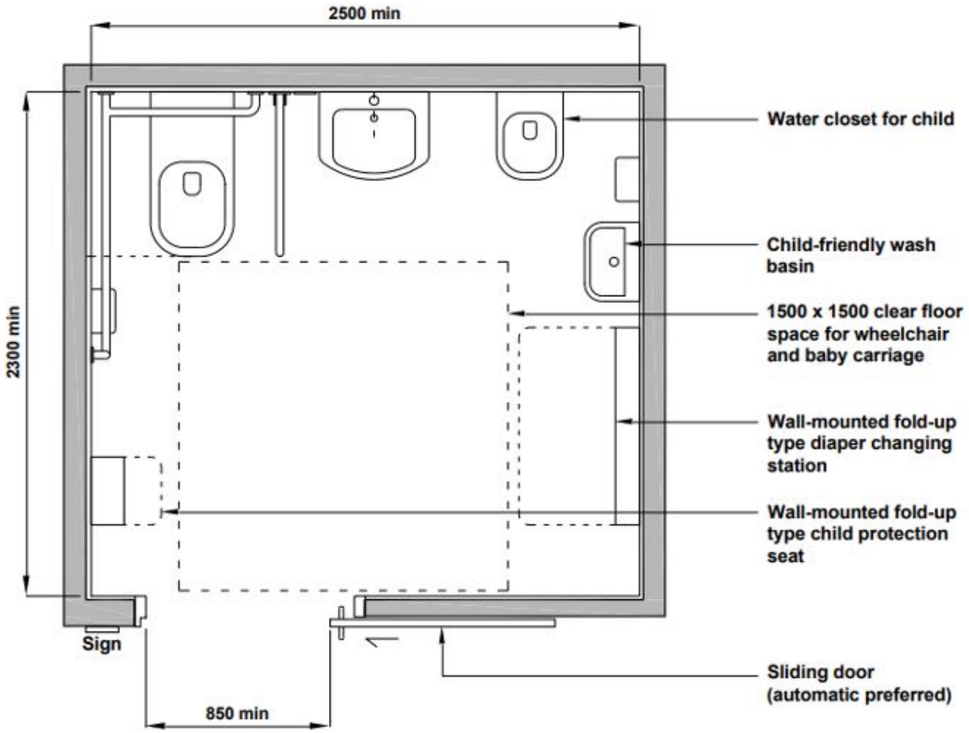


Urinal for Ambulant

Urinals for the ambulant is fitted with grab bars on both sides to allow individuals (incl older persons) who need to rely on grab bars to steady themselves.

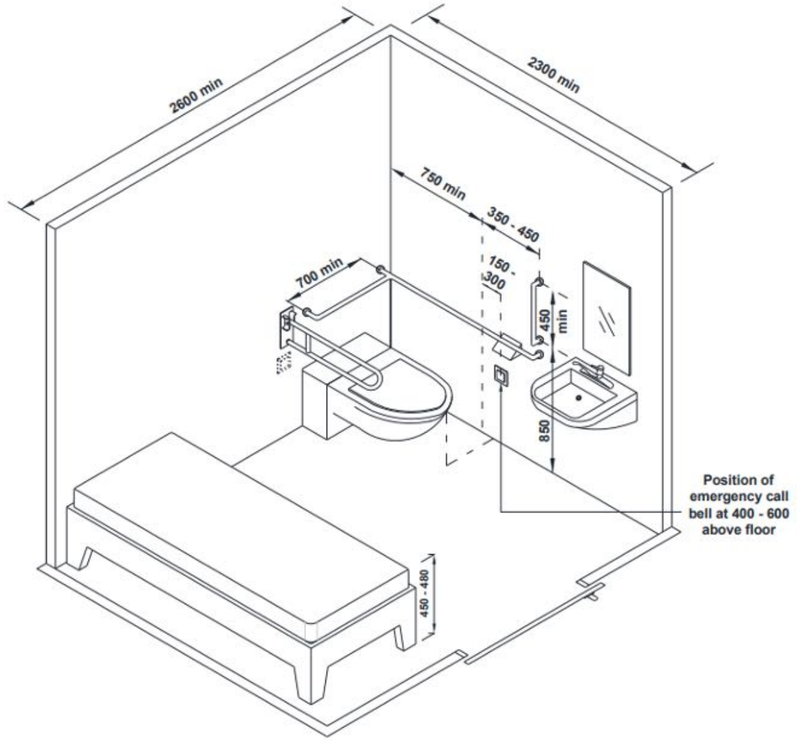
A lowered urinal rim can also be used by children.

Family Friendly Washroom and Changing Room



Accessible Family Washroom
(with child water closet, wash basin, protection seat and diaper changing station)

An accessible family washroom benefits a wide range of users including persons with disabilities, older persons, fathers bringing young daughters to toilet, parents with children in tow, and individuals who may need more than one caregiver to attend to their need. It is also larger sized to accommodate larger personal mobility aids.



Accessible Changing Room

An Accessible Changing Room provides for a height adjustable changing table to allow for dignified diaper changing for older children, teens and adults.

Diagrams extracted from BCA's Code on Accessibility

Family Friendly Washroom and Changing Room

Application of colour contrast – white fixtures against coloured background tiles.

Automatic sliding door with **braille and audio feedback** e.g. ‘door opening, door closing, door locked.

Foldable grab bar needs to be able to be **stored in an upright position**.

Dustbin provided should **not be foot activated** e.g. sensor, swing-top, open top.

Design of Operable Parts

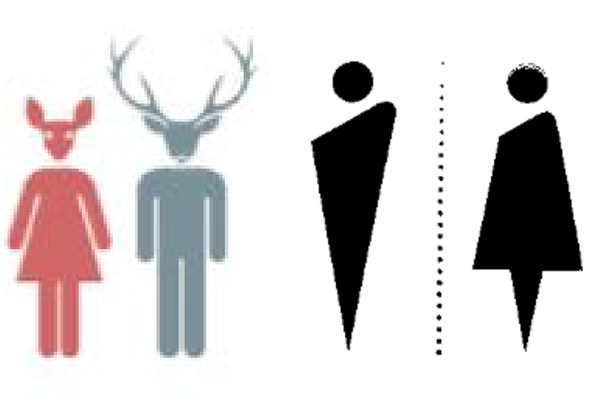
- Be operable with one hand
- Require no tight grasping, pinching or twisting of the wrist
- Operable with a closed fist
- Require a force of 22N or less to activate
- Have lever handles (not self-closing)






Which signs are more easily understood? Why?

X



Which signs are more easily understood? Why?

- Signs should be placed at appropriate locations, be contrasting and prominently displayed to direct visitors.
- The use of pictograms transcend languages and is simple and easy to understand.

Part 3: Fundamentals of Accessibility

Rescue and Evacuation

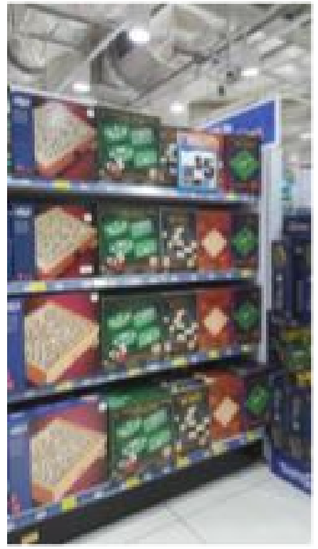
- While providing areas of refuge is essential, it is more important that persons with disabilities employed or present in the building, participate in regular fire drills to ensure relevant parties are aware of the presence of those who need help during times of emergencies. Persons with disabilities and those who need help, will also become aware of the space and how to call for help during actual situations.
- Fire alarms should be able to provide both audio and visual feedback.
- It is advisable to recess fire hose reels to have a clear unobstructed path.
- Location of fire extinguishers and AEDs should be clearly indicated.

Man-made Obstructions

- Event spaces should be pre-laid with electrical points so that unsightly cable trunkings can be avoided.
- Cable trunkings are trip hazards and difficult to overcome.
- Consider running cables overhead – this will create a more welcoming environment and no unsightly trunkings.
- If unavoidable, provide gentle ramp protection placed over the trunking, to ensure safe crossing over trunking.
- Look out for trunkings that have wheelchair logos on them, as this indicates that considerations for wheelchair access have been taken into account.

Part 3: Fundamentals of Accessibility

Other Areas for Consideration



- Placing items within reach of a wheelchair user as well as persons with shorter stature allows them to browse and be independent.
- An alternative is to display items vertically to allow a more comfortable reach by everyone.

Other Areas for Consideration

Selection of appropriate furniture designs can improve usability and inclusion.

By having a handhold along the backrest of the chair (arrowed), it makes it easier to pull out the chair – even with one hand.

A low counter with clear knee space allows assistance to be provided – space should not be repurposed or covered.

Designed to allow a wheelchair user, or a child in a pram to be able to be seated with everyone else – gives a sense of belonging.

Part 3: Fundamentals of Accessibility

Maintenance and unauthorised changes

- Regular maintenance is of the utmost to prevent prolonged ‘out-of-order’ of services as it will cause inconvenience to users e.g. accessible washroom
- It is important to understand the intent of accessibility provisions and to ensure these are not changed or eliminated over time - e.g. when interior design works are carried out and the individual washroom is converted to an accessible washroom compartment or during maintenance when a faulty sensor tap is replaced with a push tap
- These unauthorised changes are infringements to BCA’s Code on Accessibility in the Built Environment.

Thank you!

By LevelField Consultants and Disabled People's Association