

ACCESSIBILITY

Building and Construction Authority



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PREFACE

1. The implementation of the Code on Barrier-Free Accessibility in Buildings (Code) in 1990 was a critical milestone in making our buildings more user-friendly to people with movement difficulties. The Code was last reviewed and expanded in 2002 to include more mandatory barrier-free features in the common areas of new buildings. In addition, four non-mandatory design guidelines were incorporated as appendices to the Code to help architects and building owners in designing buildings for specific needs.
2. In 2004, a Study Committee led by the Building and Construction Authority to look into the level of accessibility in the built environment highlighted the lack of barrier-free inter-connectivity between buildings and from buildings to infrastructure as a major concern. Subsequently, a Code Review Committee with representatives from private and public sectors was formed in November 2005 to update, fine-tune and enhance the code provisions to meet the needs of the future.
3. To create a built environment that is seamlessly connected so that people of all ages and physical conditions will be able to integrate into the mainstream society and lead an active as well as normal life, the scope of the Code has been expanded to achieve accessibility beyond the confine of the building to cover the whole built environment. This revised Code, which is in its 4th edition, contains new requirements pertaining to the interconnection between buildings and from buildings to infrastructure.
4. To prepare for an ageing population, more mandatory requirements on elder-friendly features are incorporated in this revised Code. For example, the code now requires every residential unit to be provided with at least one bathroom which is large enough to be readily retrofitted with elder-friendly features in the future when the need arises. With such provision built in, fewer people will need to move out of their homes or make expensive alterations to their homes if their level of physical ability diminishes with age.
5. Besides enhancing accessibility in residential buildings, the revised Code also contains new requirements that help to improve the level of accessibility in transport stations, bus shelters, vehicles parks, public parks and open spaces.
6. The Code Review Committee also took the opportunity to refine and rearrange some of the existing provisions to improve clarity. Existing provisions that are open to interpretation are refined to remove any possible ambiguity. In addition, some of the diagrams illustrating the various features have been improved.

7. While the provisions in the revised Code are primarily meant to improve mobility for wheelchair users, they will also benefit others such as the elderly, parents with young children and people with different abilities.

8. As the revised Code covers the accessibility in the whole built environment and not just accessibility to and within buildings, its title has also been changed to “Code on Accessibility in the Built Environment 2007” to reflect its expanded scope and intent.

9. The Building and Construction Authority would like to record its appreciation to the members of the Code Review Committee, the industry and public for their invaluable contributions and input, without which this revised Code would not have been possible.

**BUILDING PLAN DEPARTMENT
BUILDING AND CONSTRUCTION AUTHORITY**

CHAPTER 1

SCOPE AND DEFINITIONS

1.1 SCOPE

1.1.1 The aim of this Code is to set out the fundamental design and construction requirements and guidelines for making those buildings specified in Table 1 of Chapter 2 accessible to persons with disabilities.

1.1.2 The requirements and guidelines in this Code are intended to apply to adult persons with disabilities. Where a building is required to be designed or retrofitted to accommodate children with disabilities, it is recommended that the "Design Guidelines for Children with Disabilities" in Appendix E be adopted and followed.

1.1.3 Where residential buildings are required to be designed or retrofitted to provide accessibility and safety to the future elderly and infirm population, it is recommended that the "Design Guidelines for Older Persons" in Appendix D be adopted and followed.

1.1.4 Where a physical environment is needed to meet the needs of persons with visual impairment, designers are encouraged to design or retrofit a building in accordance with the "Design Guidelines for Persons with Visual Impairment" in Appendix F.

Note: *Some people with severe physical disabilities may have requirements beyond the standards provided in this Code.*

1.1.5 In the case of building owners, developers and managing agents who are keen to provide a family-friendly environment in buildings where families with infants and young children are likely to congregate, the "Design Guidelines for Family-Friendly Facilities" in Appendix G are recommended for adoption.

1.1.6 In the case of Parks and Open Spaces, landscape designers are encouraged to adopt the "Design Guidelines for Parks and Open Spaces" as indicated in Appendix H, though it is important to maintain as much of the natural environment as possible.

- 1.1.7 The information and guidelines in the Appendices are not mandatory requirements.

1.2 DEFINITIONS

- 1.2.1 For the purpose of this Code, the definitions below shall apply:

“accessible” describes a site, building, facility, linkway, interconnection or portion thereof that complies with this Code and that can be approached, entered and used by persons with disabilities and elderly persons;

“accessible route” is a continuous unobstructed path connecting all accessible elements and spaces in a building or facility that can be negotiated safely by persons with disabilities. For non-ambulatory persons, this accessible path shall not incorporate any step, drop, stairway, turnstile, revolving door, escalator or other impediment which would prevent it from being safely negotiated by such persons. Interior accessible routes shall include doorways, corridors, floors, ramps, lifts and clear floor spaces at fixtures. Exterior accessible routes shall include parking access aisles, kerb ramps, walkways and ramps;

“ambulant disabled” is a person who is able, either with or without personal assistance, and who may depend on prostheses (artificial limbs), orthoses (callipers), sticks, crutches or walking aids to walk on level or negotiate suitably graded steps provided that convenient handrails are available;

“building” shall include part of a building;

“circulation path” is an exterior or interior way of passage from one place to another for pedestrians including walkways, hallways, courtyards, stairways and stair landings;

“persons with disabilities” are persons whose mobility and use of a building are affected as a consequence of one or more of the following physical or sensory disabilities or impairments:

- (a) ambulant disabled;
- (b) wheelchair-bound;
- (c) hearing impairment or deafness; or
- (d) visual impairment or blindness.

“grab bar” is a bar used to give a steadying or stabilising assistance to a person engaged in a particular function;

“handrail” is a rail used in circulation areas such as corridors, passageways, ramps and stairways to assist in continuous movement;

“individual washroom” is a compartment having the basic requirements of a water closet compartment, wash basin and other essential washroom accessories as required by persons with disabilities;

“kerb” is a side barrier to a trafficable surface;

“kerb ramp” is a short ramp cutting through a kerb or built up to it;

“operable part” is part of a piece of equipment or appliance used to insert or withdraw objects or to activate, deactivate, or adjust the equipment or appliance (for example, coin slot, push-button, handle);

“ramp” is an inclined way connecting one level to another;

“symbol” means the International symbol of access for persons with disabilities;

“water closet compartment” is a compartment having a water closet with grab bars installed to assist persons with disabilities;

“wheelchair user” is a person who depends on a wheelchair for mobility;

“width” is the clear distance from one finished surface to another;

“access route plan” are plan(s) showing the barrier-free access to the building from adjacent buildings and nearest public facilities as well as barrier-free access within the building;

“place of public resort” means a building or a defined or enclosed place used or constructed or adapted to be used either ordinarily or occasionally as a church, chapel, mosque, temple or other place where public worship is or religious ceremonies are performed, not being merely a dwelling house so used, or as a community club, country club, or as a cinema, theatre, public exhibition / concert / lecture hall, public ballroom, museum, stadium or as a public place of assembly for persons admitted thereto by ticket or otherwise or used or constructed or adapted to be used either ordinarily or occasionally for any other public purpose.

1.2.2 Unless otherwise specified, all dimensions shown in the figures in this Code are in millimetres (mm).

1.2.3 Where “shall” is used in this Code, it refers to mandatory design requirements and where “should” is used, it refers to recommended design requirements.

1.2.4 Unless the context otherwise requires —

- (a) words importing the singular shall include the plural and vice versa; and
- (b) words importing the masculine gender shall include the feminine gender and vice versa.

CHAPTER 2

PROVISIONS FOR PERSONS WITH DISABILITIES

2.1 BARRIER-FREE ACCESSIBILITY

2.1.1 The areas or levels in the types of buildings specified in *Table 1* shall be made accessible for persons with disabilities in accordance with the provisions of this Code:

TABLE 1

Accessibility for Persons with Disabilities

Types of buildings	Accessible areas
1. Residential buildings: (a) 4-storeys and below (without lift access); (b) 4-storeys and below (with lift access); (c) 5-storeys and above.	All communal areas and facilities at 1st storey. All communal areas and facilities. All communal areas and facilities.
2. Office buildings.	All areas intended for access by employees or public.
3. Shophouses.	The first storey for non-residential use shall be accessible to employees or public.
4. Shopping complexes and multi-purpose complexes.	All areas intended for access by employees or public.
5. Hotels, boarding houses and chalets.	All areas intended for access by employees or public.
6. Places of public resort	All areas intended for access by employees or public.
7. Parks and open spaces including zoo, civic plaza, etc	All areas intended for access by employees or public.

PROVISIONS FOR PERSONS WITH DISABILITIES

Types of buildings	Accessible areas
8. Schools, colleges, universities or institutions of learning.	All areas intended for access by staff, students or public.
9. Hostels, halls of residence or dormitories.	All areas intended for access by staff, students or public.
10. Sports complexes and public swimming pools.	All areas intended for access by employees or public.
11. Restaurants and eating establishments.	All areas intended for access by employees or public.
12. Markets and hawkers or food centres.	All areas intended for public access.
13. Hospitals, clinics, dispensaries, nursing homes, homes for the aged and welfare homes.	All areas intended for access by staff, patients, inmates or public.
14. Factories, workshops, industrial buildings and office/showroom areas in warehouses.	All areas intended for access by employees or public.
15. Transport stations, interchanges, passenger terminals, administration buildings in depots, taxi and bus shelters.	All areas intended for access by employees or public.
16. Vehicle parks (surface parking or vehicle parking buildings).	Prescribed areas. For vehicle parking buildings, at least 50% of carpark decks to be made barrier-free accessible.

2.2 MINIMUM ACCESSIBLE PROVISIONS

2.2.1 Banks and ticketing offices

- 2.2.1.1 At least one service counter shall be provided in banks and ticketing offices in accordance with the requirements of clause 3.11.3.

2.2.2 **Service booths**

- 2.2.2.1 Where kiosks and/or dispensers such as automatic teller machines (ATMs), cash dispensers, cash deposit machines, electronic service stations (eg. AXS, SAM, multimedia kiosks), library book-drops are provided; at least one kiosk and/or dispenser shall be made accessible.

2.2.3 **Hotels and boarding houses**

- 2.2.3.1 In hotels and boarding houses, at least one in every 200 guestrooms or part thereof shall be accessible.
- 2.2.3.2 In addition to clause 2.2.3.1, at least one in every 50 guestrooms or part thereof shall be provided with elder-friendly features such as grab bars in the bathrooms/toilets.

Note: *For hotels or boarding houses that are expected to cater to a larger number of persons with disabilities the owners are encouraged to provide over and above the required minimum number of guestrooms.*

2.2.4 **Cinemas, theatres, concert halls, stadia or other places of public resort**

- 2.2.4.1 In cinemas, theatres, concert halls, stadia or other places of public resort where permanent fixed seating arrangement is provided, a minimum of two wheelchair spaces shall be provided where there are 200 seats or less. Additional one wheelchair space shall be provided for every subsequent 200 seats or part thereof.
- 2.2.4.2 The wheelchair spaces, each measuring 900 mm X 1200 mm, shall be located alongside the fixed seats to enable wheelchair users to sit together with their able-bodied or ambulant companion.

Note:

- (a) *Wheelchair spaces should be an integral part of any seating plan. Efforts must be made to disperse the seating spaces throughout the seating area and in each pricing tier.*
- (b) *Persons on wheelchairs usually sit higher and their viewing positions should be arranged so as not to obstruct the view of persons who may be seated behind.*

2.2.5 **Hostels, halls of residence or dormitories**

2.2.5.1 In hostels, halls of residence or dormitories, at least one in every 100 rooms or part thereof shall be accessible.

2.2.6 **Sports complexes and public swimming pools**

2.2.6.1 In sports complexes and public swimming pools at least one individual shower stall shall be accessible.

2.2.7 **Departmental stores, supermarkets, foyers and public concourses**

2.2.7.1 In departmental stores, supermarkets, foyers of places of public resort and public concourses, seats shall be provided for persons who are unable to stand for long periods.

Note:

- (a) *It is recommended that seats be provided with armrests or grab bars to assist elderly or persons with disabilities to get up from the seats.*
- (b) *Where changing rooms are provided in departmental stores or supermarkets, it is recommended that at least one accessible changing room should be provided with foldable door, swing out doors or curtain. The size of room should have a minimum of 1000 mm X 1200 mm.*

2.2.7.2 At least one accessible checkout lane and counters shall be provided.

2.2.8 **Transport station**

2.2.8.1 Where entrances are located across roads, at least one entrance on each side of the road shall be made accessible.

2.2.9 **Bathroom in residential unit**

2.2.9.1 In residential unit (residential building specified in Table 1 of Chapter 2), at least one bathroom shall be able to be retrofitted to one suitable for wheelchair users in future. Its design shall comply with clause 4.14.

2.3 **APPLICATION**

2.3.1 The provisions of this Code shall not apply to plant and equipment rooms in a building as persons with disabilities are not expected to be performing maintenance tasks in these rooms.

2.3.2 Where plans for repairs, alterations or additions to an existing building are submitted and, where the Commissioner of Building Control is of the opinion that the repairs, alterations or additions are major and substantial and are generally spread over the entire building, he may, in writing, direct the qualified person who submitted the plans to comply with the requirements of this Code.

2.4 **INTER-CONNECTIVITY**

2.4.1 The access route plan shall be accompanied with the application for building plan approval or application for Temporary Occupation permit / Certificates of Statutory Completion if it has not been submitted earlier or there is an amendment to the access route.

2.4.2 The provisions of this Code apply to building works within the development and it shall be read in conjunction with LTA's and NParks' guidelines where streetworks/public footpaths and public open spaces/parks are involved respectively. Where interfaces between buildings and from building to infrastructures are involved, the applicant for the building works shall ensure that accessibility right up to the interface is considered.

CHAPTER 3

GENERAL REQUIREMENTS

3.1 APPROACHES

3.1.1 Access to building

3.1.1.1 The buildings specified in *Table 1* of Chapter 2 shall be provided with at least one accessible entrance door served by an approach complying with clause 3.1.2.

3.1.1.2 The access shall be through the main entrance of the building.

Note: *If there are other main entrances, such entrances should be made accessible.*

3.1.1.3 Directional signs bearing the symbol shall be displayed at all other non-accessible entrances to direct persons with disabilities to the accessible entrance.

3.1.1.4 At least one accessible route leading to an accessible entrance of the building shall be provided from the alighting and boarding point of taxi shelters, bus shelters (if any) and vehicle parking lots for persons with disabilities.

3.1.1.5 The width of the accessible entrance door shall not be less than 850 mm as described in clause 3.8.2 and the width of corridors or passageways leading to and from such access door shall not be less than 1200 mm.

3.1.1.6 A floor diagram embossed on metal, plastic or other durable material indicating the accessible route and facilities shall be displayed at an appropriate place in every storey of a non-residential building. In the case of residential building, it shall be displayed at appropriate place where common facilities are provided.

3.1.2 Approach to building

3.1.2.1 A passenger alighting and boarding point complying with clause 3.1.3 should, where possible, be provided at the level of approach for persons with disabilities to alight from and board a vehicle.

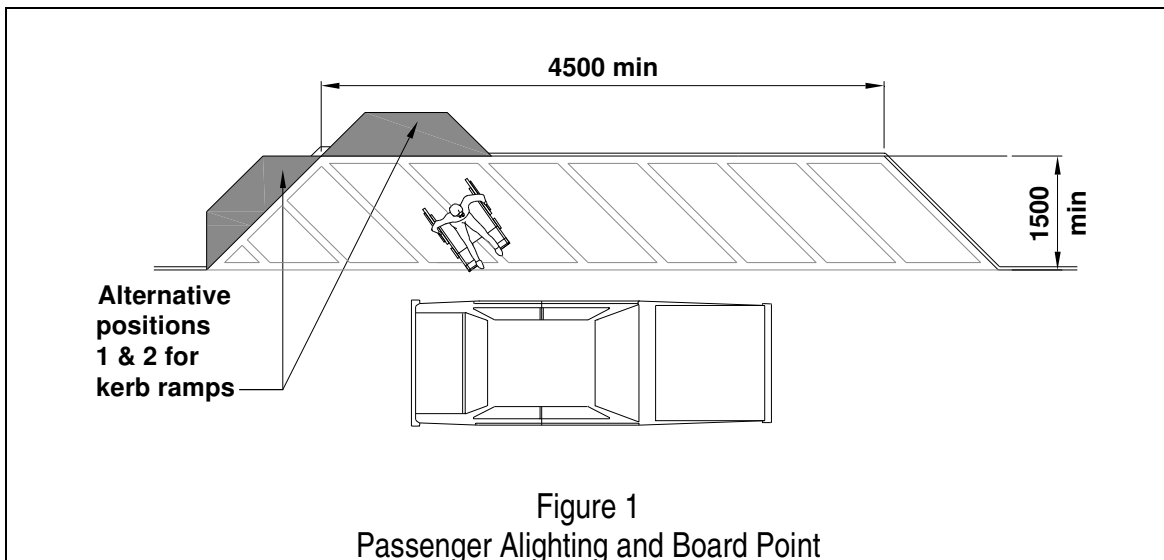
3.1.2.2 Where transfer has to be made from a vehicular surface to a pedestrian surface, the driveway and the pavement or footway surfaces shall be blended to a common level or ramped.

3.1.2.3 Differences in level between the driveway and the pavement or footway level shall be avoided. Where the difference is unavoidable then such drop shall comply with clause 3.2 and *Table 2*.

3.1.3 Passenger alighting and boarding point

3.1.3.1 A passenger alighting and boarding point, as illustrated in *Figure 1*, shall –

- (a) provide an access aisle of at least 1500 mm wide by 4500 mm long adjacent and parallel to the vehicle pull-up space;
- (b) have a kerb ramp complying with clause 3.4 if there is a kerb between the access aisle and the vehicle pull-up space; and
- (c) where possible, be sheltered.



3.2 CHANGE IN LEVEL

3.2.1 Any change in level of the floor surface, the gradient of the slope shall conform to *Table 2*.

TABLE 2

Changes in Level

Changes in Vertical Rise (mm)	Gradient not steeper than
0 to 15	1 : 2
more than 15 to 50	1 : 5
more than 50 to 200	1 : 10
Exceeding 200	1 : 12

3.2.2 Where the change in vertical rise is more than 15 mm to 200 mm –

- (a) The ramp and landings shall be of contrasting colour; or
- (b) a coloured band shall be painted or marked across the top and bottom levels of the ramp or slope; alternatively, tactile warning indicators may be provided in lieu of coloured band. The tactile indicators shall be set back 300 mm from the edge of ramp.

as illustrated in *Figure 2* so that the ramp or slope can clearly be seen and identified.

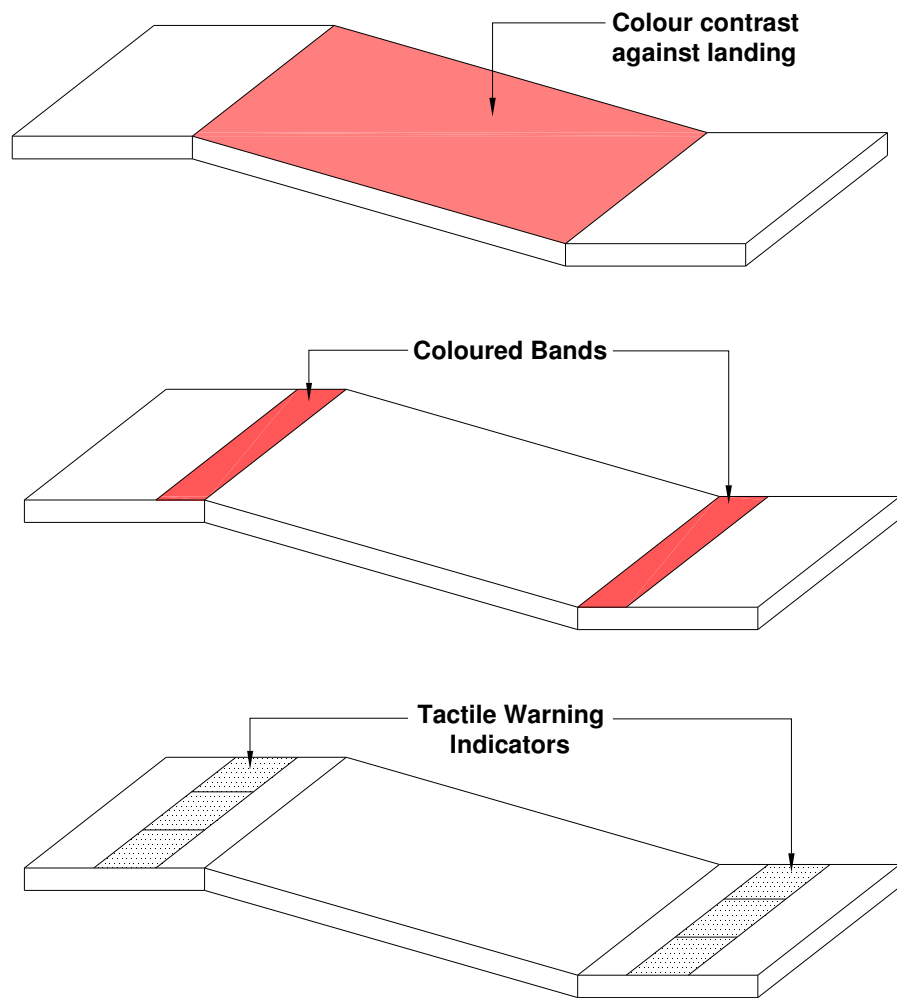


Figure 2
Contrasted Colour, Coloured Bands or Tactile Warning Indicators on Ramp

3.3 RAMPS

3.3.1 General

3.3.1.1 Ramps allow wheelchair users to move from one level to another.

3.3.1.2 Where the horizontal run of an approach ramp exceeds 9.0 m in length, an alternative stepped approach as shown in *Figure 3*, complying with the requirements in clause 3.9, in addition to the ramp approach, may be provided for the ambulant disabled and the total rise of any flight of steps shall not exceed 1200 mm.

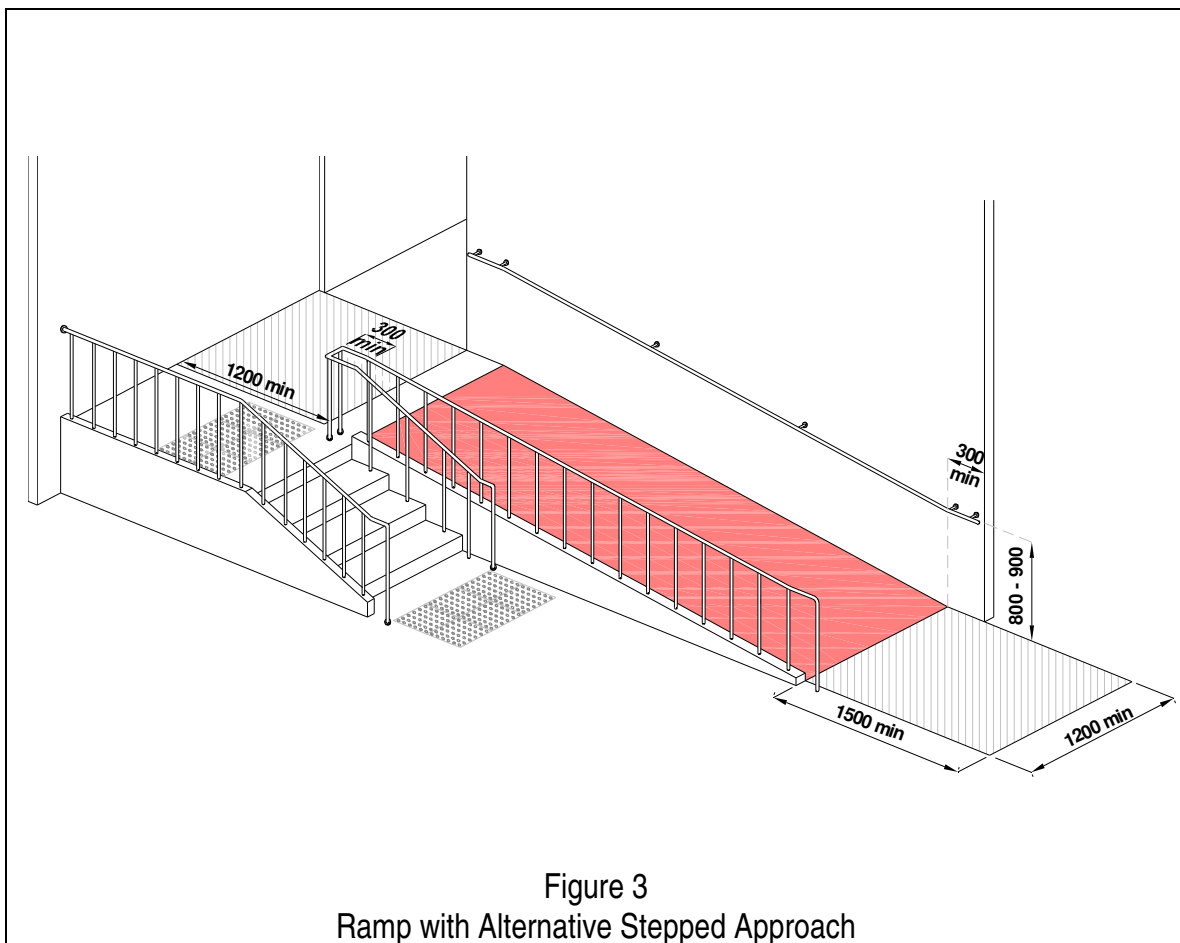


Figure 3
Ramp with Alternative Stepped Approach

- Note:
- (1) *Ambulant disabled negotiate steps more easily and safely thus accessibility by both steps and ramps is preferred.*
 - (2) *Where the change in level results in having a combination of multiple ramps and landings, other solutions should be considered.*

3.3.2 Gradient

3.3.2.1 The gradient of a ramp shall:

- (a) comply with *Table 2*; and
- (b) be constant between landings.

3.3.3 Width

3.3.3.1 The minimum width of a ramp shall be 1200 mm.

3.3.4 Surfaces

3.3.4.1 Ramps and landing surfaces shall be slip-resistant and in accordance with the current edition of SS 485.

3.3.5 Landings

3.3.5.1 Ramps shall have a level landing at the top and bottom of each run and also where the run changes direction as shown in *Figure 4*.

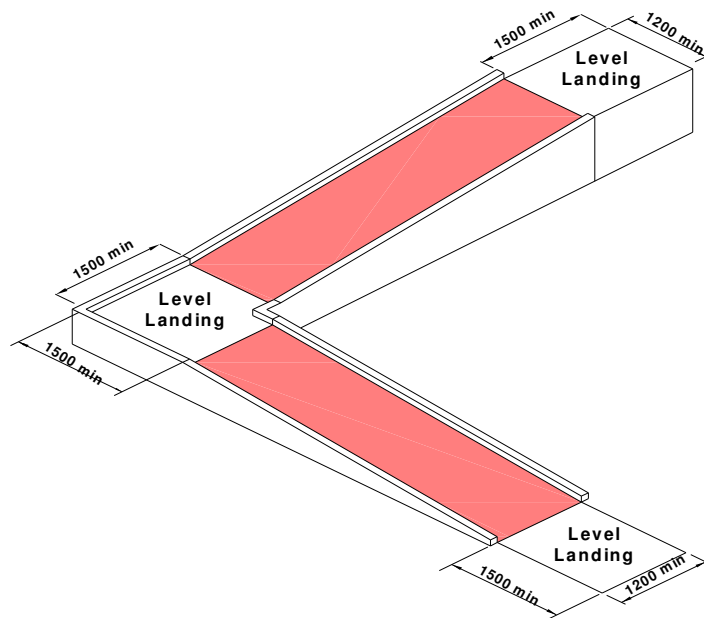


Figure 4
Level Landings and Edge Protection

3.3.5.2 Landings:

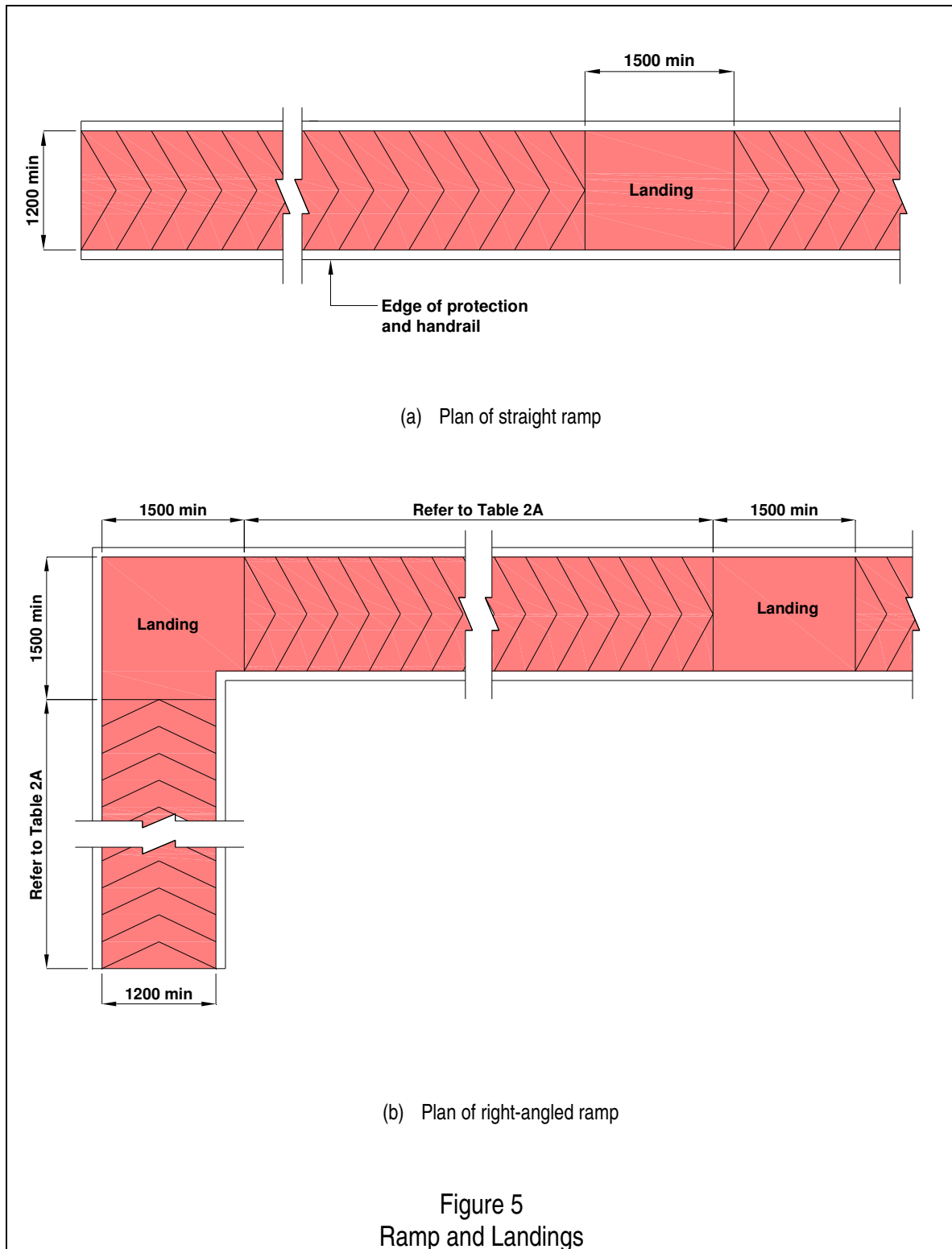
- (a) shall have a level platform of not less than 1500 mm;
- (b) shall be provided at regular intervals for different gradient and the intervals shall not be more than as shown in *Table 2A*. *Figure 5* illustrates a typical plan of ramp and landings;
- (c) need not be provided if the gradient of a ramp is equal or gentler than 1 : 25; and
- (d) shall conform to clause 3.8.4 if served by a doorway.

TABLE 2A

Gradient and length of a ramp

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

Note: *For ramp gradients between those specified in Table 2A, the intervals shall be obtained by linear interpolation.*



3.3.6 Ramp Handrails

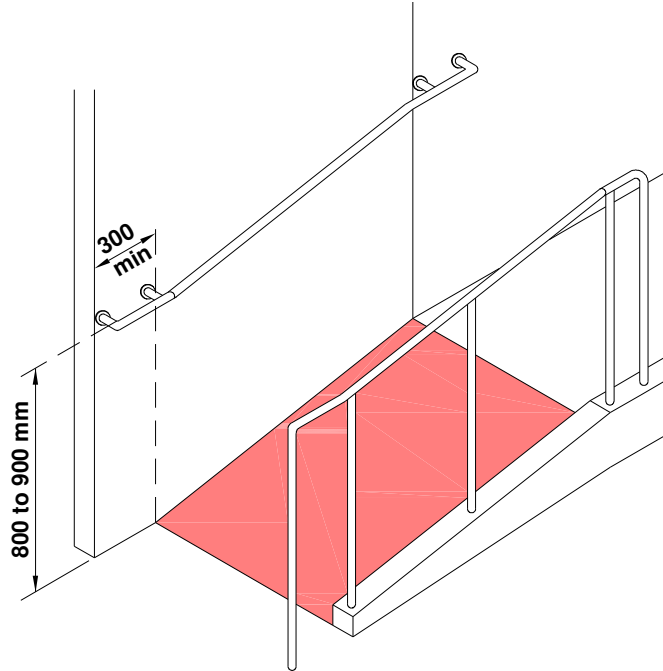
3.3.6.1 Except for the provision in clause 3.3.6.3, a ramp run with a rise greater than 175 mm shall have handrails that:

- (a) are on both sides;
- (b) comply with clause 3.5.2; and
- (c) are placed at a height of between 800 mm and 900 mm above the floor level.

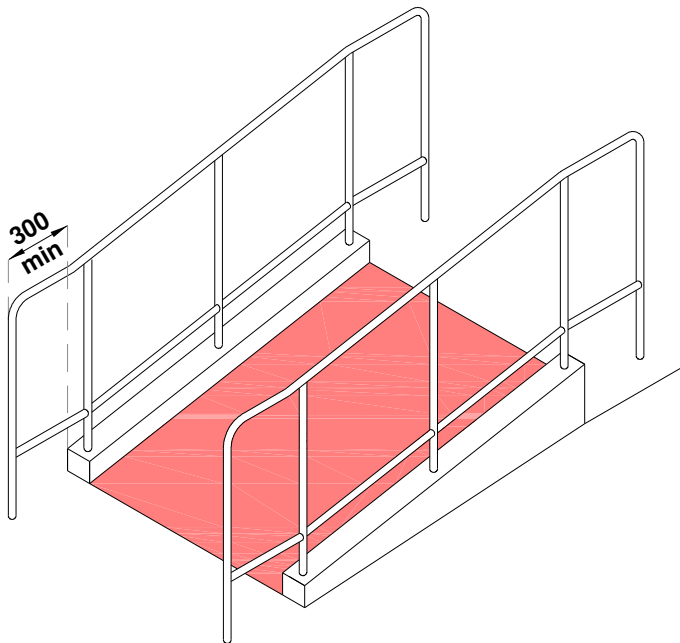
3.3.6.2 Handrail extensions as shown in *Figure 6*:

- (a) shall extend horizontally for a distance of not less than 300 mm beyond the top and bottom of the ramp to provide support for persons who may need help to negotiate the ramp; and
- (b) should not project into another path of travel.

3.3.6.3 Handrails need not be provided if the gradient of a ramp is equal or gentler than 1 : 25

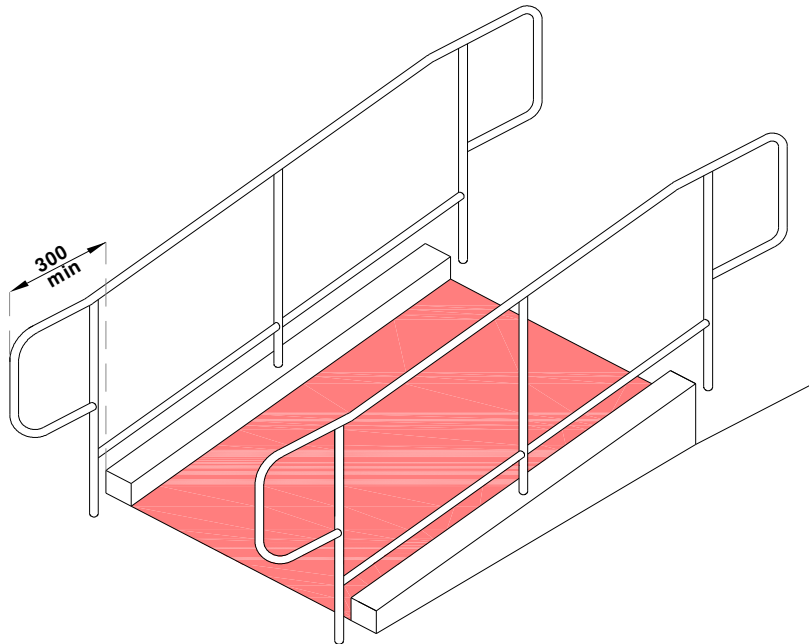


(a) Handrail returns to wall



(b) Handrail returns to floor

Figure 6
Handrails Extensions



(c) Handrail returns to post

Figure 6
Handrails Extensions

3.3.7 Edge Protection

3.3.7.1 Ramps and landings not adjacent to a wall shall have an edge protection such as:

- (a) a kerb with a minimum height of 75 mm as shown in *Figure 7(a)*;
- (b) a raised barrier with its lower edge not more than 75 mm from the ramp or landing surface as shown in *Figure 7(b)*; or
- (c) a rail with the bottom edge not more than 75 mm from the ramp or landing surface as shown in *Figure 7(c)*.

Note: *The ends of the rail as shown in Figure 7(c) should be safely returned to the floor.*

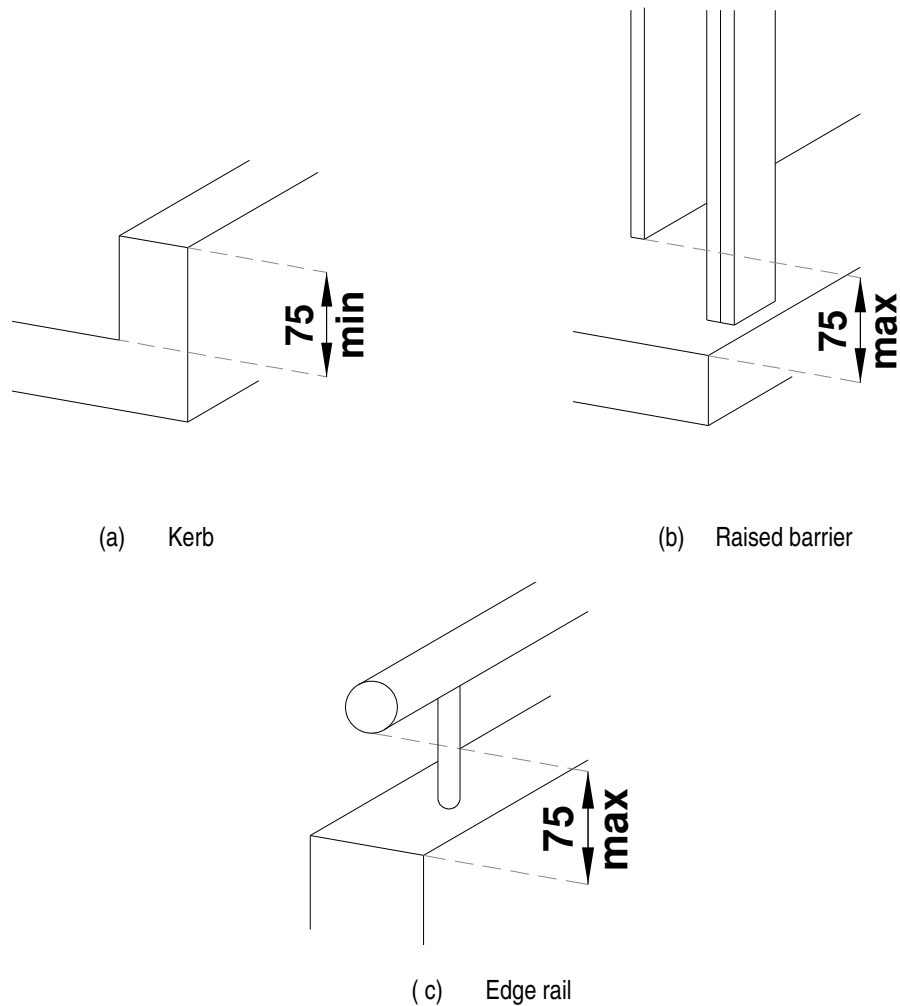


Figure 7
Edge Protection

Note: *Clause 3.3 does not apply to the footpath within the road reserve that generally is parallel and adjacent to the road.*

3.3.8 Outdoor Conditions

3.3.8.1 Outdoor ramps and their approaches shall be designed so that water will not accumulate on the walking surfaces.

3.4 KERB RAMPS AT WALKWAYS AND PEDESTRIAN CROSSINGS

3.4.1 General

3.4.1.1 Kerb ramps:

- (a) do not require handrails;
- (b) shall not project onto a road surface;
- (c) shall be located or protected to prevent obstruction by parked vehicles; and
- (d) shall be free from any obstruction, such as signposts, traffic lights, bollards and the like.

3.4.1.2 The gradient of a kerb ramp shall not be steeper than 1:10.

3.4.1.3 The width of a kerb ramp shall not be less than 900 mm.

3.4.1.4 Where the vertical rise is greater than 175 mm, it shall constitute a ramp and shall conform to the requirements of clause 3.3.

3.4.1.5 Surfaces of kerb ramps shall –

- (a) be slip-resistant; and
- (b) have a detectable warning surface 600 mm wide where the colour and texture are contrasted with the adjacent surfaces.

Note: *A textured surface will assist in giving a secure foothold to the ambulant disabled. A detectable surface with a change in plane will assist persons with visual impairment.*

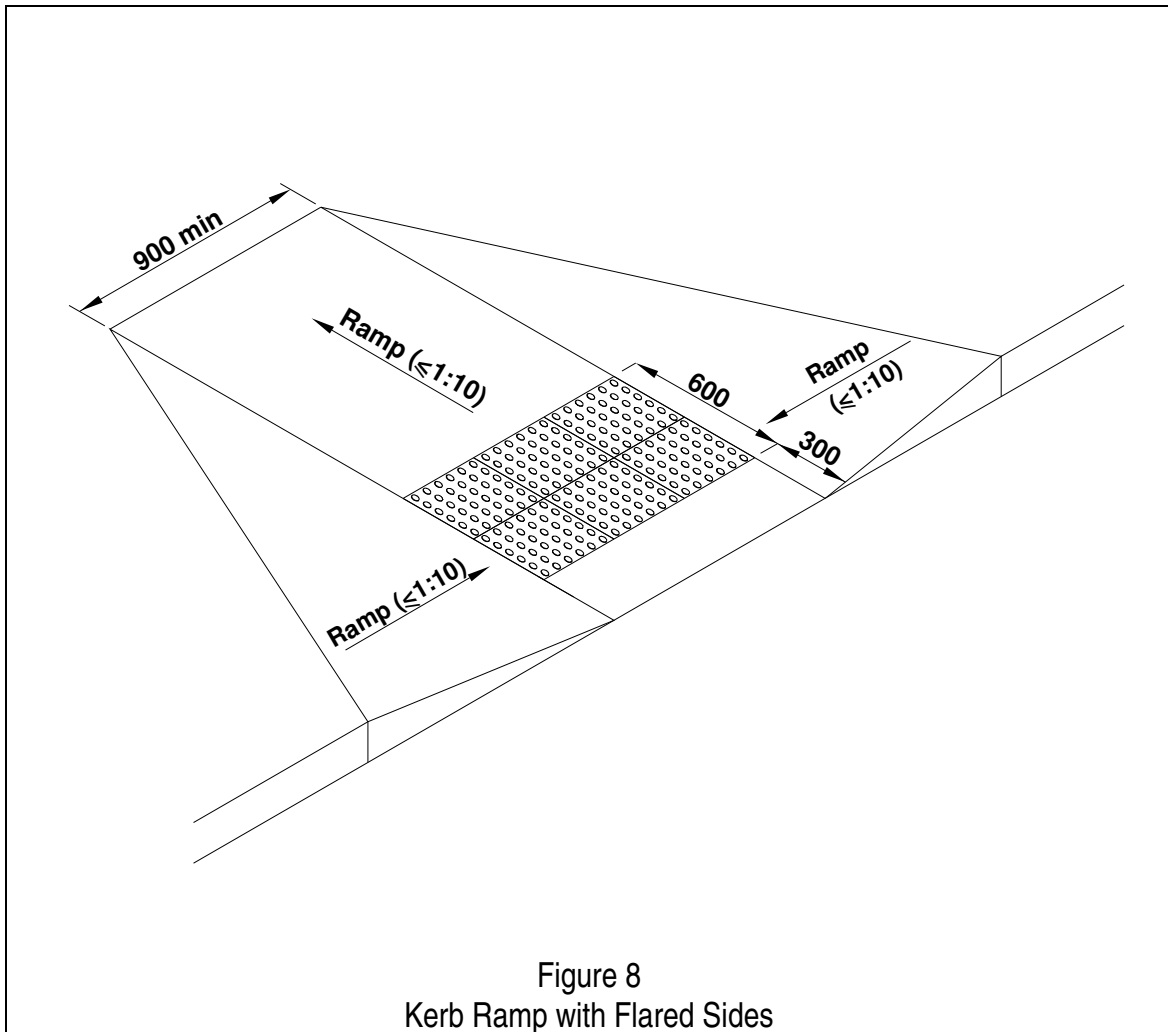
3.4.2 Outdoor conditions

3.4.2.1 The approach shall be designed so that water will not accumulate on the walking surfaces.

3.4.3 Kerb ramp with flared sides

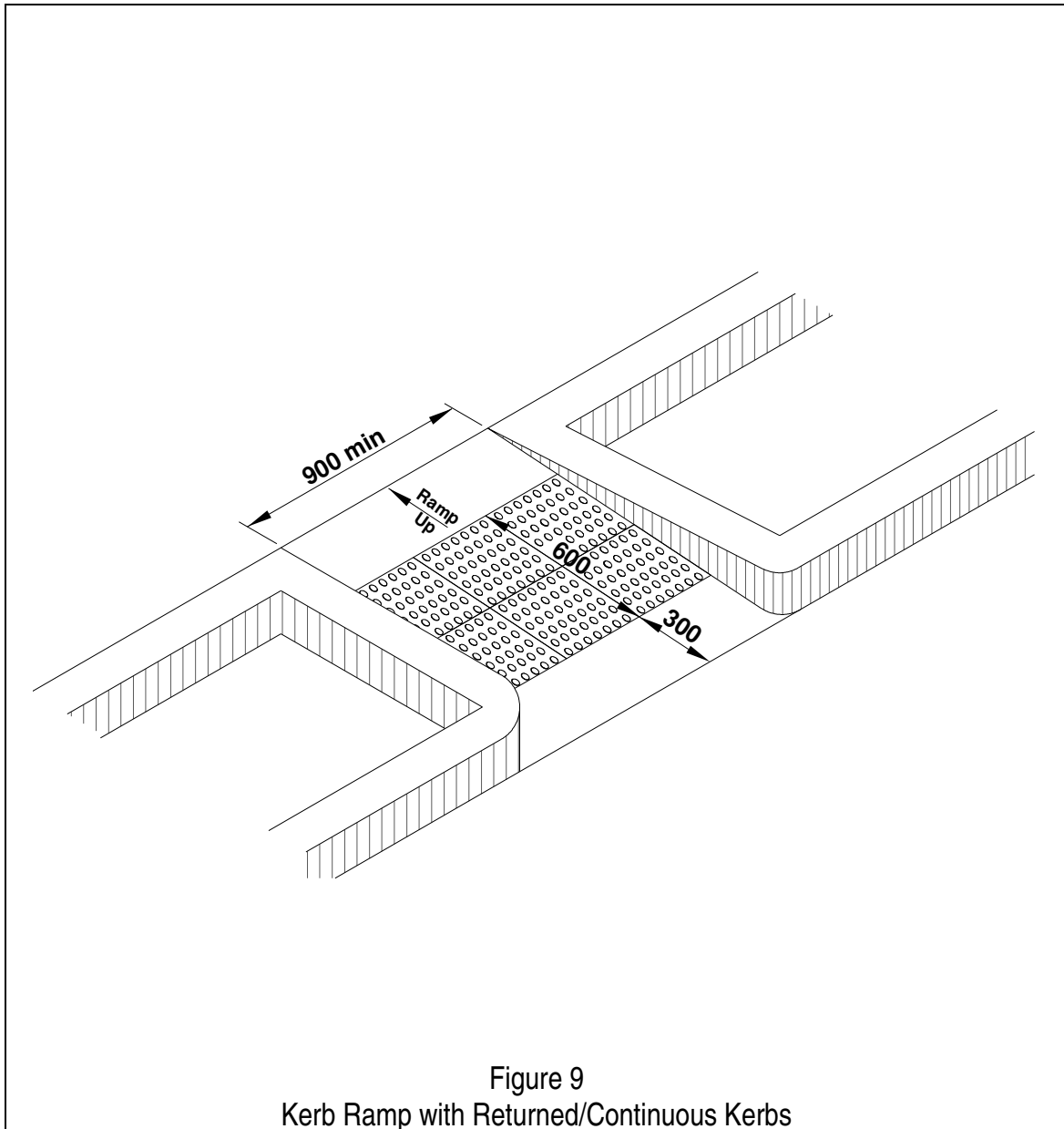
3.4.3.1 Kerb ramps shall have flared sides where pedestrians are likely to walk across them as shown in *Figure 8*.

3.4.3.2 The gradient of the flared sides shall not be steeper than 1:10.



3.4.4 **Kerb ramps with returned/continuous kerbs**

- 3.4.4.1 Kerb ramps with returned/continuous kerbs as shown in *Figure 9* are an alternative approach that can be used where pedestrians are not expected to walk across the ramp.



3.4.5 **Kerb ramps with built-up/extended kerbs**

- 3.4.5.1 Kerb ramps with built-up or extended kerbs as shown in *Figure 10* are not recommended if they project into a roadway as they are dangerous to users and obstructive to vehicles.

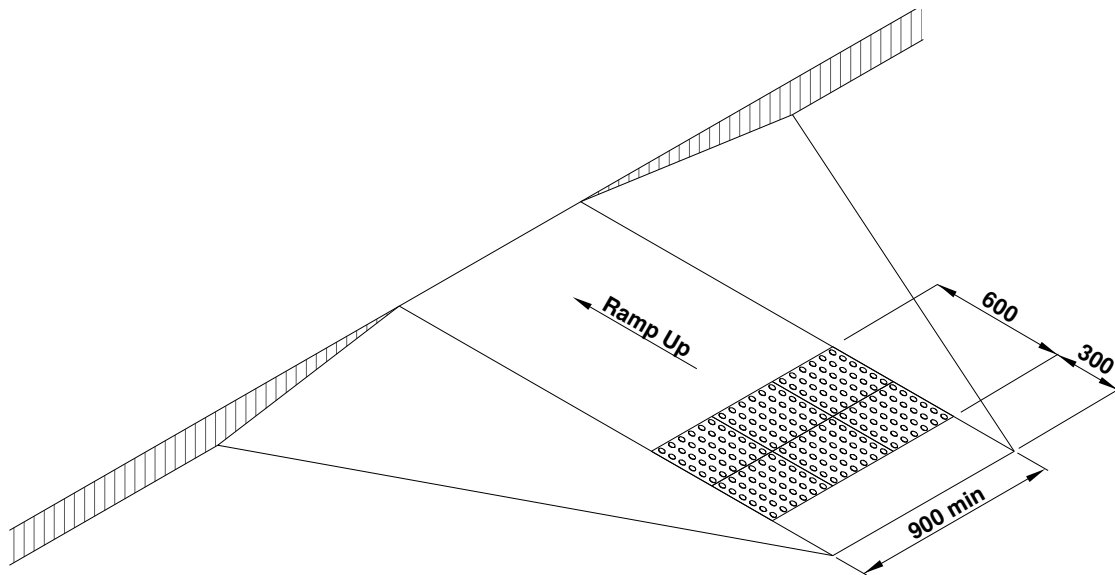


Figure 10
Kerb Ramp with Built-Up/Extended Kerbs

3.4.6 **Location at Pedestrian Crossing**

- 3.4.6.1 Kerb ramps at pedestrian crossings shall be wholly contained within the area designated for pedestrians' use as shown in *Figure 11*.

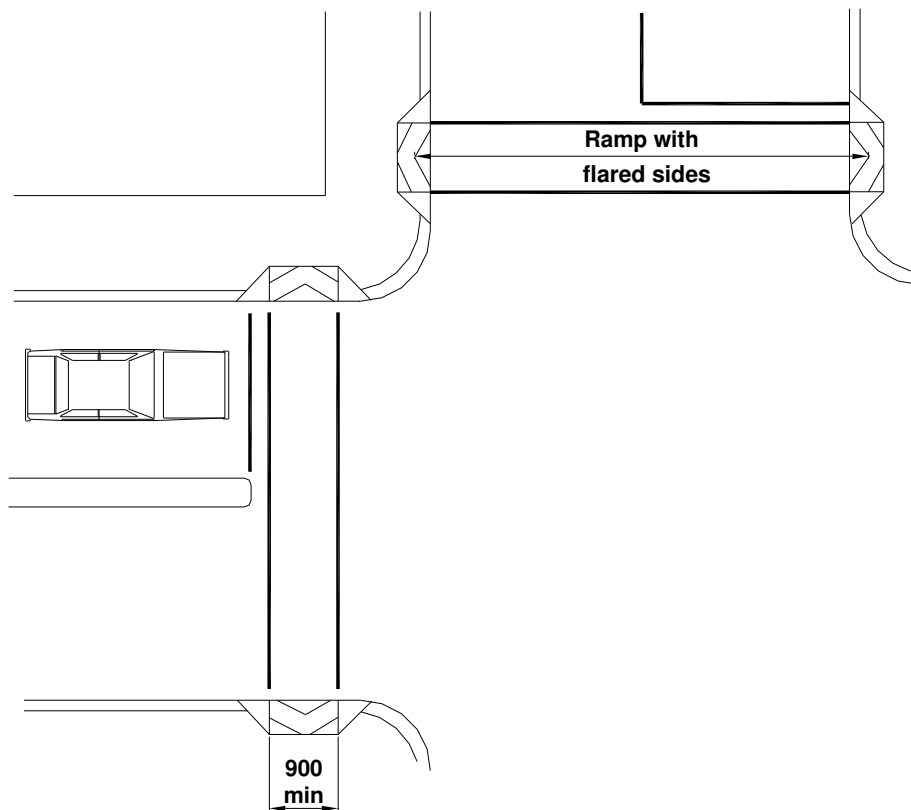


Figure 11
Location at Pedestrian Crossings

3.4.7 Islands

3.4.7.1 Raised islands in crossings shall:

- (a) be cut through and level with the street as shown in *Figure 12*; or
- (b) have kerb ramps at both sides and have a level area not less than 1200 mm long in the middle.

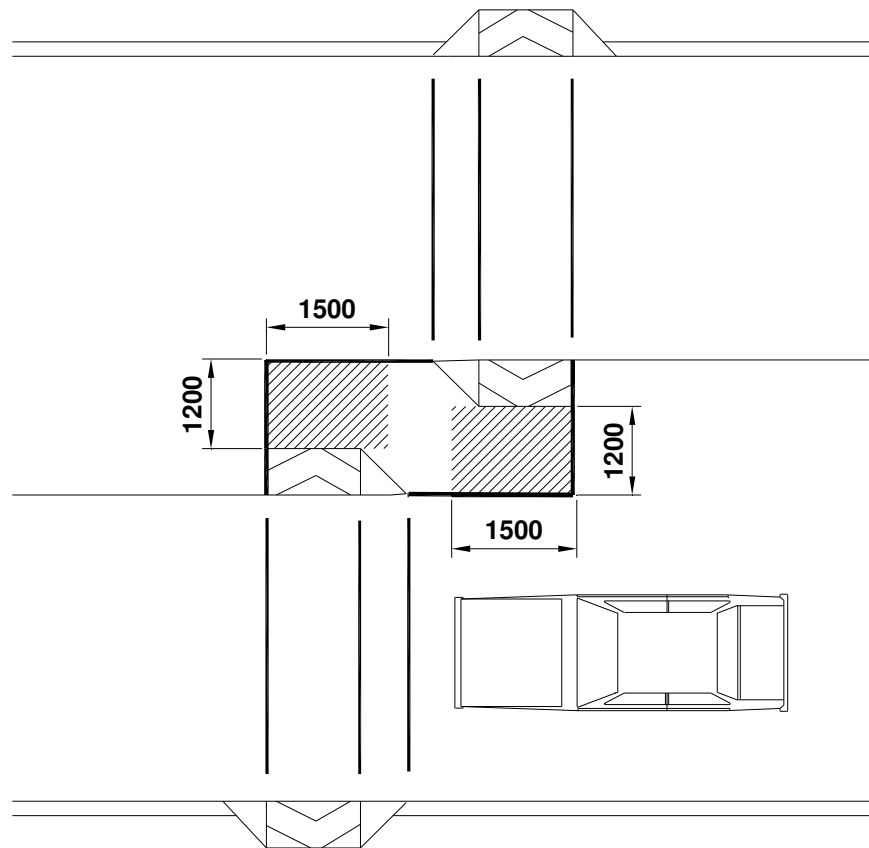


Figure 12
Location at Islands

3.5 HANDRAILS/GRAB BARS

3.5.1 General

- 3.5.1.1 Handrails/grab bars are extremely important features and must be designed to be easy to grasp and to provide a firm and comfortable grip so that the hand can slide along the rail without obstruction.

Note: *Many persons with disabilities and elderly persons rely upon handrails/grab bars to maintain balance or prevent serious falls.*

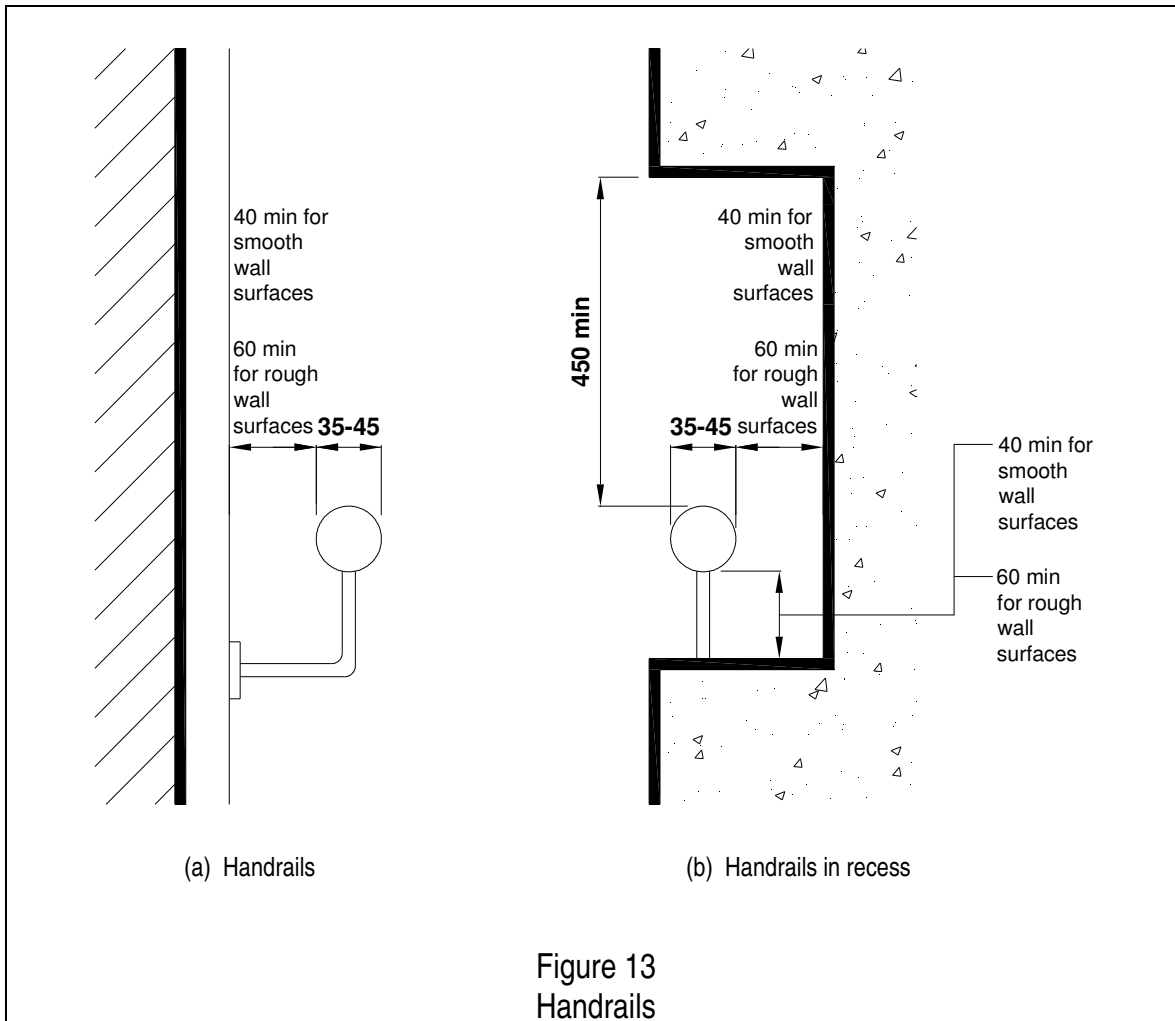
- 3.5.1.2 Wide handrails/grab bars which allow only pinching grip are undesirable unless a proper hand-size grasping area is provided.

3.5.2 Requirements

3.5.2.1 Handrails shall:

- (a) be slip-resistant;
- (b) have a circular section of 35 mm to 45 mm in diameter or an equivalent gripping surface;
- (c) be free of any sharp or abrasive elements;
- (d) have continuous gripping surfaces, without interruptions or obstructions that can break a hand hold; and
- (e) have a clear space between the handrail and all wall surfaces as shown in *Figure 13(a)* of –
 - (i) not less than 40 mm; or
 - (ii) at least 60 mm where the wall has a rough surface.

- 3.5.2.2 A recess containing a handrail shall extend at least 450 mm above the top of the rail as shown in *Figure 13(b)*.



- 3.5.2.3 Grab bars shall:
- (a) be slip-resistant;
 - (b) have a diameter of between 35 mm to 45 mm or a shape that provides an equivalent gripping surface; and
 - (c) have a space of 40 mm to 50 mm between the wall and grab bar where mounted adjacent to a wall.

Note: *Handrails and grab bars should contrast with the colour of its background to aid visibility.*

3.5.3 **Structural strength**

3.5.3.1 Grab bars and handrails shall be installed to resist a force of at least 1.3 kN applied vertically or horizontally.

3.5.4 **Safety**

3.5.4.1 The grab bars and adjacent surfaces shall be free of any sharp or abrasive elements.

3.6 **FLOOR SURFACES**

3.6.1 **General**

3.6.1.1 Floor surfaces shall –

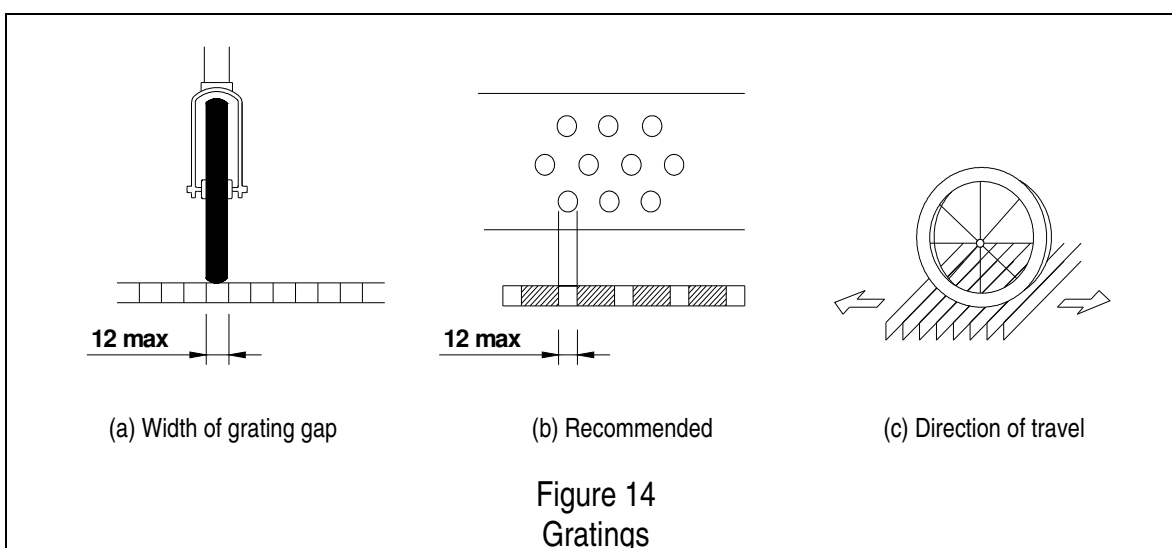
- (a) be stable, firm, level and slip-resistant;
- (b) not have any projection, drop or unexpected variation in level;
- (c) have colour and tone that are contrasting with the walls, otherwise the skirting must provide a clear distinction between the floor and wall; and
- (d) Where there is a change in level, contrasting colour bands are to be provided to alert the users of the change in level.

- Note:
- (1) *Where carpets or carpet tiles are used in general circulation area, they should –*
 - (i) *be securely fixed;*
 - (ii) *have a firm cushion, pad or backing; and*
 - (iii) *have exposed edges fastened to floor surfaces with trim complying with Table 2.*
 - (2) *Information on slip resistance of floor finishes is given in Appendix B.*
 - (3) *All floor finishes exposed to elements under the wet condition shall be in accordance with the current edition of SS 485.*
 - (4) *Highly polished or reflective surface should be avoided as it can cause glare. This will cause discomfort for persons with visual impairment.*

3.6.2 Gratings

3.6.2.1 Gratings located on walking surfaces shall –

- (a) have spaces not greater than 12 mm wide in one direction;
- (b) be placed so that the long dimension is across the dominant direction of travel as illustrated in *Figure 14(c)*; and
- (c) be set flush with the surrounding surface.



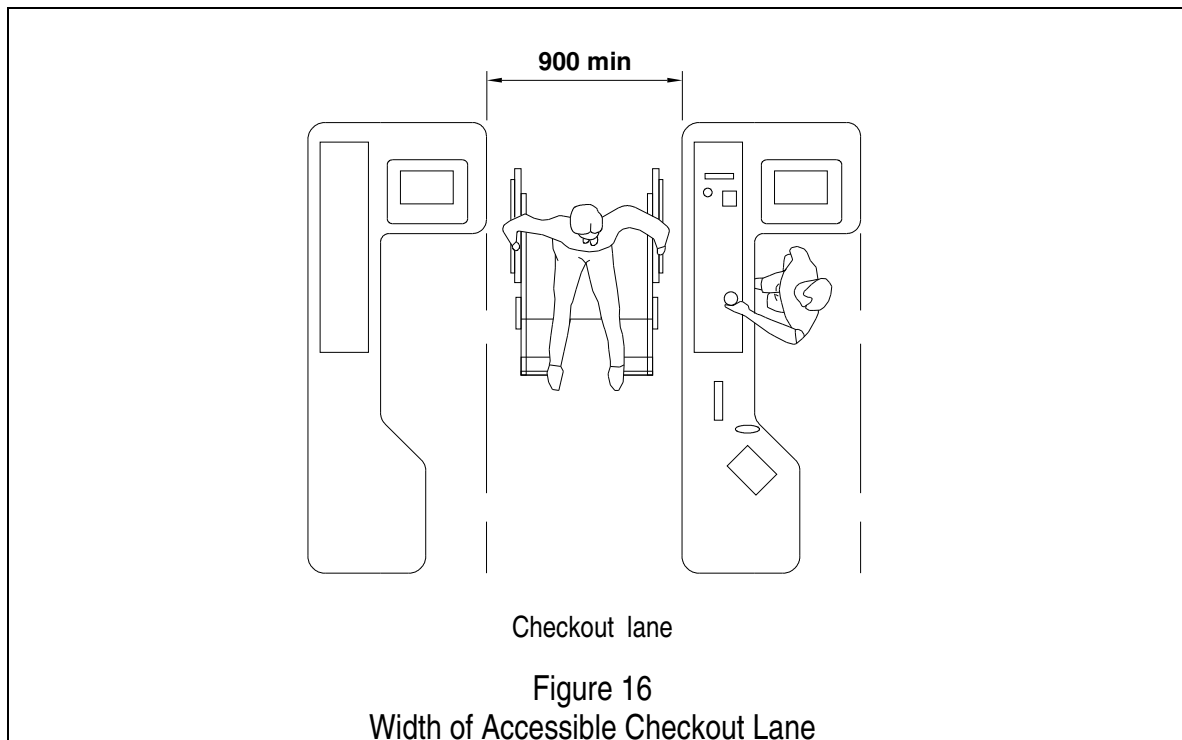
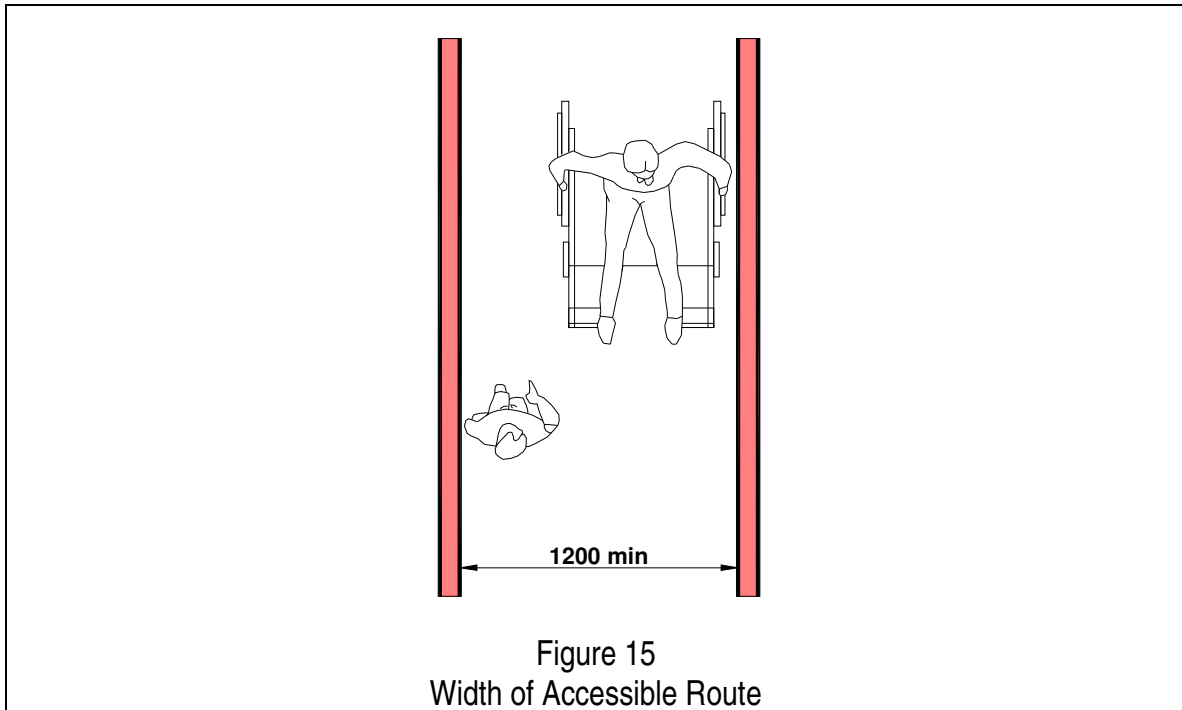
Note: *Where possible, gratings should be located outside the accessible route.*

3.7 ACCESSIBLE ROUTES, CORRIDORS OR PATHS

3.7.1 Width

3.7.1.1 The minimum width of –

- (a) an accessible route shall be 1200 mm to allow for both a wheelchair user and a walking person to pass as shown in *Figure 15* except where additional manoeuvring space, described in clause 3.8.4, is required at doorways;
- (b) an accessible checkout lane shall be at least 900 mm as shown in *Figure 16*.



- 3.7.1.2 Where space is required for two wheelchairs to pass, the minimum width shall be 1800 mm.

3.7.2 Walls

3.7.2.1 The corners of walls should not have sharp edges.

3.7.2.2 The wall finish shall be smooth or, in the case of rough walls, have trailing bars placed at a height of 840 mm from the floor level as illustrated in *Figure 17* so that persons with visual impairment can trail along it without hurting their hands.

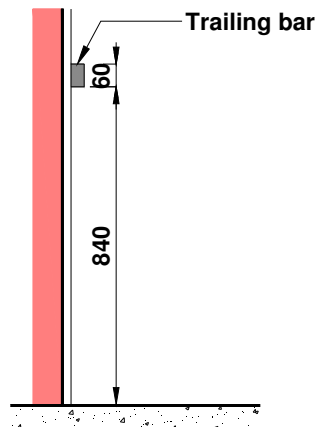


Figure 17
Trailing Bar

3.7.3 Bollards

3.7.3.1 Where bollards are erected at entrances to walkways or pathways they shall

-
- (a) have a minimum clear distance of 900 mm between the bollards;
- (b) not be linked with a chain or rope;
- (c) have a maximum height of 1000 mm;
- (d) have a colour which contrasts with the background or be provided with a coloured or reflected band around the neck of the bollard to further aid visibility;
- (e) not have ornamental features protruding horizontally; and

- (f) be well lit and the light fitting should be positioned in such a manner that will not cause glare.

3.7.4 **Protruding Objects**

3.7.4.1 **General**

- 3.7.4.1.1 Obstacles, projections or other protrusions shall be avoided in pedestrian areas such as walkways, halls, corridors, passageways or aisles.

3.7.4.2 **Undetectable objects attached to a wall**

- 3.7.4.2.1 Objects or obstructions, with their leading edges at any height above 580 mm from the floor level shall not protrude more than 100 mm into pedestrian areas as illustrated in *Figure 18(a)*.

Note: *Where a person with visual impairment is walking alongside protruding objects, they cannot detect overhangs. Where the person is using the wall or an edge as a guide, a protrusion of not more than 100 mm is acceptable.*

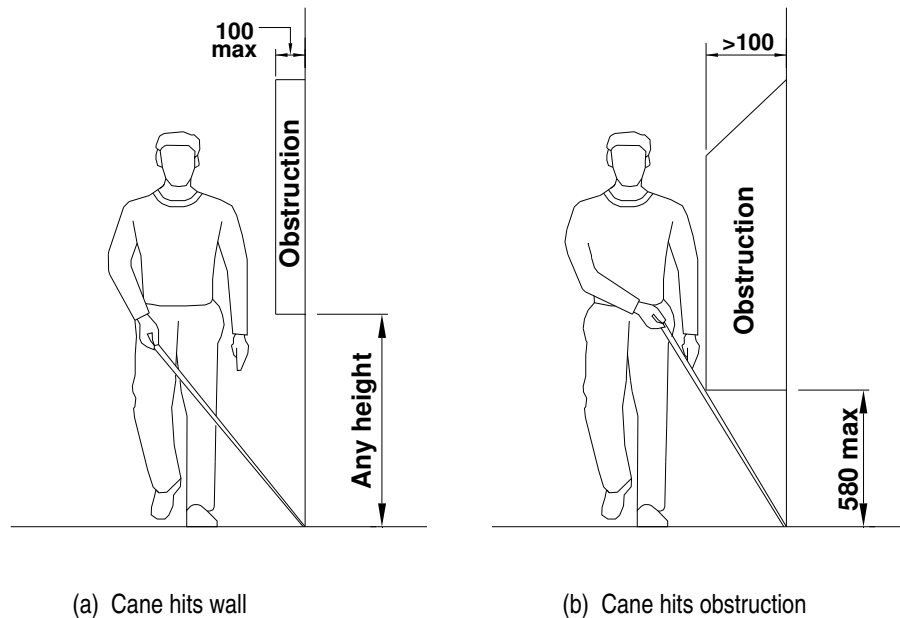


Figure 18
Limit of Protruding Objects

3.7.4.3 Detectable objects attached to a wall

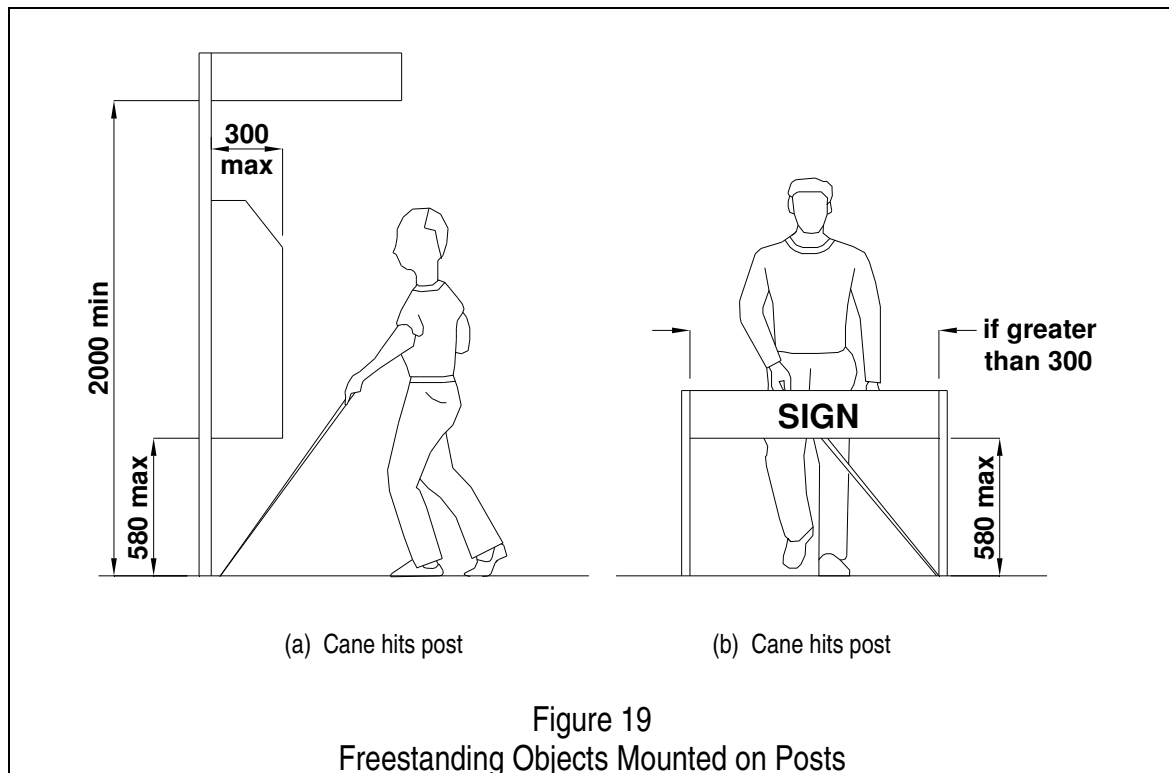
3.7.4.3.1 Objects or obstructions, with their leading edges up to a maximum height of 580 mm from the floor level, may protrude more than 100 mm into pedestrian areas as illustrated in *Figure 18(b)*.

Note: *Potentially hazardous objects or obstructions are noticed only if they are within the detection range of canes. Persons with visual impairment, walking towards an object or obstruction can detect an overhang if its lowest surface (leading edge) is less than 580 mm from the floor level.*

3.7.4.4 Free standing objects

3.7.4.4.1 Free standing objects placed between the height of 580 mm and 2000 mm from the floor level shall have an overhang of not more than 300 mm as illustrated in *Figure 19(a)*.

3.7.4.4.2 The maximum height of the bottom edge of freestanding objects with a space of more than 300 mm between supports shall be 580 mm from the floor level as illustrated in *Figure 19(b)*.



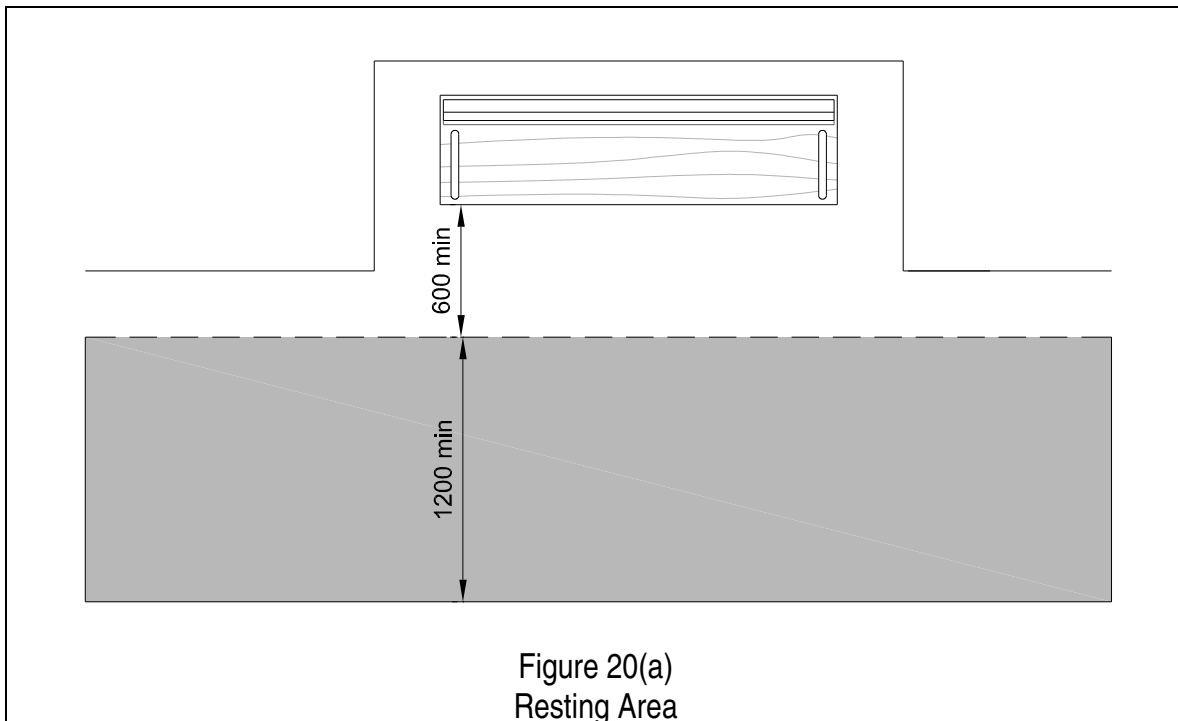
3.7.4.5 Clear width maintenance

- 3.7.4.5.1 Protruding objects shall not reduce the clear width required for an accessible route or manoeuvring space.

3.7.4.6 Resting areas

- 3.7.4.6.1 Long paths of travel should be avoided and resting areas shall be provided at frequent intervals not exceeding 40.0m.

Note: *Resting areas should be recessed from the long paths of travel which can also act as a passing place for two wheelchair users to pass each other as illustrated in Figure 20(a).*



- 3.7.4.6.2 Where seats are provided, they should have armrests to assist persons with disabilities or elderly persons to get up from the seats. The height of seat should be between 440 mm to 470 mm.

3.7.4.7 Exterior walkways

- 3.7.4.7.1 Wherever possible, exterior walkways should be protected from the elements.

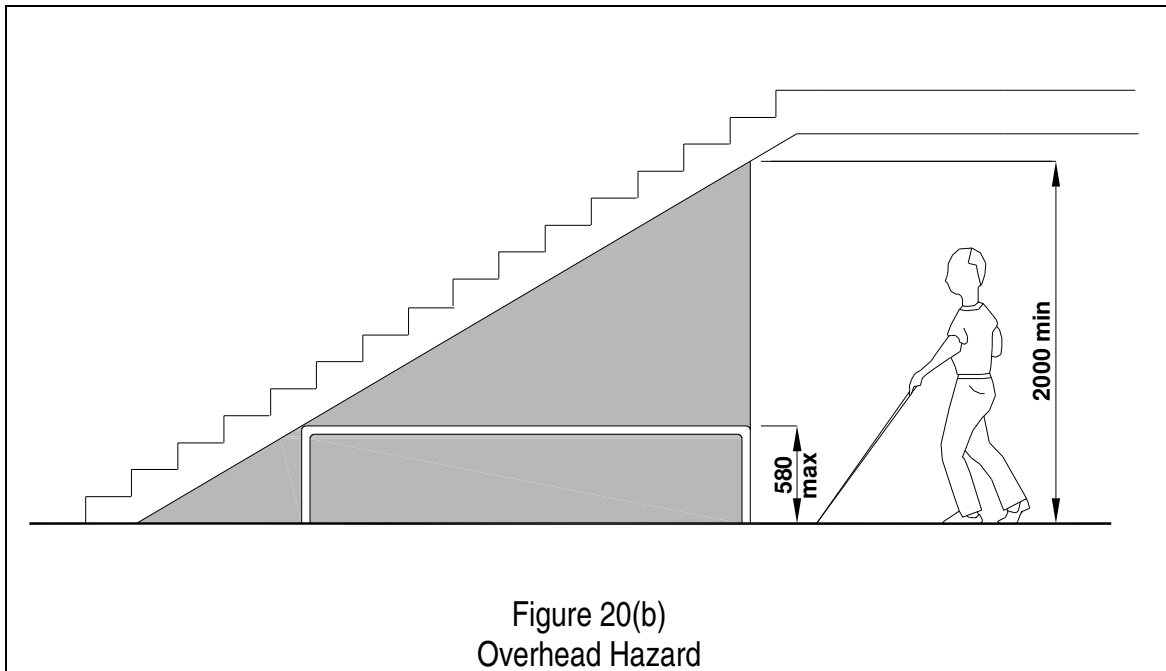
3.7.5 Headroom

3.7.5.1 General

3.7.5.1.1 The minimum clear headroom in pedestrian areas such as walkways, halls, corridors, passageways or aisles shall be 2000 mm.

3.7.5.2 Overhead hazard

3.7.5.2.1 A detectable guardrail or other barrier having its leading edge at or below 580 mm from the floor level shall be provided where the headroom of an area adjoining an accessible route is reduced to less than 2000 mm as illustrated in *Figure 20(b)*.



Note: *The requirement to have an area free from obstruction is primarily to aid persons with visual impairment as shown in Figures 18, 19 and 20(b). Examples of such obstructions are directional signs, fire fighting equipment and the underside of staircases or escalators.*

3.8 DOORS

3.8.1 General

3.8.1.1 Doorways shall be level.

3.8.1.2 At least one power assisted or automatic door should be provided at the main entrance to a building.

3.8.1.3 Wherever possible and practicable, automatic doors (swing or sliding type) should be provided instead of doors that are manually opened. Heavy or revolving doors should be avoided.

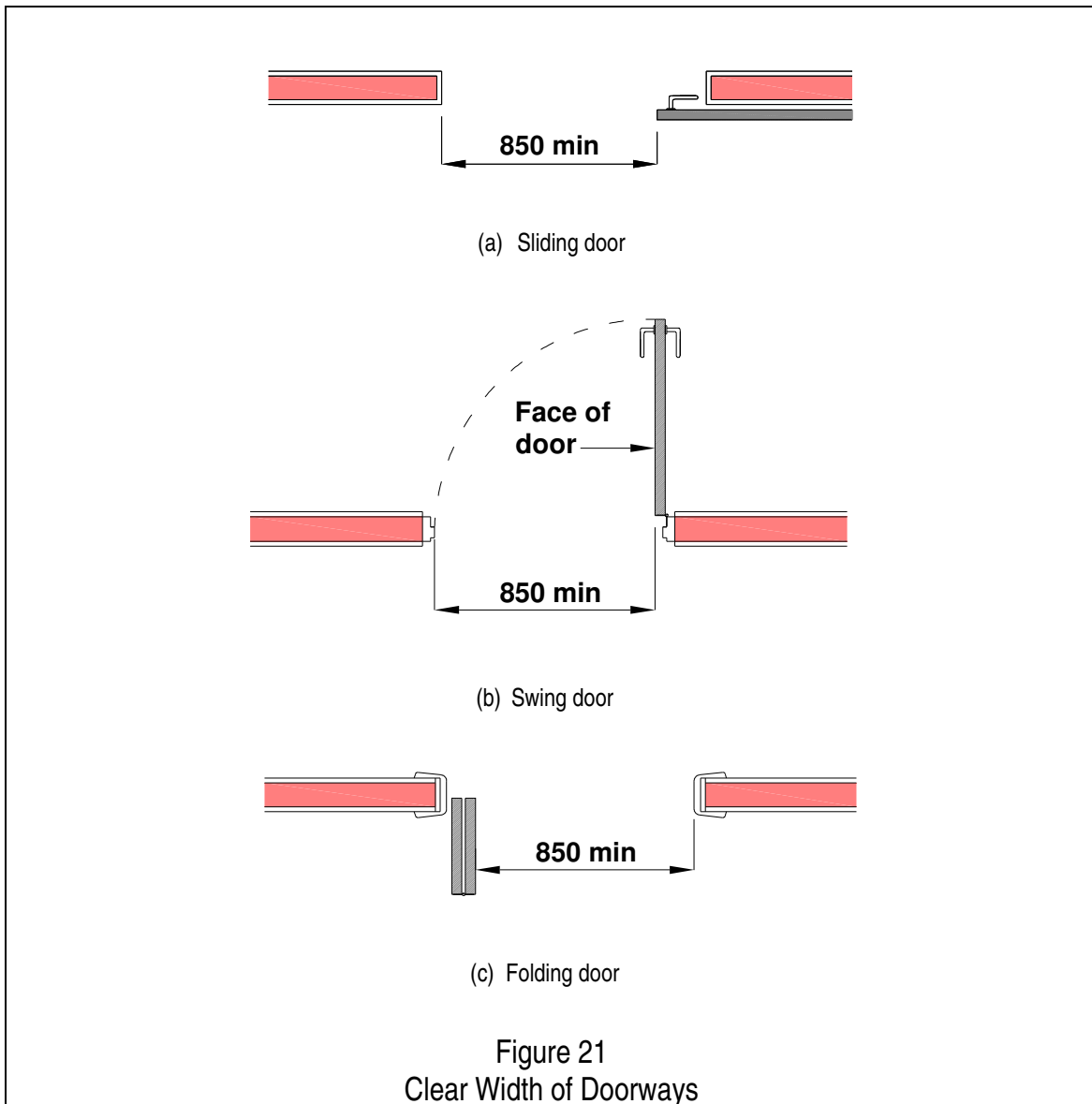
3.8.1.4 Where revolving doors are installed, there shall be an auxiliary side-hung door with a minimum clear opening of 850 mm.

3.8.1.5 The colour of the door shall contrast with the door frame or the wall.

3.8.1.6 Where doors are numbered, the digits should be in accordance with the requirements of clause 10.5.1.3 and *Table 5*.

3.8.2 Clear opening

3.8.2.1 The minimum clear opening of doorways shall be 850 mm measured between the face of the door and the face of the doorstop with the door open at 90° as illustrated in *Figure 21*.



3.8.3 Double-leaf doorways

3.8.3.1 If doorways have two independently operated door leaves, at least one active leaf shall comply with clauses 3.8.2 and 3.8.4.

3.8.4 Manoeuvring spaces at doors

3.8.4.1 The doorway of a one-way swing door shall have manoeuvring spaces on both sides for wheelchairs and the following clear spaces shall be provided adjacent to the leading edge of the door as illustrated in *Figure 22*:

- (a) on the pull side, a minimum space of 600 mm; and
- (b) on the push side, a minimum space of 300 mm.

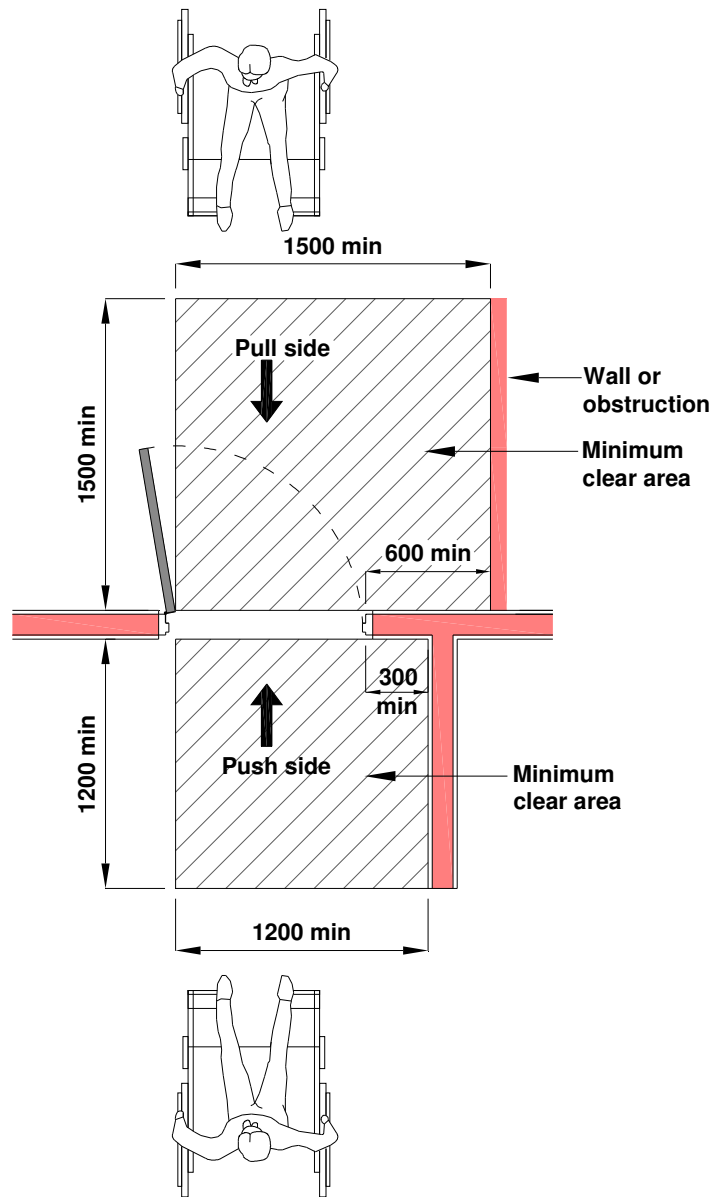
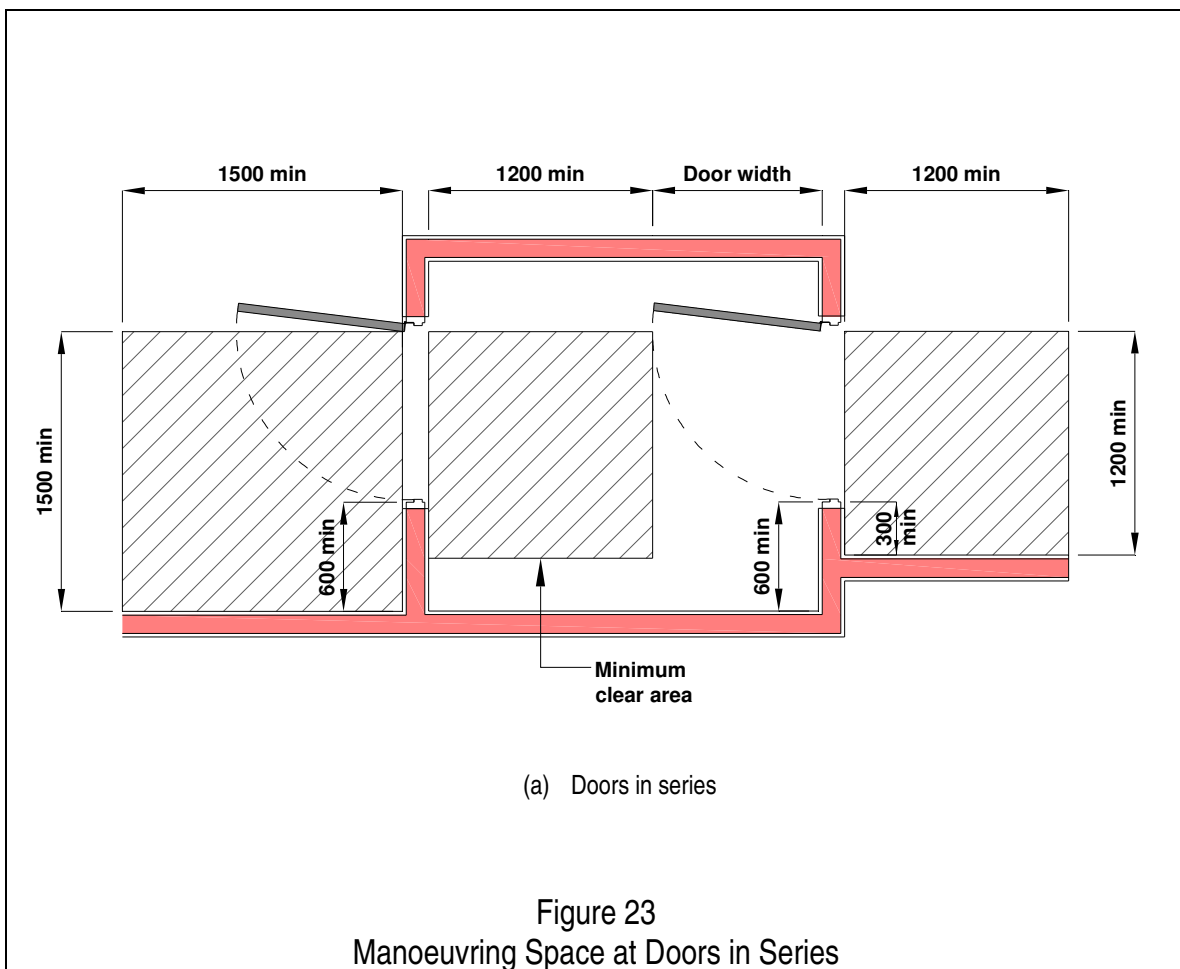


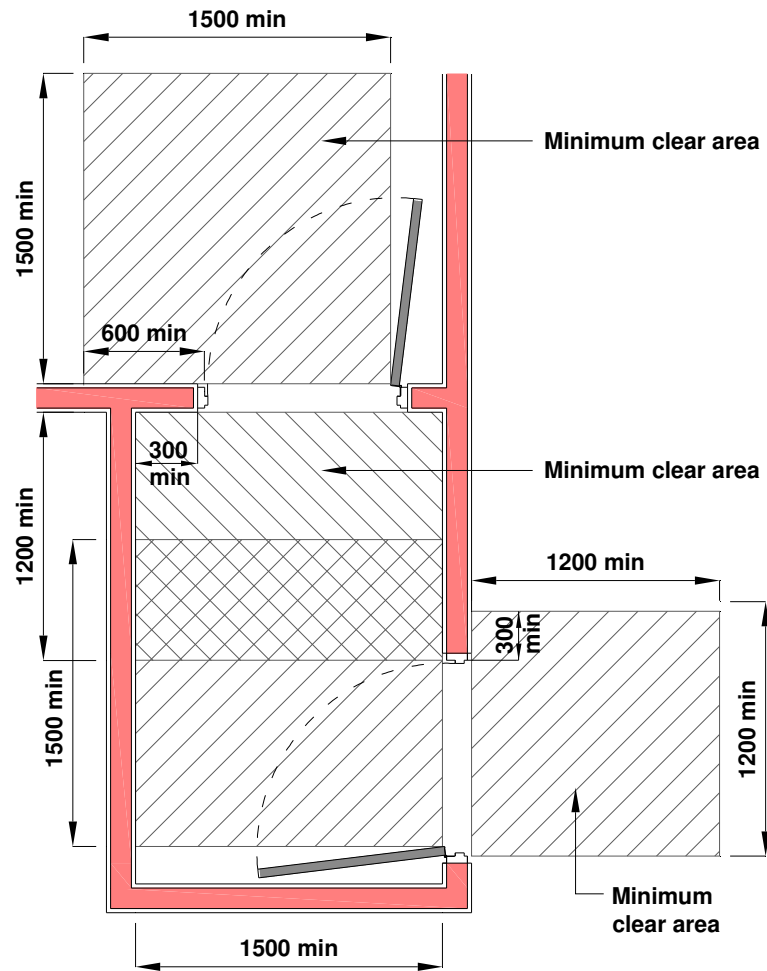
Figure 22
Minimum Doorway Manoeuvring Space

3.8.4.2 Where two-way swing doors or sliding doors are used, a minimum space of 300 mm adjacent to the leading edge of the door shall be provided on each side of the door.

3.8.5 Two doors in series

3.8.5.1 The minimum space between two hinged doors or pivoted doors in series shall be 1200 mm plus the width of the door swinging into that space as illustrated in *Figure 23*.





(b) Doors at right angles

Figure 23
Manoeuvring Space at Doors in Series

3.8.6 Door hardware

3.8.6.1 Operating devices such as handles, pulls, latches and locks shall:

- (a) be operable by one hand;
- (b) not require fine finger control, tight grasping, pinching or twisting of the wrist to operate; and

- (c) be mounted at a height of 900 mm to 1100 mm from the floor.

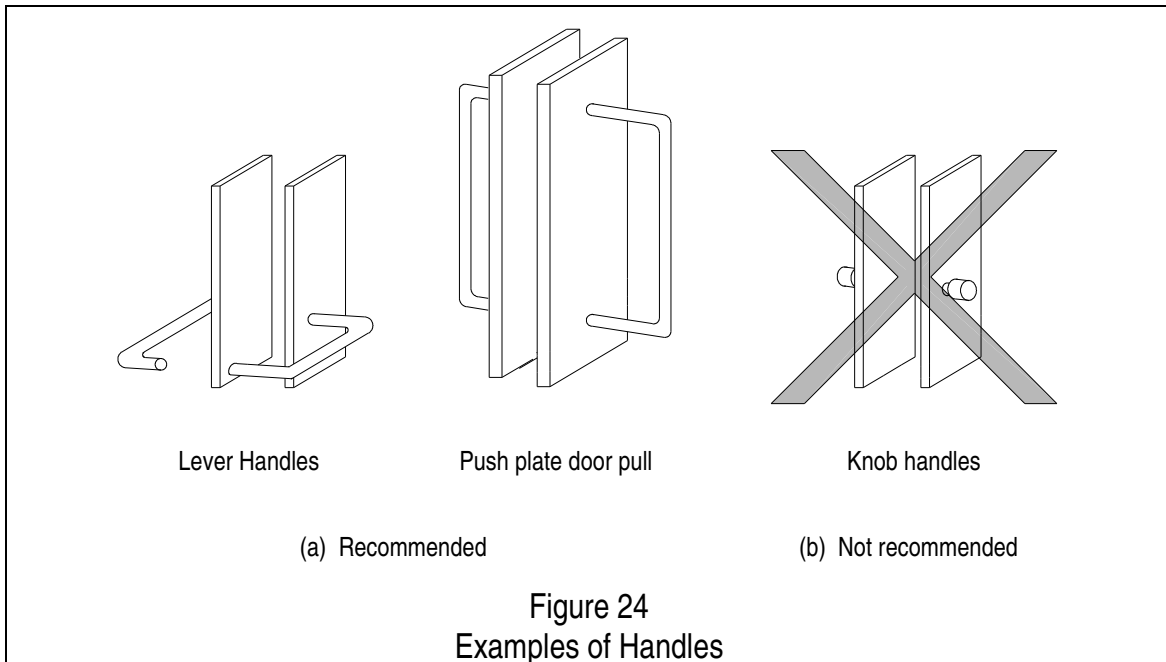
3.8.6.2 Door hardware and doorbells should have colour that contrasts with the background.

3.8.7 Door handles

3.8.7.1 Door handles, as illustrated in *Figure 24*, with the following characteristics are recommended:

- (a) push-pull mechanisms that do not require grasping;
- (b) lever handles should be used on latched doors;
- (c) U-shaped door handles that reduce the risk of catching on clothing or injury from the exposed lever end; and
- (d) should contrast with the colour of the door.

- Note:
- (1) *Door knob is not recommended as it does not provide adequate grip for persons with impaired hand functions.*
 - (2) *Door handles should be at a consistent height throughout the building.*



3.8.8 **Sliding/folding doors**

3.8.8.1 Operating hardware shall be exposed and have sufficient gripping surface area from both sides when sliding/folding doors are fully open.

3.8.8.2 If the door retracts fully into the wall pocket, an accessible handle is required on the exposed edge of the door.

3.8.9 **Door opening force**

3.8.9.1 The maximum force for pushing or pulling open a door should be:

- (a) 38N for exterior hinged doors;
- (b) 22N for interior hinged doors; and
- (c) 22N for sliding or folding doors.

Note: *This clause does not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.*

3.8.10 **Door closers**

3.8.10.1 The sweep period of the door shall be adjusted so that from an open position of 90° the door will not take less than 3 seconds to move to a semi-closed position of approximately 12°.

Note: *Door closers with adjustable tension are recommended for this purpose so that the tension can be adjusted to comply with clause 3.8.9.*

3.8.11 Vision Panels

3.8.11.1 All two-way swing doors or doors across circulation routes shall be provided with vision panels as shown in *Figure 25* giving a minimum zone of visibility from a height of 900 mm to 1500 mm. This will allow for both the ambulant disabled and wheelchair user to be seen or observed by a person on the opposite side in order to prevent him from being accidentally struck by the opening door.

3.8.11.2 The width of the vision panel shall be not less than 100 mm.

3.8.12 Kickplates

3.8.12.1 Kickplates of not less than 250 mm high as shown in *Figure 25* are recommended for doors in high-use areas to protect the push side of doors from damage caused by wheelchair foot-rests.

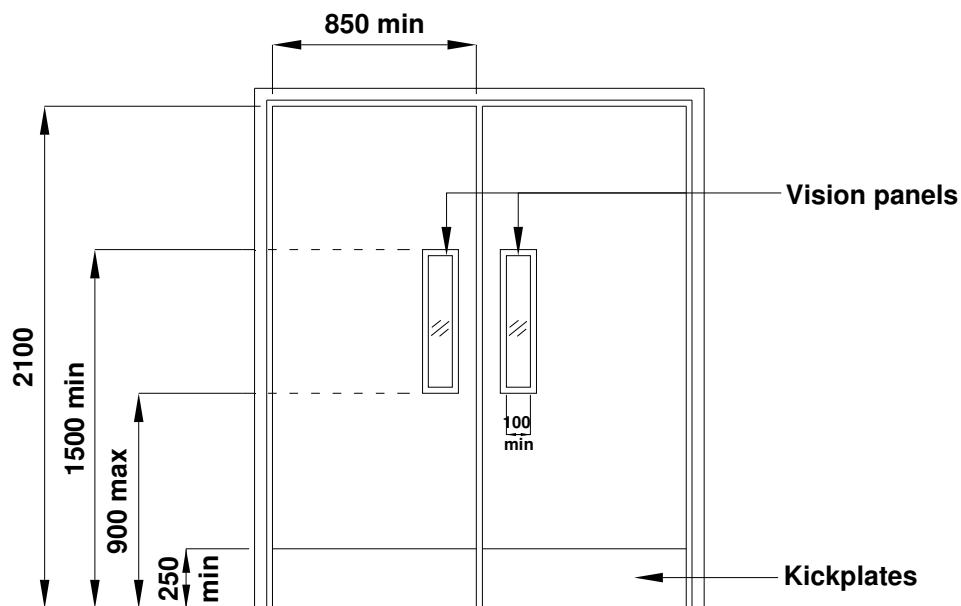


Figure 25
Vision Panels and Kickplates

3.8.13 Guardrails (Out-swinging automatic door)

3.8.13.1 Where doors swing automatically into the path of travel, it is desirable to have guardrails, as shown in *Figure 26* –

- (a) extending at right angles to the wall containing the door; and
- (b) provided at a cane detectable height of 580 mm.

Note:

- (1) *Power-assisted swinging doors shall –*
 - (a) *take not less than 3 seconds to move from the closed to the fully open position; and*
 - (b) *require a force of not more than 66 N to stop door movement.*
- (2) *Sliding automatic doors do not need guardrails for protection and are more convenient for wheelchairs users or persons with visual impairment.*

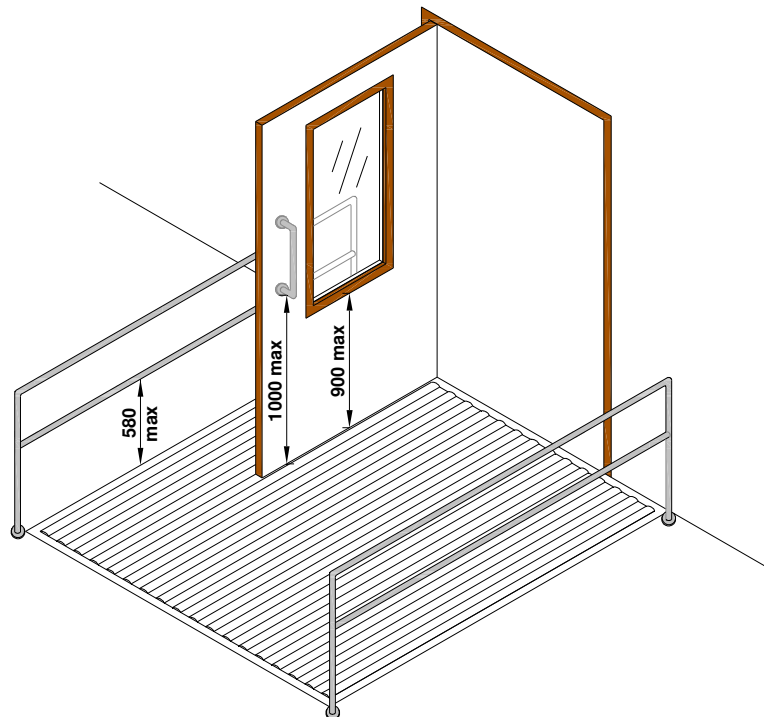
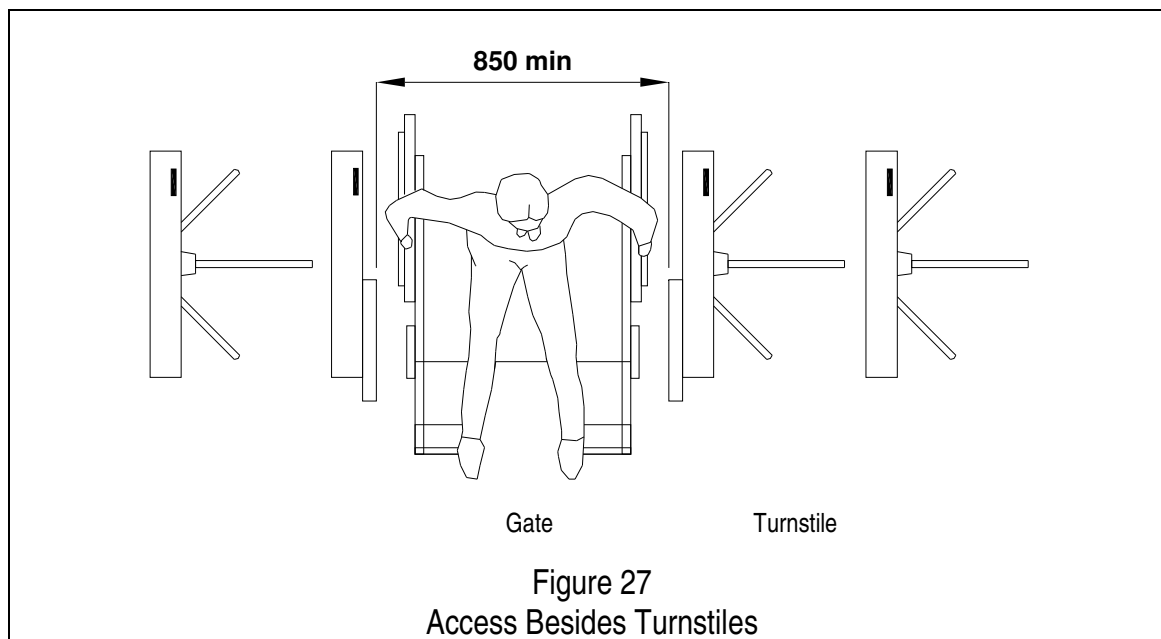


Figure 26
Guardrails At Out-Swinging Automatic Doors

3.8.14 Turnstiles

- 3.8.14.1 An accessible gate with a width of at least 850 mm shall be provided beside a turnstile as shown in *Figure 27*.



3.8.15 Glass doors

- 3.8.15.1 Unframed full-height glass doors shall, if provided, be prominently marked or highlighted with motifs to make them visible.
- 3.8.15.2 The markings or motifs shall consist of two horizontal bands, each at least 100 mm high and of contrasting colours to assist visibility.
- 3.8.15.3 The upper band shall be affixed at a height between 1400 mm and 1600 mm and the lower band affixed at a height between 850 mm and 1000 mm above the floor level. Where each band zone consists of more than one band, the aggregate width of the bands in each zone shall not be less than 100 mm.

3.8.15.4 The doorway shall either have –

- (a) a clearly marked boundary; or
- (b) tactile indicators such as firmly fastened carpets,
on both sides of the door.

Note: *A full description of tactile indicators is given in Appendix F – Design Guidelines for Persons with Visual Impairment.*

3.9 STAIRS

3.9.1 General

3.9.1.1 In every building, staircases are intended as an optional requirement for the ambulant disabled and, if provided, shall be designed to comply with the requirements of clauses 3.9.2 to 3.9.6.

3.9.2 Treads and risers

3.9.2.1 A flight of steps shall have:

- (a) uniform risers of maximum 150 mm and treads of minimum 300 mm; and
- (b) no open risers as shown in *Figure 28(a)*.

3.9.2.2 The treads and walls of the staircase shall have contrasting colours to alert persons with visual impairment of the presence of steps.

3.9.3 Nosings

3.9.3.1 Nosings shall:

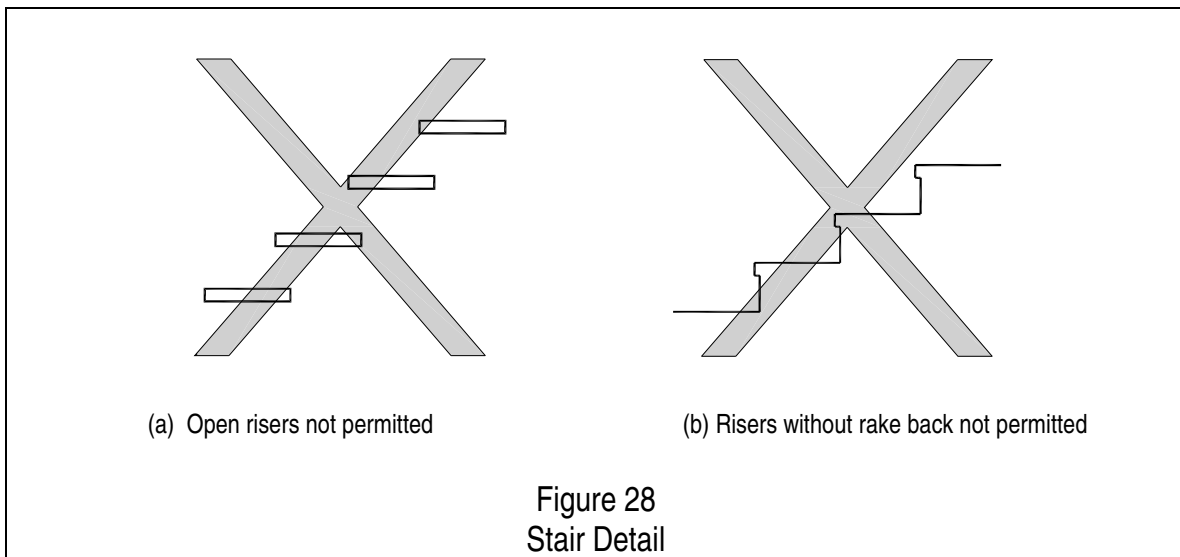
- (a) have no abrupt undersides as shown in *Figure 28(b)*; and
- (b) project not more than 25 mm over the back edge of the step as shown in *Figure 28(c)*.

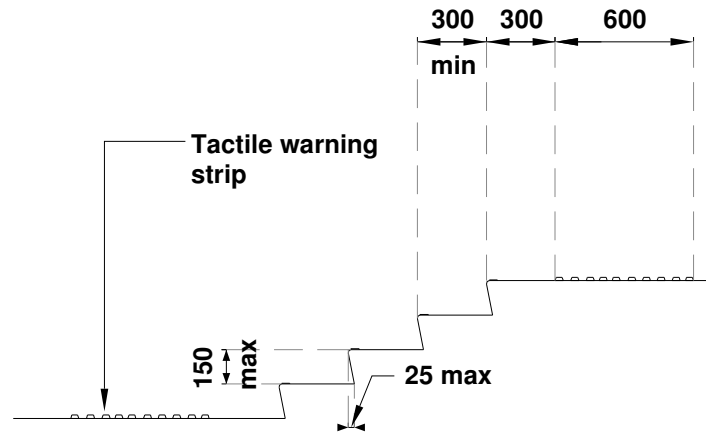
3.9.3.2 All steps shall be fitted with non-slip nosing strips between 50 mm and 65 mm in width with permanent contrasting colours.

Note: *The contrasting colour of the nosing is meant to ensure that the tread edge is clearly visible in descent.*

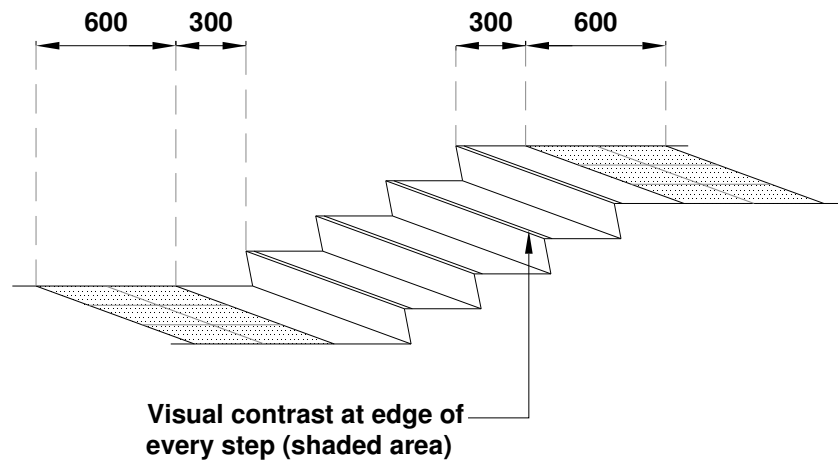
3.9.4 Detectable warning surfaces**3.9.4.1 Tactile warning strips shall –**

- (a) be provided at the top, bottom and intermediate landings;
- (b) extend the full width of the stair for a depth of 600 mm commencing 300 mm back from the stair as shown in *Figure 28(d)*; and
- (c) consist of flooring material that is –
 - (i) contrasting in colour with the surrounding flooring material; and
 - (ii) of a different texture from the surrounding flooring material.





(c) Acceptable treads and risers



(d) Tactile Warning Strip

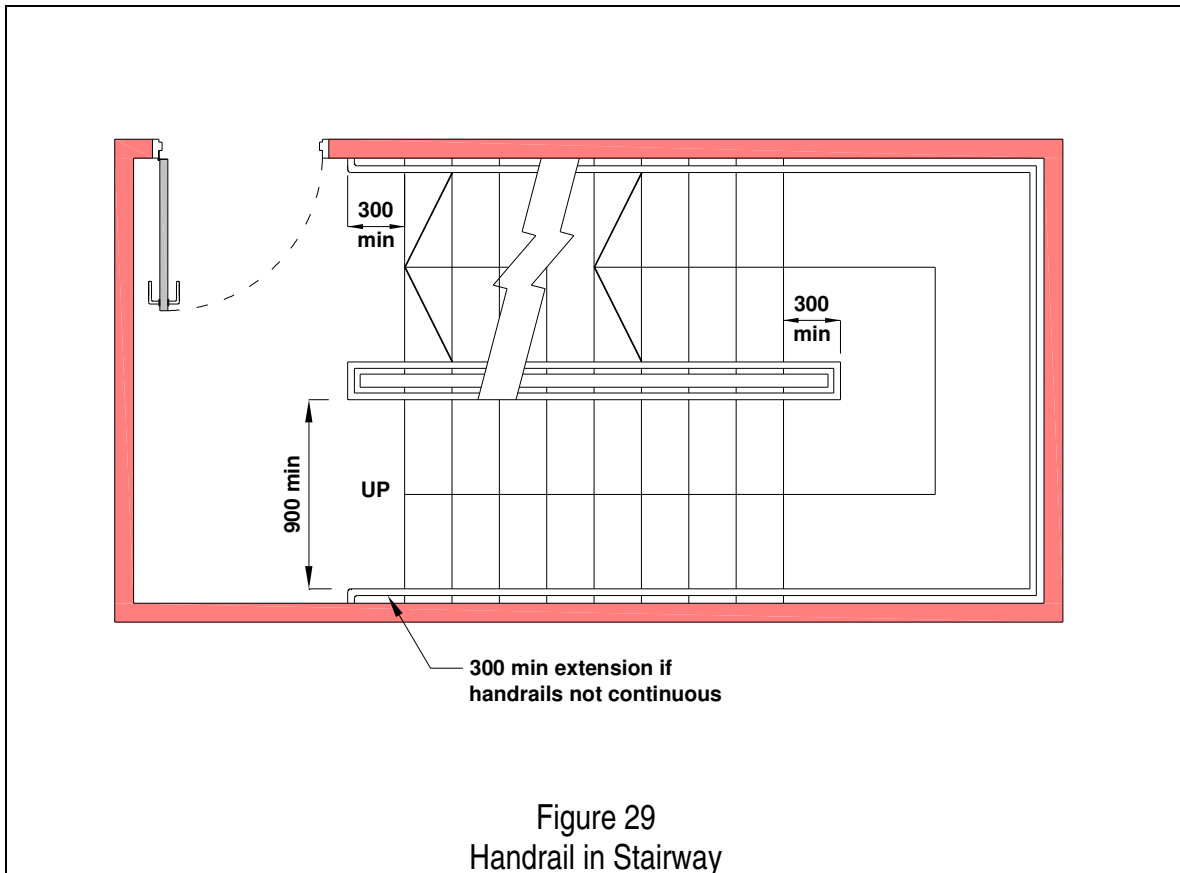
Figure 28
Stair Detail

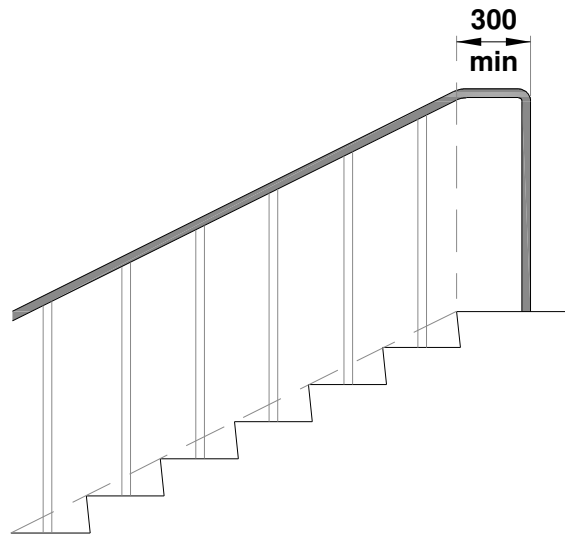
- Note:
- (1) *Strongly patterned carpets shall not be used for stairs as they obscure the definition of the tread edges and can cause danger to users.*
 - (2) *Bright stainless steel or polished brass should not be used for nosing strips as glare reflection can cause disorientation to persons with visual impairment.*
 - (3) *The tactile warning strip is to alert persons with visual impairment that they are approaching steps and to be extra careful.*

3.9.5 Stair handrails

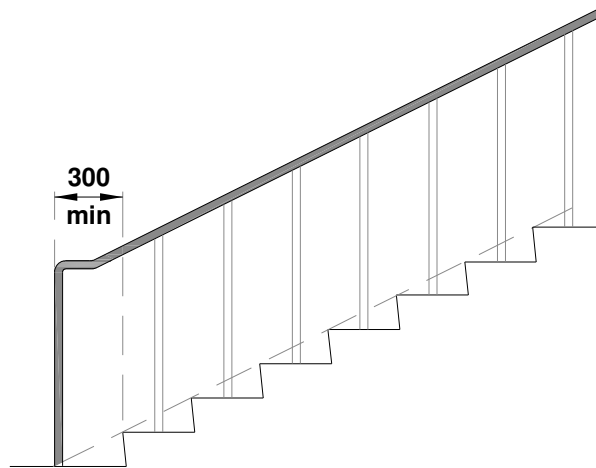
3.9.5.1 Handrails for stairs shall:

- (a) comply with clauses 3.5.2, 3.5.2.1, 3.5.2.2 and 3.5.3.1;
- (b) be installed on both sides as shown in *Figure 29*;
- (c) be positioned between 800 mm and 900 mm measured from the pitch line vertically to the top of the handrails;
- (d) be continuous throughout the entire length and extend not less than 300 mm beyond the top and bottom step as shown in *Figure 30*.





(a) Handrail extension at Top of Stairs



(b) Handrail extension at Bottom of Stairs

Figure 30
Handrail Extensions

3.9.6 **Illumination**

3.9.6.1 The stairs shall stand out visually from the accessible route.

3.9.6.2 The stairs should be lit to a minimum level of 200 lux and the lighting should be positioned to function successfully in both directions of travel without causing shadows and offering adequate contrast between treads and risers.

3.10 **CONTROLS AND OPERATING MECHANISMS**

3.10.1 **Floor Space**

3.10.1.1 A clear and level floor space of at least 900 mm x 1200 mm should be provided at controls, operating mechanisms such as dispensers and receptacles designated for use by persons with disabilities.

3.10.2 **Electrical Controls and Outlets**

3.10.2.1 The operable part of controls such as vending machines and vehicle park auto-pay machines, electrical switches and wall sockets should be:

- (a) located adjacent to a clear floor space that has a minimum width of 900 mm;
- (b) located at a height of between 450 mm to 1200 mm from the floor level as shown in *Figure 31*;
- (c) operable by one hand;
- (d) of a type that does not require tight grasping, pinching or twisting of the wrist; and
- (e) operable with a force less than 22N.

3.10.2.2 The key pads, card readers and intercom buttons should be provided at a height of between 800 mm and 1000 mm from the floor level.

3.10.2.3 The colour of controls and operating mechanisms should contrast with their backgrounds.

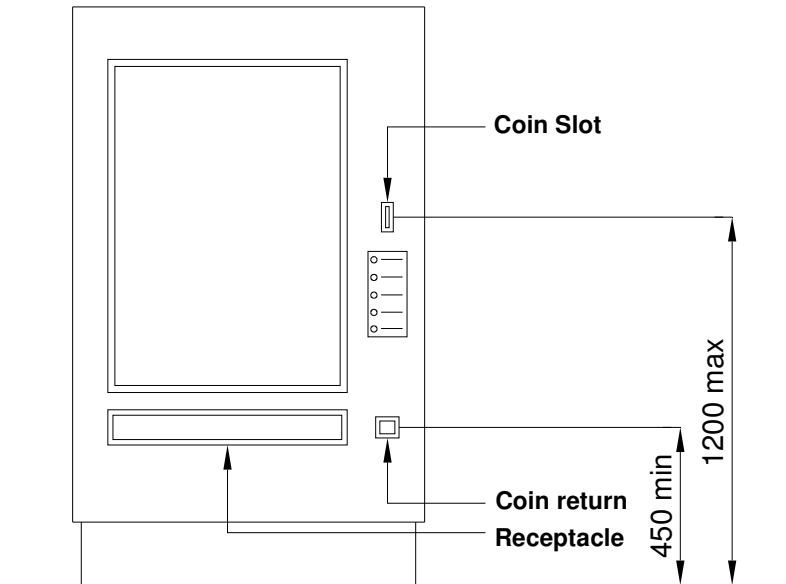


Figure 31
Vending Machine/Vehicle Park Auto-Pay machine

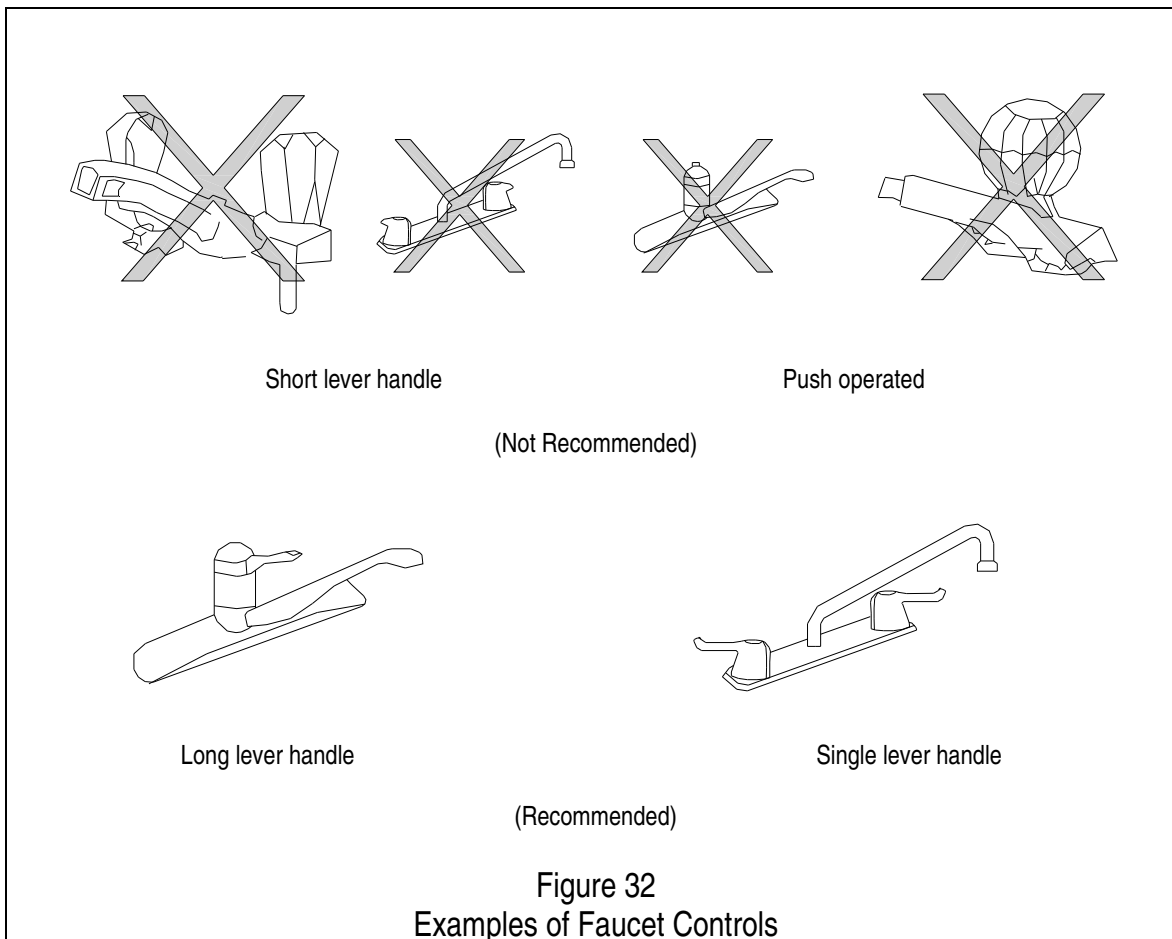
3.10.3 Operation

3.10.3.1 Faucets and other controls designated for use by persons with disabilities shall be hand-operated or electronically controlled.

3.10.3.2 Hand-operated controls shall:

- (a) be operable with one hand;
- (b) require no tight grasping, pinching or twisting of the wrist;
- (c) require a force less than 22N to activate;
- (d) have handles of the lever type (not self-closing) operable with a closed fist as shown in *Figure 32*; and
- (e) not be of the self-closing type.

- 3.10.3.3 The temperature of hot water supplied to the shower shall be controlled by a pressure-equalizing valve or by an automatic, thermostatically controlled valve.



3.10.4 Illumination

- 3.10.4.1 Controls and operating mechanisms should be capable of being illuminated to at least a level of 100 lux.

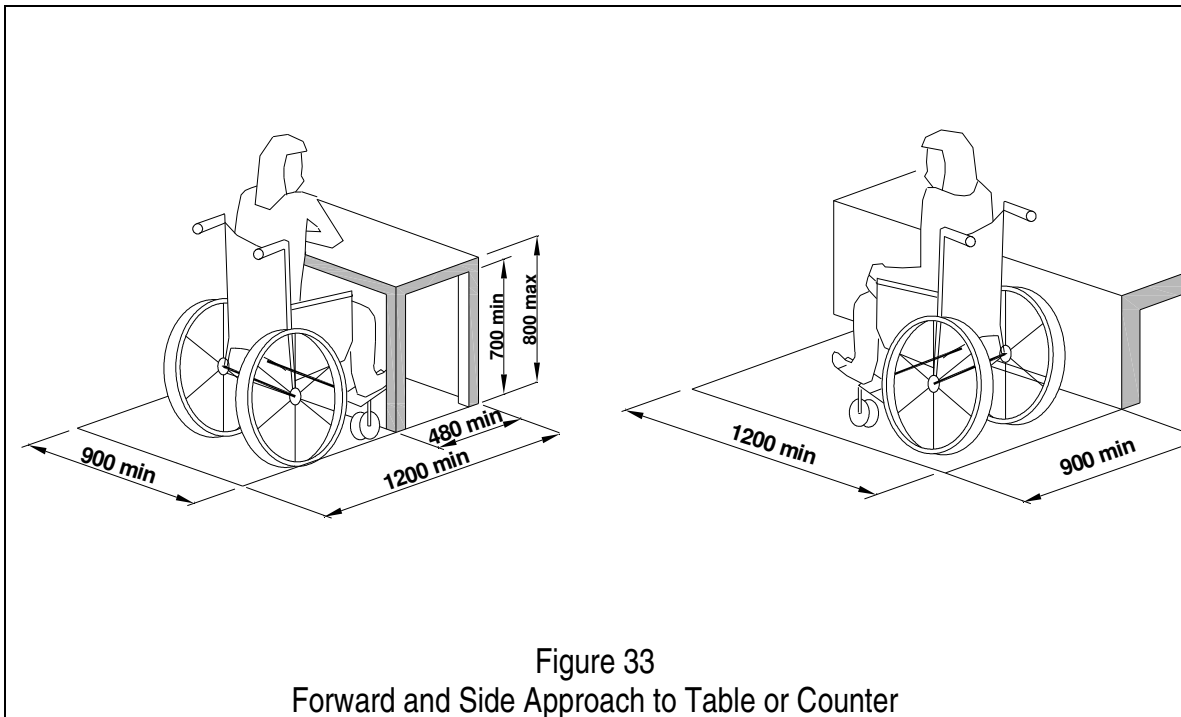
3.11 SEATING SPACES

3.11.1 Clear Floor Space

- 3.11.1.1 Seating space, such as those provided at counters, tables or work surfaces for wheelchair users shall have a clear floor space not less than 900 mm x 1200 mm.

3.11.2 Clear Knee Space

- 3.11.2.1 Where a forward approach is used, a clear knee space of at least 900 mm wide, 480 mm deep and 700 mm high shall be provided which may overlap the clear floor space by a maximum of 480 mm as shown in *Figure 33*.



3.11.3 Service and Information Counters

- 3.11.3.1 Where service counters are provided, part of the counter shall not be more than 800 mm from the floor as shown in *Figure 34(a)*.

Note: *Where the service counters do not serve as writing surfaces, the height of the counter may be raised to not more than 860 mm.*

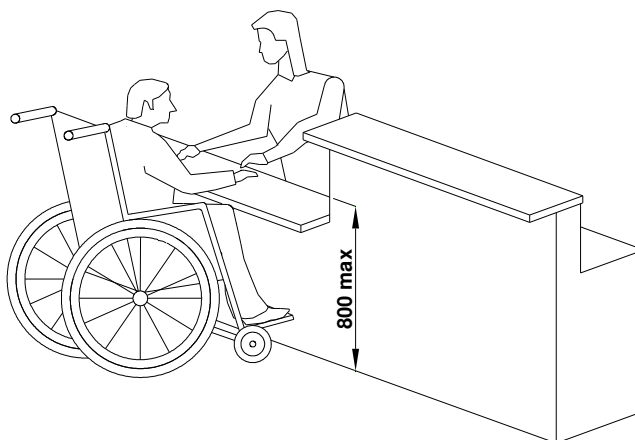


Figure 34 (a)
Service Counters

- 3.11.3.2 Where information displayed counters are provided, the bottom edge of the counter shall be at a height of between 700 mm and 800 mm from the floor and tilt at an angle which varies from 30° to 45° as shown in *Figure 34(b)*.

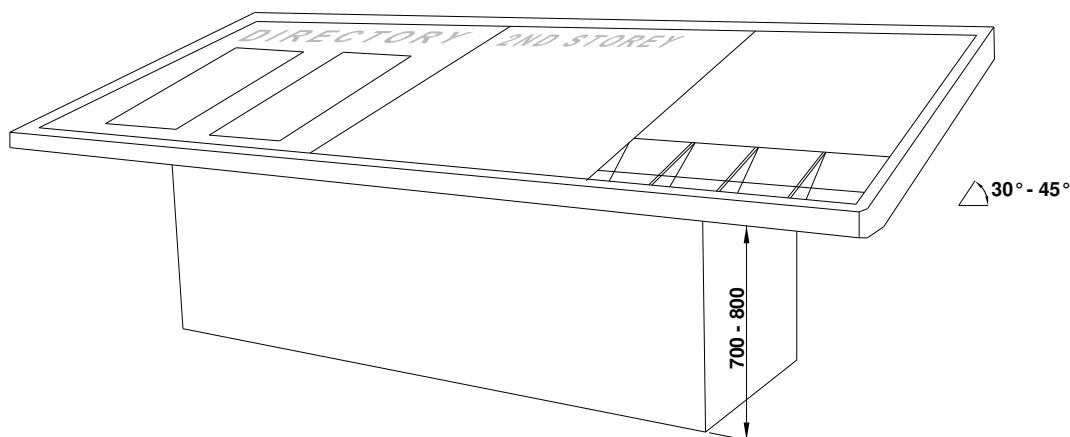


Figure 34 (b)
Information Display Counter

3.12 DRINKING FOUNTAIN

3.12.1 The fountain spout should:

- (a) have an opening located between 750 mm and 800 mm from the floor or ground surface as shown in *Figure 35*;
- (b) be located at the front of the unit;
- (c) direct the water flow in a trajectory that is parallel or nearly parallel to the front of the unit; and
- (d) provide a flow of water at least 100 mm high.

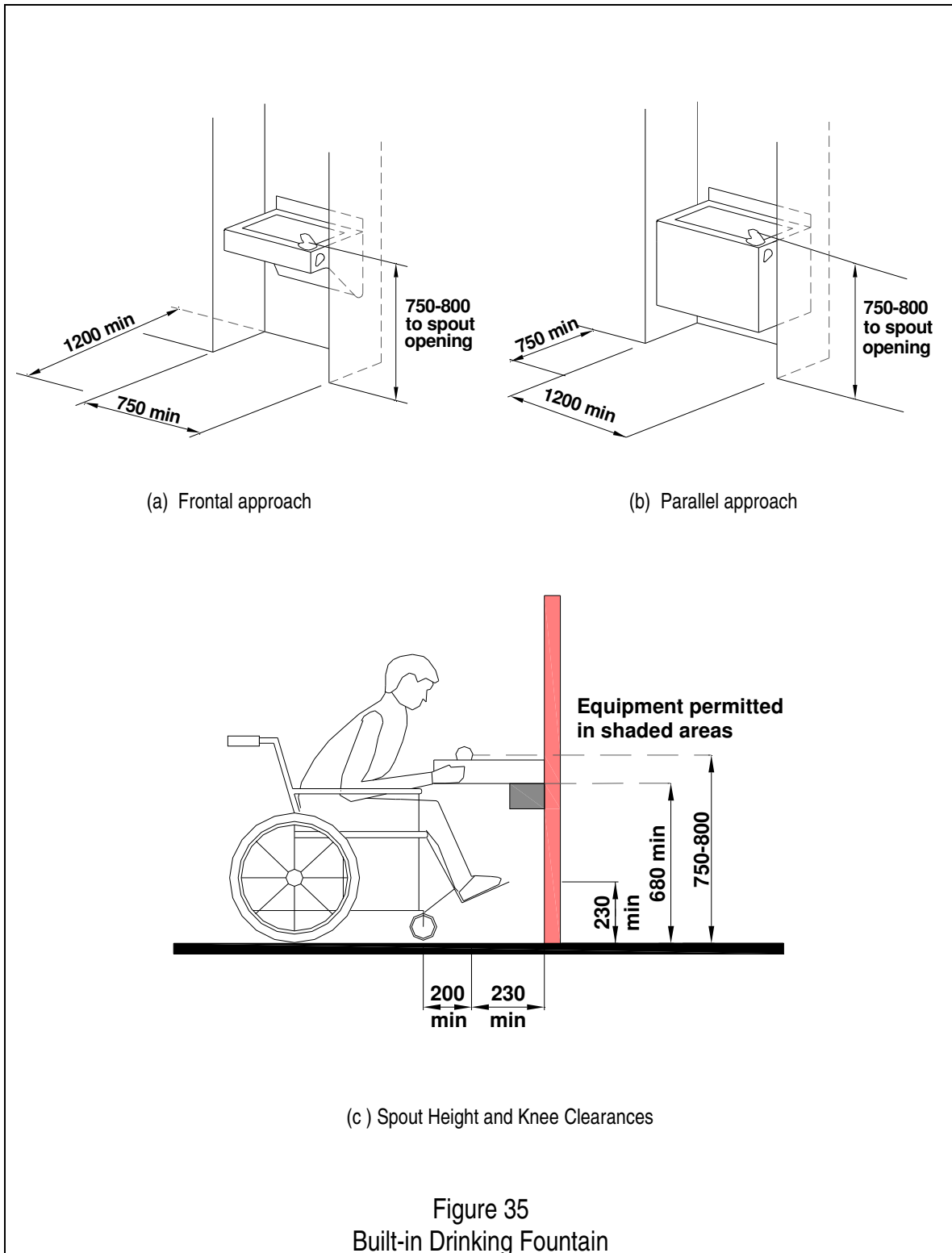
3.12.2 Controls should comply with clauses 3.10.3.1 and 3.10.3.2 and be at or near the front of the fountain.

3.12.3 Cantilevered drinking fountains should:

- (a) have a clear floor space of at least 750 mm x 1200 mm as shown in *Figure 35(a)*;
- (b) have a clear knee space between the bottom of the apron and floor or ground of at least 750 mm wide, 1200 mm deep and 680 mm high as shown in *Figure 35(c)*;
- (c) have a toe space not less than 750 mm wide, 230 mm deep and 230 mm high as shown in *Figure 35(c)*.

3.12.4 Freestanding or built-in drinking fountains not having a knee space should have a clear floor space of at least 1200 mm wide x 750 mm in front of the unit as shown in *Figure 35(b)*.

Note: *A wall-mounted drinking fountain in an alcove is preferred because it does not create a hazard for persons with visual impairments. Drinking fountains that extend into corridors and have an open space underneath the fountain 680 mm in height should be protected by a wall guard. The provision of two drinking fountains at different heights is very convenient for standing adults, wheelchair users and children. The 100 mm high water flow is to allow for the insertion of a cup or glass.*



3.13 **ILLUMINATION**

- 3.13.1 Lighting shall be uniform.
- 3.13.2 Extreme difference in the level of brightness should be avoided.
- 3.13.3 Lights shall be acceptably bright but should not cause glare or shadows that would give rise to optical illusions.
- 3.13.4 Ceiling mounted light fittings with diffusers shall be positioned longitudinally at the centre of the accessible route.

CHAPTER 4

SANITARY PROVISIONS

4.1 GENERAL

- 4.1.1 At every level of a building where toilets are provided, at least –
- (a) one individual washroom for wheelchair users, as described in clause 4.9, shall be provided for both the male and female; or
 - (b) one water closet compartment for wheelchair users, as described in clause 4.10, shall be provided in both the male and female toilets.
- 4.1.2 In addition to clause 4.1.1, a standard water closet compartment, as described in clause 4.11, shall be provided for the ambulant disabled and elderly persons at every level of shopping complexes, sport complexes, places of public resort, hotels, hospitals, transport stations, interchanges and passenger terminals where toilets are provided.
- 4.1.3 In buildings, other than factory, workshop, office/showroom areas in warehouses or industrial buildings, where two or more clusters of toilets are provided at the same level but at different locations, the corresponding number of individual washrooms or water closet compartments shall be provided.
- 4.1.4 Where swing door is provided for bathroom and toilet, the door shall swing outwards. This will aid the rescue operation should the person inside the bathroom or toilet falls and obstructs it. Consideration should be given to the use of sliding or folding doors that are easier to operate and require less wheelchair manoeuvring space.
- 4.1.5 At least one wash basin complying with clause 4.6 shall be provided in the toilet.
- 4.1.6 At least one of each type of washroom accessories complying with clause 4.4 shall be provided in the toilet.

4.1.7 Where urinals are provided, at least one shall comply with clause 4.8 to cater to the ambulant disabled.

4.1.8 Signs at washroom entrances shall —

- (a) be clearly visible and have tactile finish in accordance with clause 10.5; and
- (b) comply with the symbol as described and illustrated in clause 10.2.

4.2 **INDIVIDUAL WASHROOM AND WATER CLOSET COMPARTMENT DOORS**

4.2.1 Individual washroom and water closet compartment doors shall:

- (a) provide a clear opening of at least 850 mm with the door in the fully open position in accordance with clause 3.8.2;
- (b) be designed to swing outwards or be provided with a sliding/folding door;
- (c) be provided with a horizontal pull-bar as shown in *Figure 40(a)* —
 - (i) at least 600 mm long on the inside of an out-swinging door;
 - (ii) located so that the end closer to hinge is not more than 130 mm from the hinged-side of the door; and
 - (iii) fixed at a height between 900 mm and 1100 mm.
- (d) be provided with a vertical/horizontal pull-bar as shown in *Figure 40(b)* —
 - (i) at least 140 mm long on the outside near the latch side of the door;
 - (ii) located so that the pull-bar is not more than 130 mm from the latch side of the door; and
 - (iii) placed at a height between 900 mm and 1100 mm.

- (e) be capable of being locked from the inside by a device that is operable with one hand and activated by a force not more than 22N and which does not require:
 - (i) fine finger control;
 - (ii) tight grasping; and
 - (iii) pinching or twisting of the wrist.

- Note:
- (1) *Toilet doors shall be designed to open outwards so that it would be easier for a rescuer to enter a compartment if a person has fallen and is lying behind the door. To allow for assistance in case of emergency, locks and latches should allow the door to be opened from the outside with a coin or any simple device.*
 - (2) *Wherever possible and practicable, a button-operated, automatic sliding door should be considered as it is easier to operate and manoeuvre around the doorway*

4.3 **GRAB BARS**

4.3.1 Grab bars shall be provided in individual washrooms or water closet compartments as illustrated in *Figures 40 and 41* and shall comply with the following requirements:

- (a) be in accordance with clause 3.5;
- (b) be mounted at a height between 280 mm and 300 mm from the top of the water closet seat;
- (c) one horizontal grab bar to be mounted on the side wall closest to the water closet extending from the rear wall to at least 450 mm in front of the water closet seat;
- (d) one flip-up grab bar to be mounted on the wide side of the compartment adjacent to the water closet and be able to remain at a vertical position when not in use as shown in *Figure 40*;
- (e) one vertical bar to be provided on the side wall closest to the water closet and located between 350 mm and 450 mm from the front edge as illustrated in *Figures 40(b) and 41(c)*; and

- (f) one horizontal grab bar of at least 700 mm long, to be mounted on the wall behind the water closet.

4.3.2 The flip-up grab bar specified in clause 4.3.1(d), when lowered from the wall shall:

- (a) be at a height between 280 mm and 300 mm from the top of the water closet seat;
- (b) extend not more than 100 mm from the front of the water closet seat; and
- (c) be 380 mm to 400 mm to the centre line of the water closet.

Note: *Unless otherwise specifically stated, all measurements shall be to the centre line of the bar.*

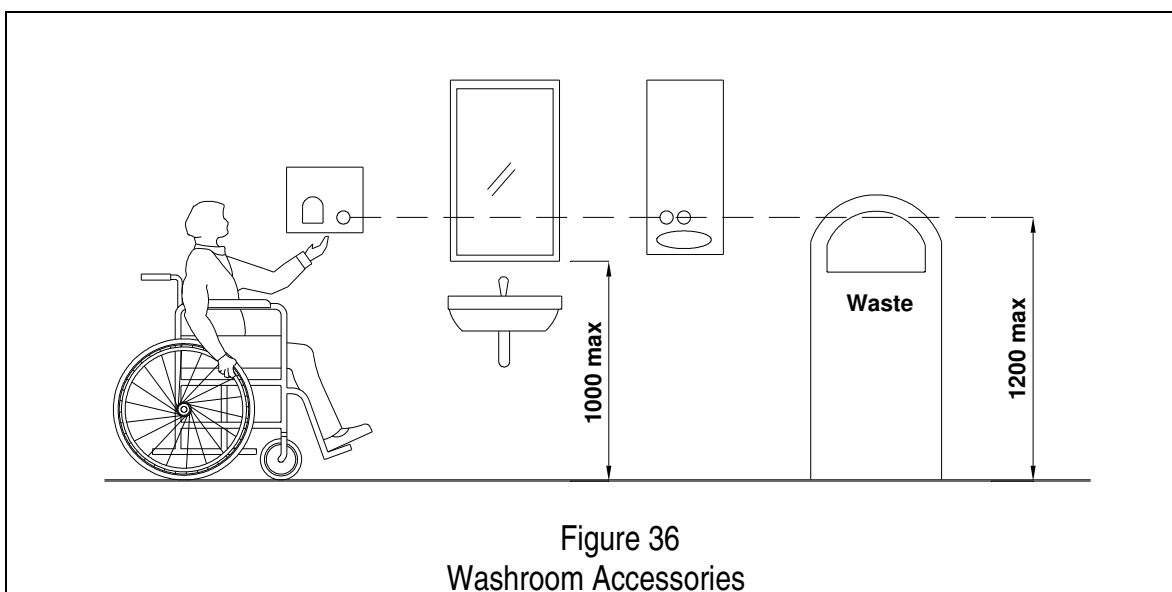
4.4 **WASHROOM ACCESSORIES**

4.4.1 Where washroom accessories are required to be provided under clause 4.1.6, they shall comprise the following:

- (a) a mirror positioned at a height of not more than 1000 mm from the bottom edge of the mirror to the floor as shown in *Figure 36*;
- (b) towel and soap dispensers, hand dryer, waste bin and sanitary bin shall contrast in colour and tone and positioned such that the operable parts and controls are between 1000 mm and 1200 mm from the floor.

Note: (1) *Accessories should be placed in close proximity to the accessible basin to avoid having a person wheeling a chair with wet hands.*

(2) *The lighting should be fixed in such a position that it does not shine directly onto the mirror.*



4.5 **EMERGENCY CALL BELL**

4.5.1 An emergency call bell shall be provided in —

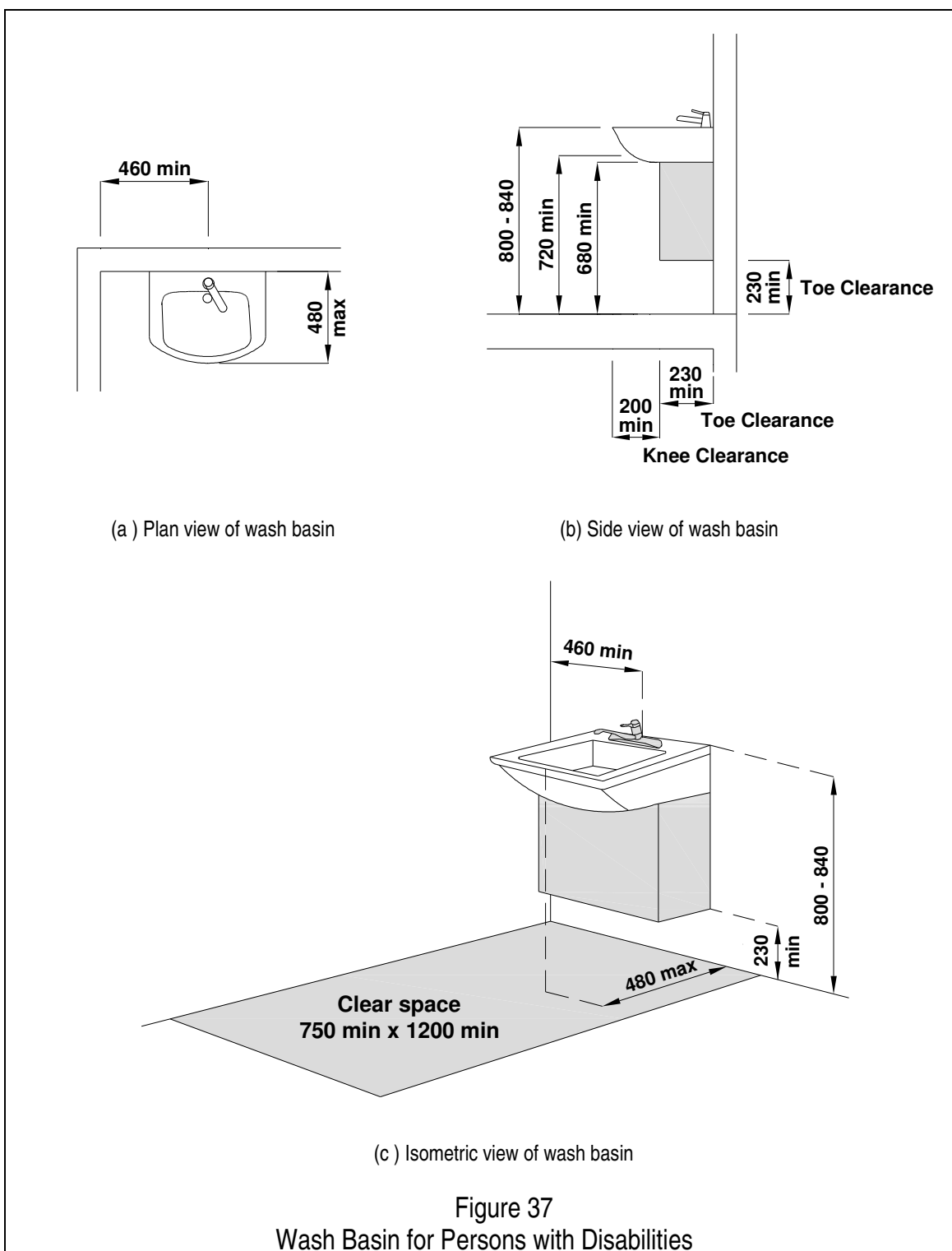
- (a) an individual washroom compartment; or
- (b) a water closet compartment.

4.5.2 The emergency call bell shall be equipped with a waterproof push-button or pull-chord for activating the bell.

4.5.3 The push-button or pull-chord shall —

- (a) be located at a height between 400 mm to 600 mm above the floor level and located between 150 mm to 300 mm from either the front or side edges of the water closet as illustrated in *Figures 40(c) and 41(d)*; and
- (b) have a colour that is contrasting with the background.

- 4.5.4 The call annunciation shall, where appropriate, be provided by –
- (a) a call bell located outside the compartment; or
 - (b) a buzzer in the caretaker's office.
- 4.5.5 A notice stating "Emergency Call" shall be prominently affixed next to the push-button or pull-chord.
- 4.6 **WASH BASIN**
- 4.6.1 Wash basins, as illustrated in *Figure 37*, shall:
- (a) be of a standard size with dimensions of approximately 520 mm by 410 mm;
 - (b) be mounted such that the minimum distance between the centre line of the fixture and the side wall is 460 mm;
 - (c) be mounted such that the top edge is between 800 mm and 840 mm from the floor;
 - (d) have a knee space of at least 750 mm wide by 200 mm deep by 680 mm high with an additional toe space of at least 750 mm wide by 230 mm deep by 230 mm high; and
 - (e) have a minimum clear floor space of 750 mm wide by 1200 mm deep of which a maximum of 480 mm in depth may be under the wash basin.
- 4.6.2 The hot water and drain pipes located within the knee space or toe space shall be properly insulated.
- 4.6.3 Faucets and other controls provided shall comply with clause 3.10.
- 4.6.4 The front apron of a vanity counter shall have a minimum clearance of 750 mm wide by 720 mm high.



Note: *The depth of the vanity counter should be kept to a minimum so that the controls and faucets are easily within the reach of a wheelchair user.*

4.7 WATER CLOSET

4.7.1 Water closet shall comply with the following requirement:

- (a) be located between 460 mm to 480 mm from the centre line of the water closet to the adjacent wall and have a clear dimension of 750 mm from the front edge of the water closet to the rear wall to facilitate side transfer;
- (b) the top of the water closet seat shall be between 450 mm and 480 mm from the floor as shown in *Figures 40(b) and 41(c)*;
- (c) have no spring-activated seat;
- (d) have a back support where there is no seat lid or tank. A back support reduces the chance of imbalance or injury caused by leaning against exposed valves or pipes;
- (e) preferably be of the wall-hung as it provides additional space at toe level as shown in *Figure 38*;
- (f) have flush control:
 - (i) complying with clause 3.10;
 - (ii) if hand-operated, be located on the transfer side of the water closet; and
 - (iii) located at a height of between 800 mm to 1100 mm from the floor; and
- (g) be equipped with a self-closing water spray head connected by a flexible hose beside the water closet seat for cleaning purposes.

- Note:
- (1) *Preferences for toilet seat heights vary considerably. Higher seats may be an advantage to some ambulant disabled but a disadvantage to wheelchair users. Toilet seats at a height of 450 mm offer a reasonable compromise. Thick seats and filler rings are available to adapt standard fixtures to these requirements.*
 - (2) *Major problems are encountered by wheelchair users entering and leaving a washroom. Within the washroom, sufficient space is required to allow wheelchair users to move freely to and from the various fixtures as shown in Figure 40(a).*

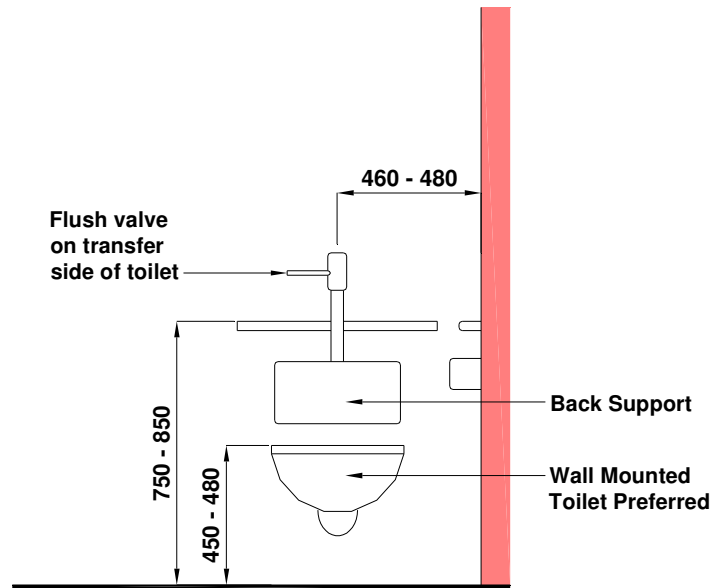
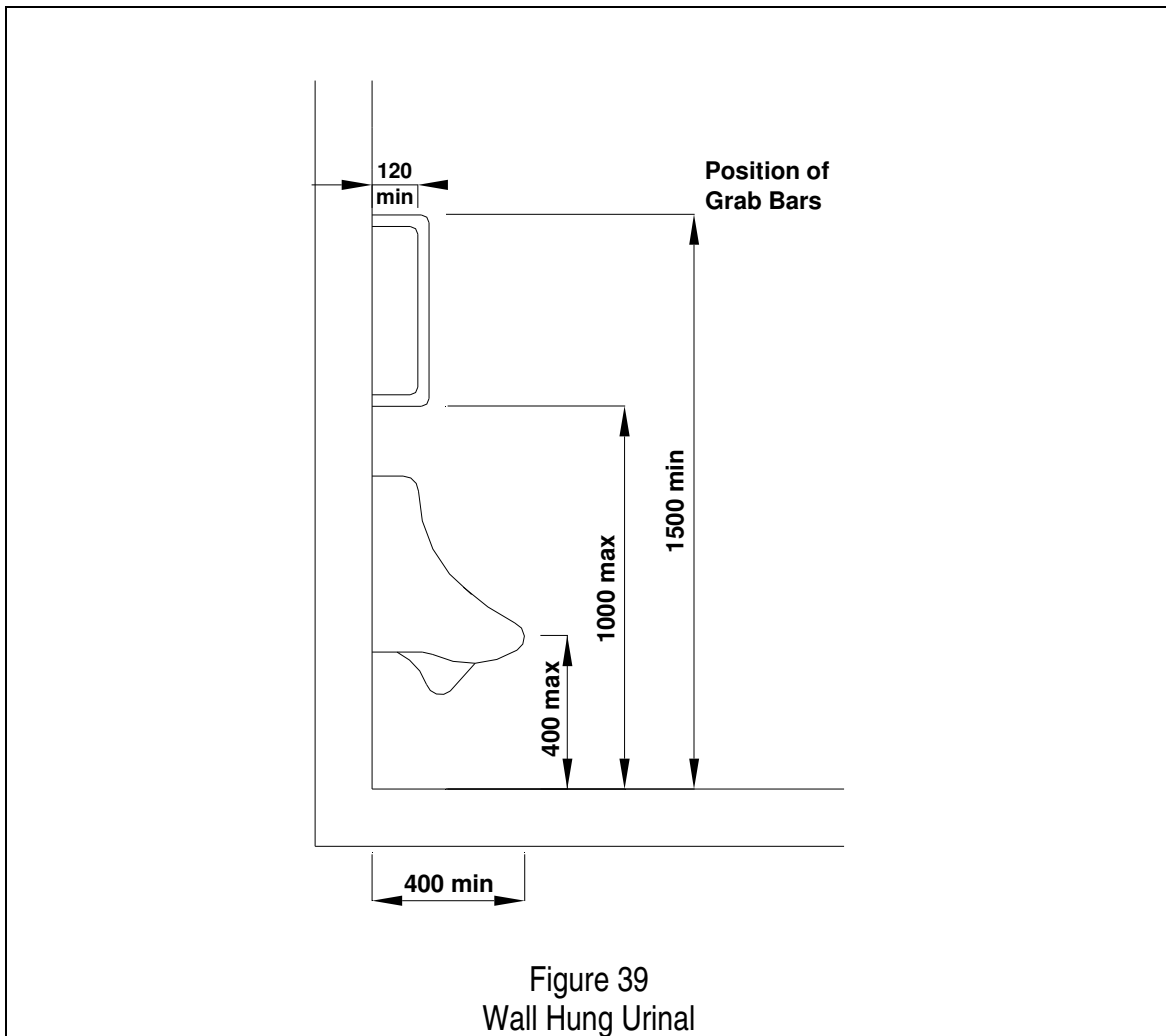


Figure 38
Wall Hung Water Closet

4.8 URINALS

4.8.1 Where urinals for the ambulant disabled are to be provided under clause 4.1.7, they shall comply with the following as illustrated in *Figure 39*:

- (a) be of the wall-hung type with a rim not more than 400 mm from the floor;
- (b) have a minimum clear floor space of 750 mm wide by 1200 mm deep without steps in front of the urinals; and
- (c) not have privacy shields extending beyond the front edge of the urinal rim unless such shields allow a clear width of not less than 750 mm.



4.8.2 Grab bars, complying with clause 3.5, shall be provided on both sides of the urinals and shall:

- (a) extend from 1000 mm to 1500 mm above the floor level; and
- (b) have a clear space of 120 mm between the grab bar and wall surface.

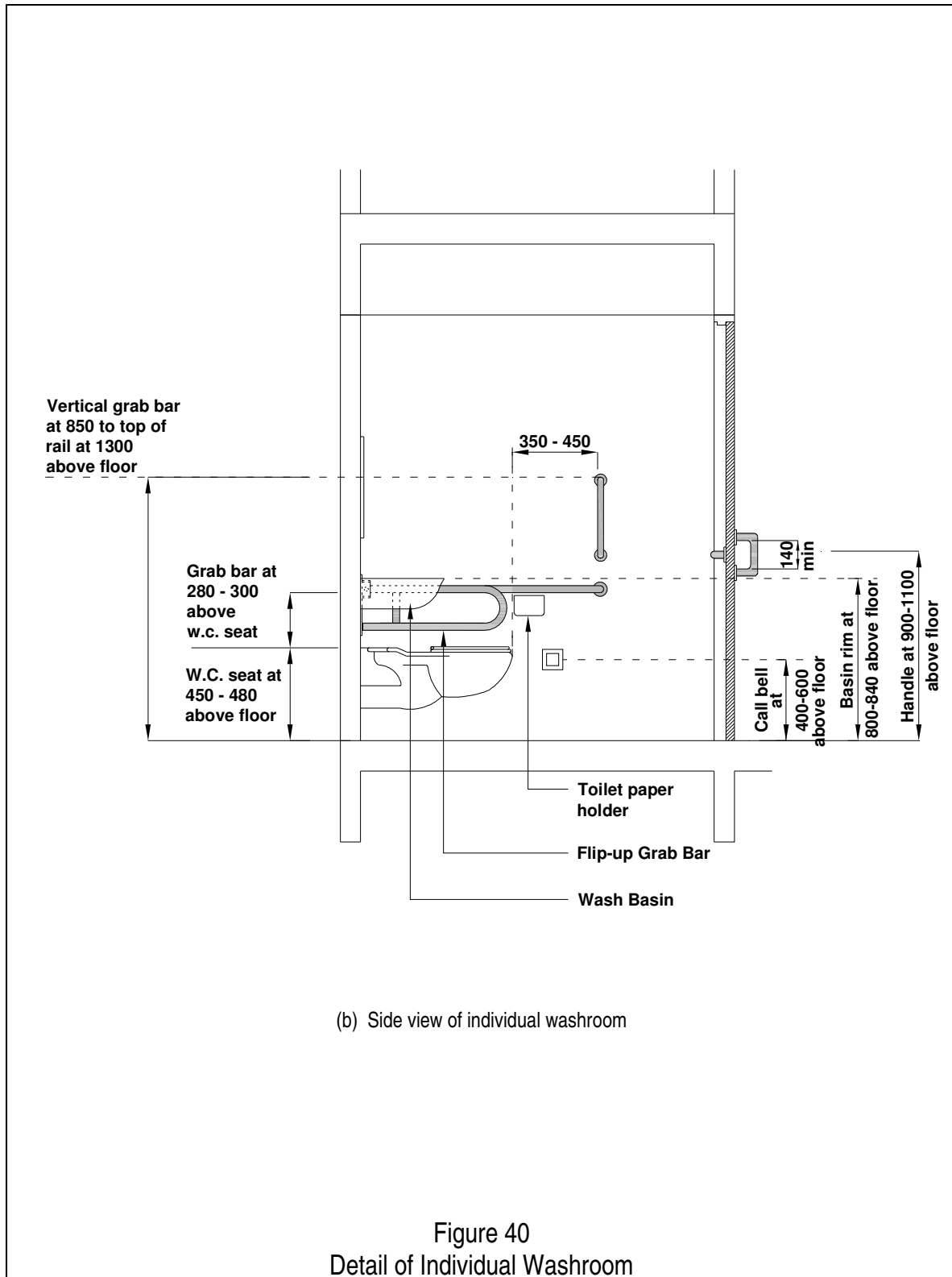
4.8.3 Flush controls shall:

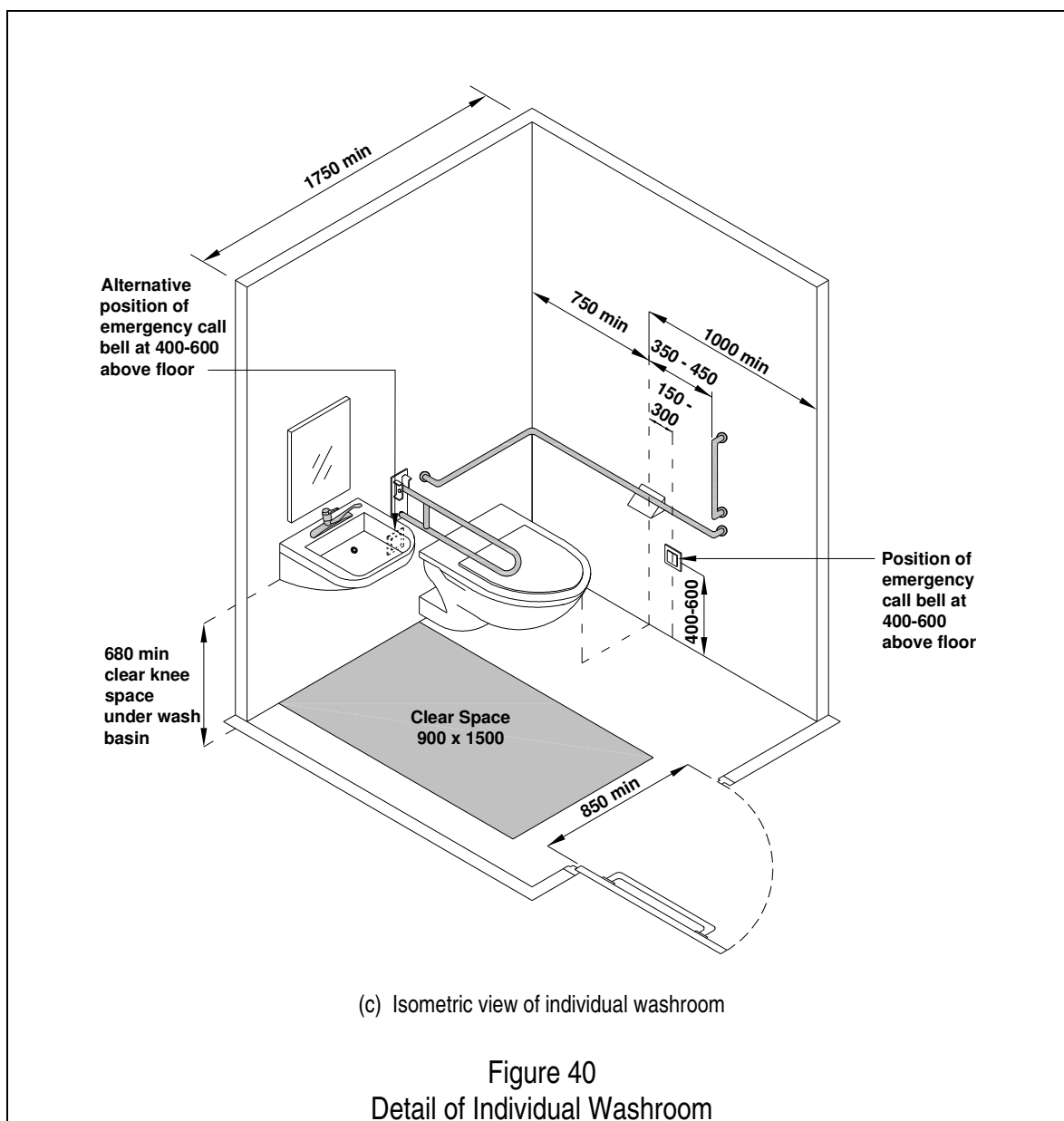
- (a) comply with clause 3.10; and
- (b) be located not more than 1200 mm from the floor.

4.9 INDIVIDUAL WASHROOM

4.9.1 Where an individual washroom for the wheelchair user is provided under clause 4.1.1(a), it shall;

- (a) have clear dimensions between opposite walls of not less than 1750 mm;
- (b) have a clear space of not less than 900 mm X 1500 mm adjacent to the water closet;
- (c) be equipped with a door complying with clause 4.2;
- (d) have grab bars complying with clause 4.3;
- (e) have essential washroom accessories complying with clause 4.4;
- (f) have a wash basin complying with clause 4.6;
- (g) have a water closet complying with clause 4.7;
- (h) have a toilet roll dispenser mounted below the grab bars and not more than 300 mm from the front edge of the seat and at a height between 50 mm to 250 mm from the top of the water closet seat;
- (i) be equipped with a coat hook mounted on a side wall not more than 1300 mm from the floor and projecting not more than 40 mm from the wall;
- (j) be equipped with an emergency call bell in accordance with clause 4.5;
- (k) where possible, be equipped with a shelf or counter measuring 400 mm x 200 mm and fixed at a height of between 900 mm and 1100 mm from the floor; and
- (l) where appropriate, be equipped with a shower head complying with clause 4.12.5.





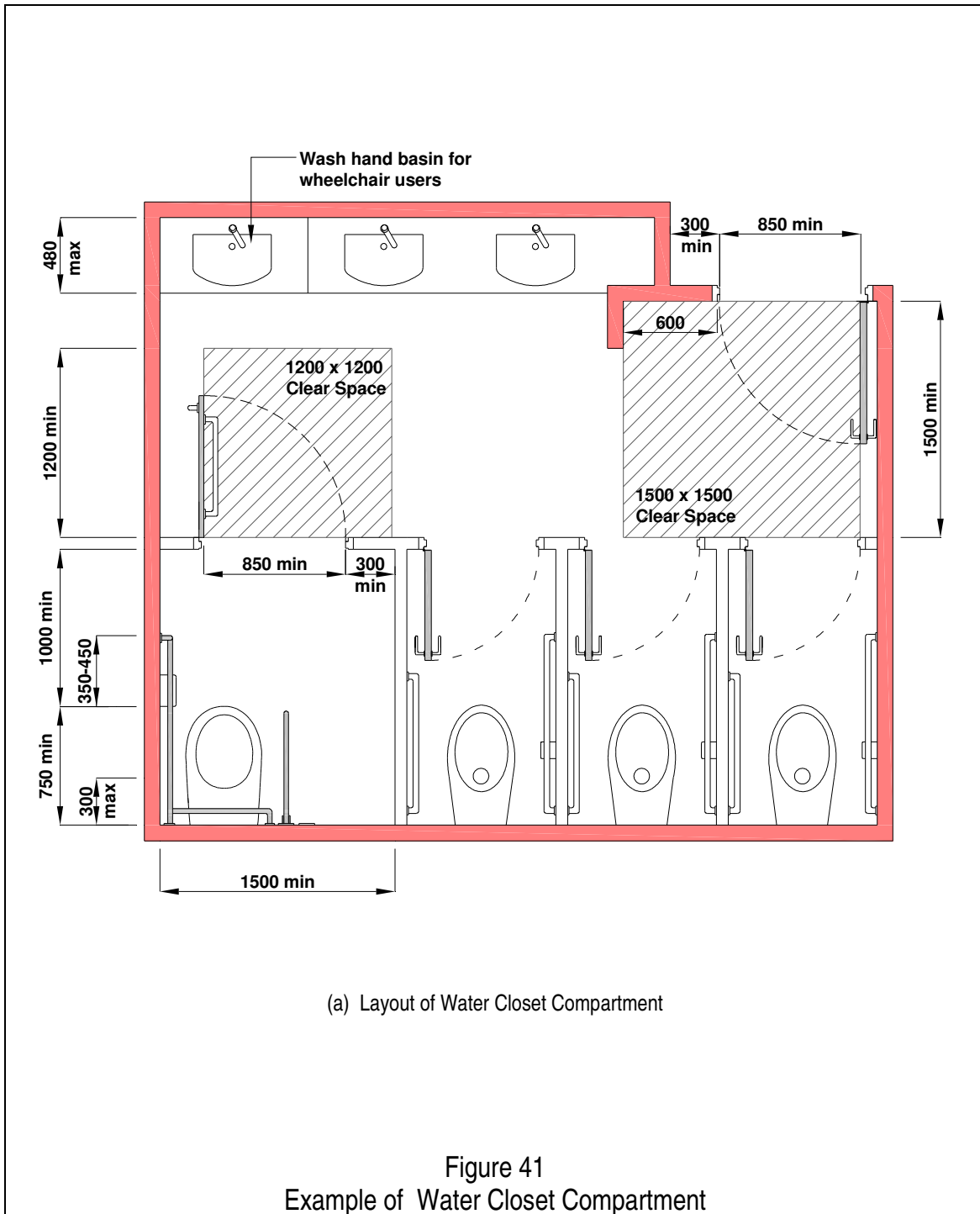
- Note:
- (1) An individual washroom is a unisex washroom containing a wash basin and a water closet.
 - (2) An individual washroom is used by persons with different disabilities. It is especially suitable when persons or children with disabilities and their respective care-givers or parents are of the opposite sex.
 - (3) For public buildings such as shopping complexes, office buildings and hotels, an individual washroom is preferred over a water closet compartment for the reason given in Note (2) above.

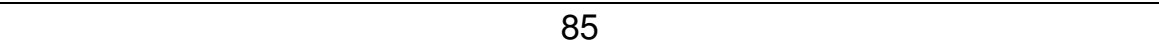
4.10 **WATER CLOSET COMPARTMENT FOR WHEELCHAIR USER**

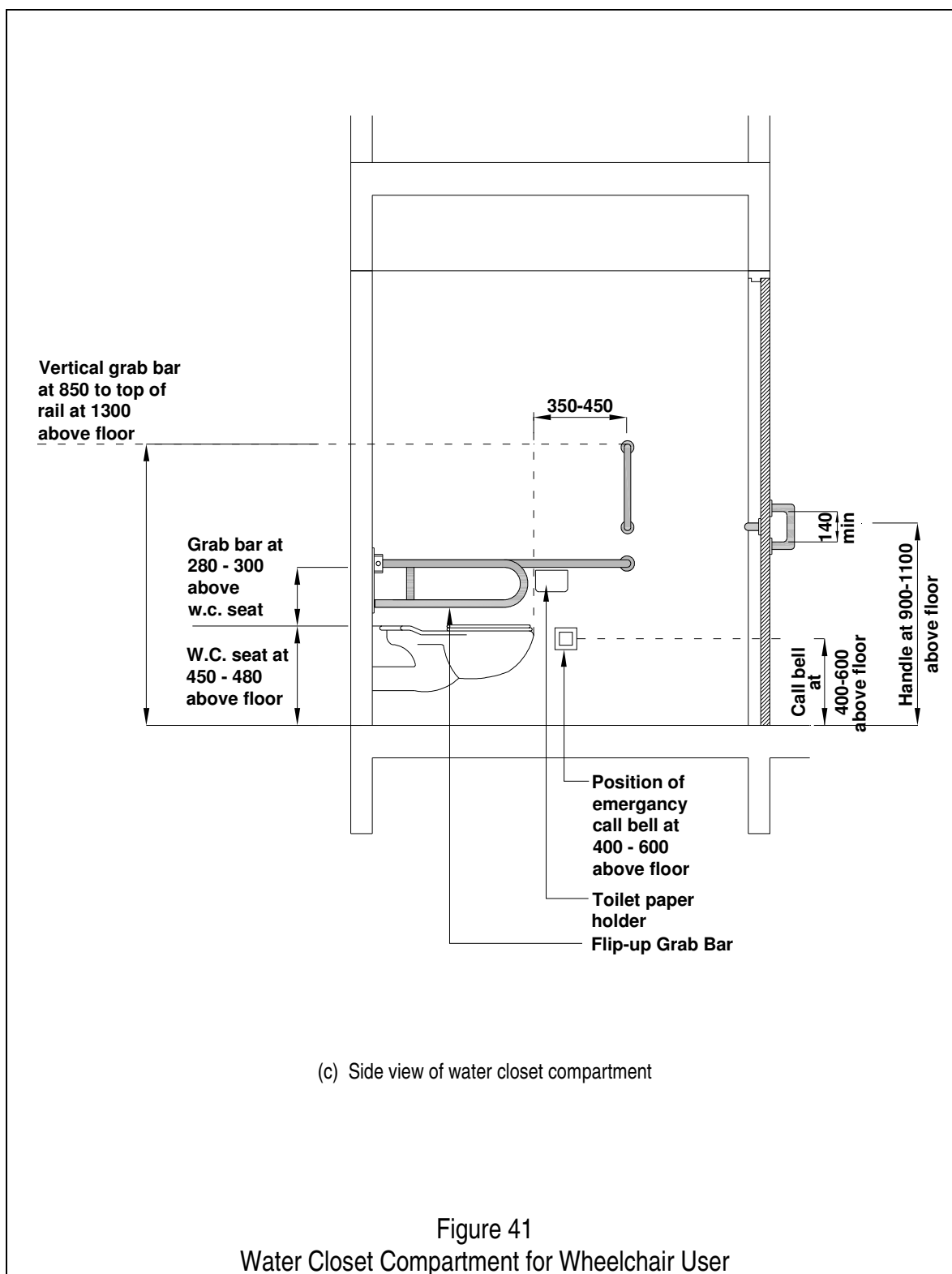
4.10.1 Where a water closet compartment for the wheelchair user is provided under clause 4.1.1(b), it shall:

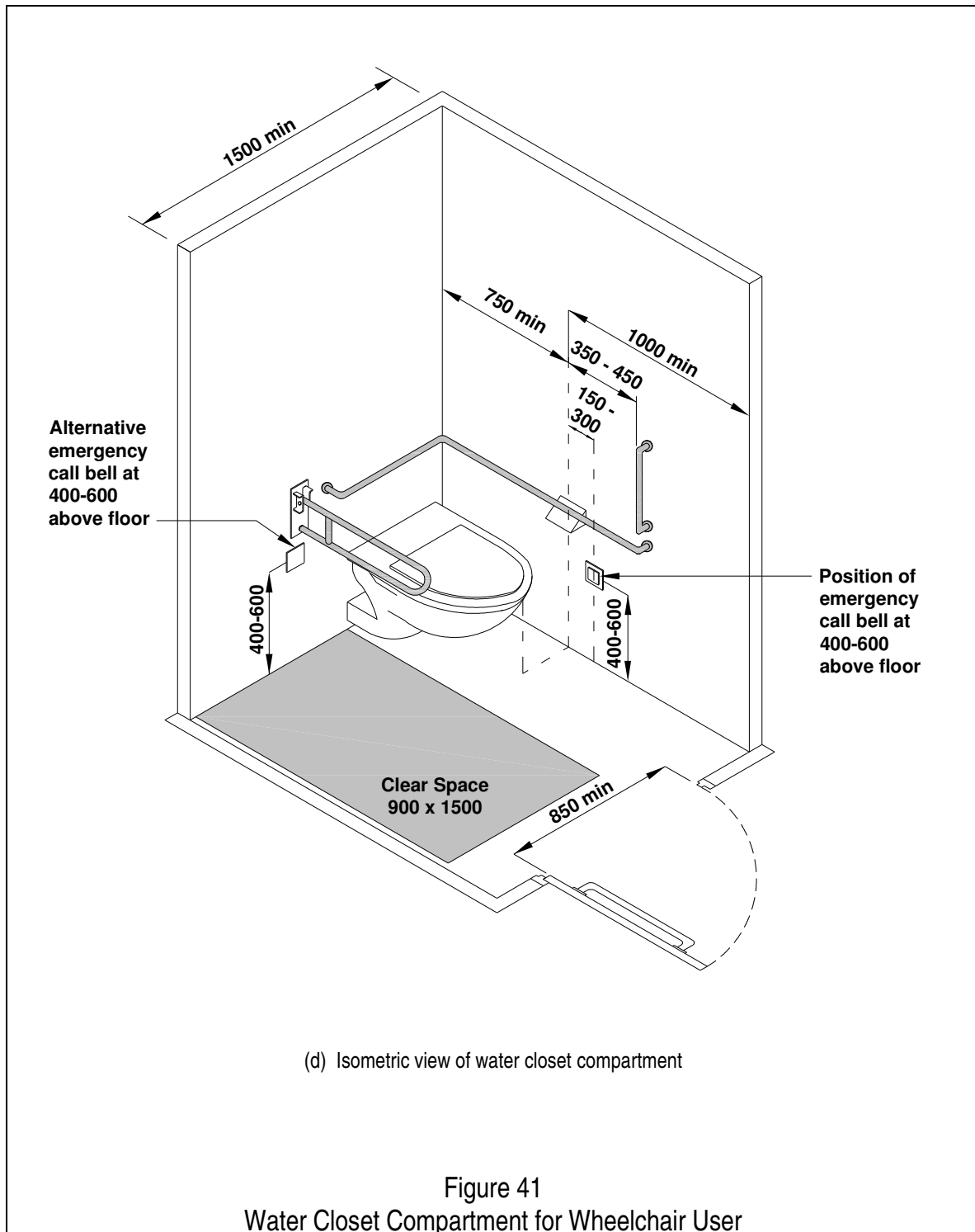
- (a) have clear internal dimensions of not less than 1500 mm x 1750 mm;
- (b) have a clear space of not less than 900 mm X 1500 mm adjacent to the water closet;
- (c) be equipped with a door complying with clause 4.2;
- (d) have grab bars complying with clause 4.3;
- (e) have a water closet complying with clause 4.7;
- (f) have a toilet roll dispenser mounted below the grab bars and not more than 300 mm from the front edge of the seat and at a height between 50 mm to 250 mm from the top of the water closet seat;
- (g) be equipped with a coat hook mounted on a side wall not more than 1300 mm from the floor and projecting not more than 40 mm from the wall; and
- (h) be equipped with an emergency call bell in accordance with clause 4.5.

4.10.2 A water closet compartment for the wheelchair user is illustrated in *Figure 41*.





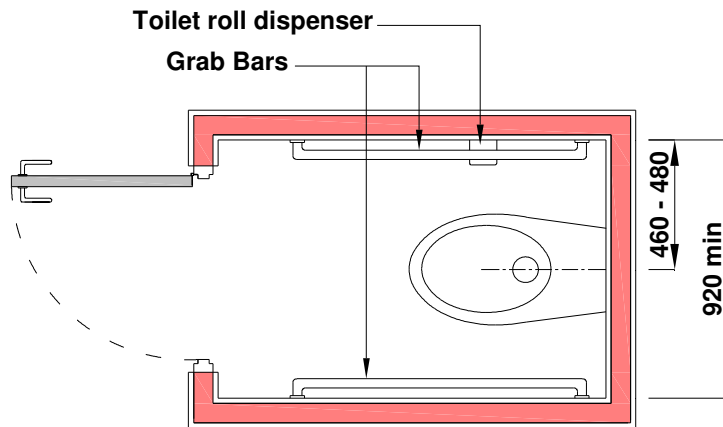




4.11 **WATER CLOSET COMPARTMENT FOR AMBULANT DISABLED**

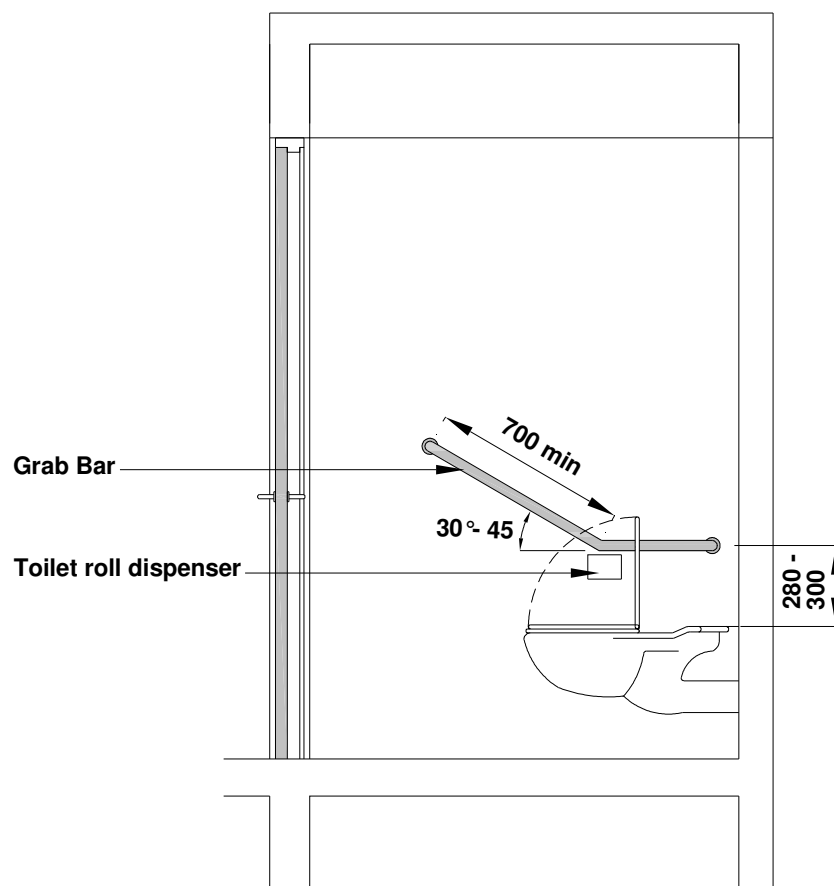
4.11.1 Where a water closet compartment for the ambulant disabled is provided under clause 4.1.2, it shall comply with the following:

- (a) have internal dimensions of a standard compartment with a minimum width of 920 mm;
- (b) have grab bars on both sides of the compartment to act as handhold for ambulant user to stand as illustrated in *Figure 42*;
- (c) not have spring activated seat;
- (d) be equipped with a door complying with clause 4.2; and
- (e) have a ambulant disabled sign placed on the outside of the door indicating that the compartment is suitable for use by persons who require grab bars.



(a) Layout plan of water closet compartment

Figure 42
Water Closet Compartment for Ambulant Disabled



(b) Side view of water closet compartment

Figure 42
Water Closet Compartment for Ambulant Disabled

Note: *Water closet compartment for the ambulant disabled is not suitable for wheelchair users and shall not be taken as an alternative to individual washroom or water closet compartment for wheelchair users.*

4.12 BATH FACILITIES

4.12.1 General

4.12.1.1 Hotels or boarding houses and hostels, halls of residence or dormitories which are required to have accessible provisions for persons with disabilities as stipulated in Chapter 2, shall be provided with bathtubs complying with clause 4.12.2 or shower stalls complying with clause 4.13.

4.12.1.2 Sports complexes and public swimming pools which are required to have accessible provisions for persons with disabilities as stipulated in Chapter 2, shall be provided with shower compartments in both the male and female areas complying with clause 4.13.

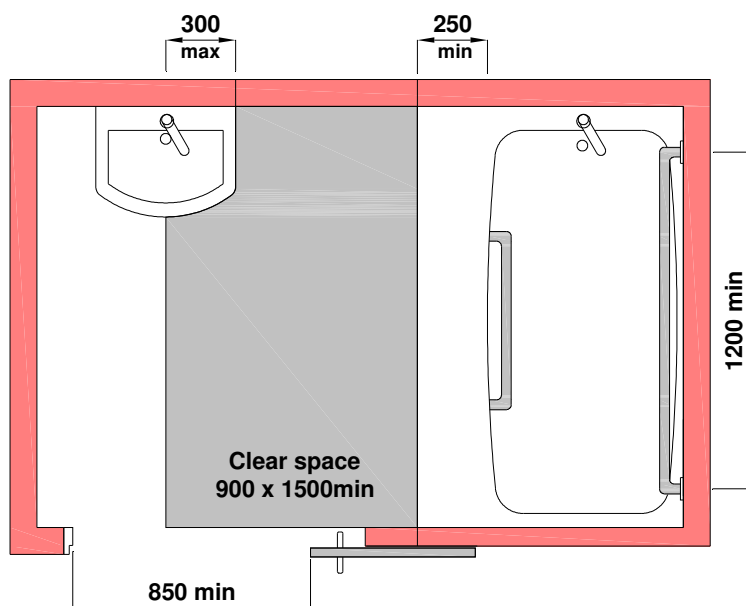
4.12.2 **Bathtub**

4.12.2.1 There shall be a clear floor space of at least 900 mm by 1500 mm in front of the bathtub. The wash basin may encroach to a maximum of 300 mm into this space provided there is a clear knee and toe space under the wash basin.

4.12.2.2 The bathtub shall be provided with a seat of at least 250 mm wide along its entire length and at a height of between 450 mm to 480 mm.

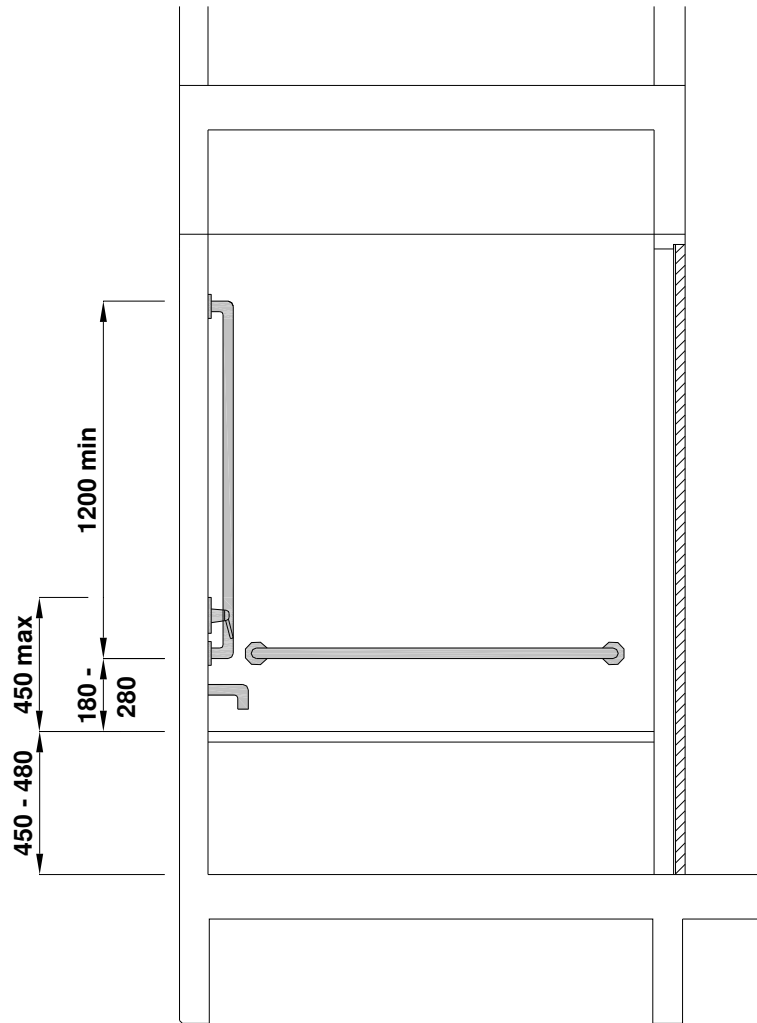
4.12.2.3 The base of the bathtub shall be slip-resistant and, where it is not possible, a slip-resistant rubber mat shall be provided.

4.12.2.4 The layout of a bathtub is illustrated in *Figure 43*.



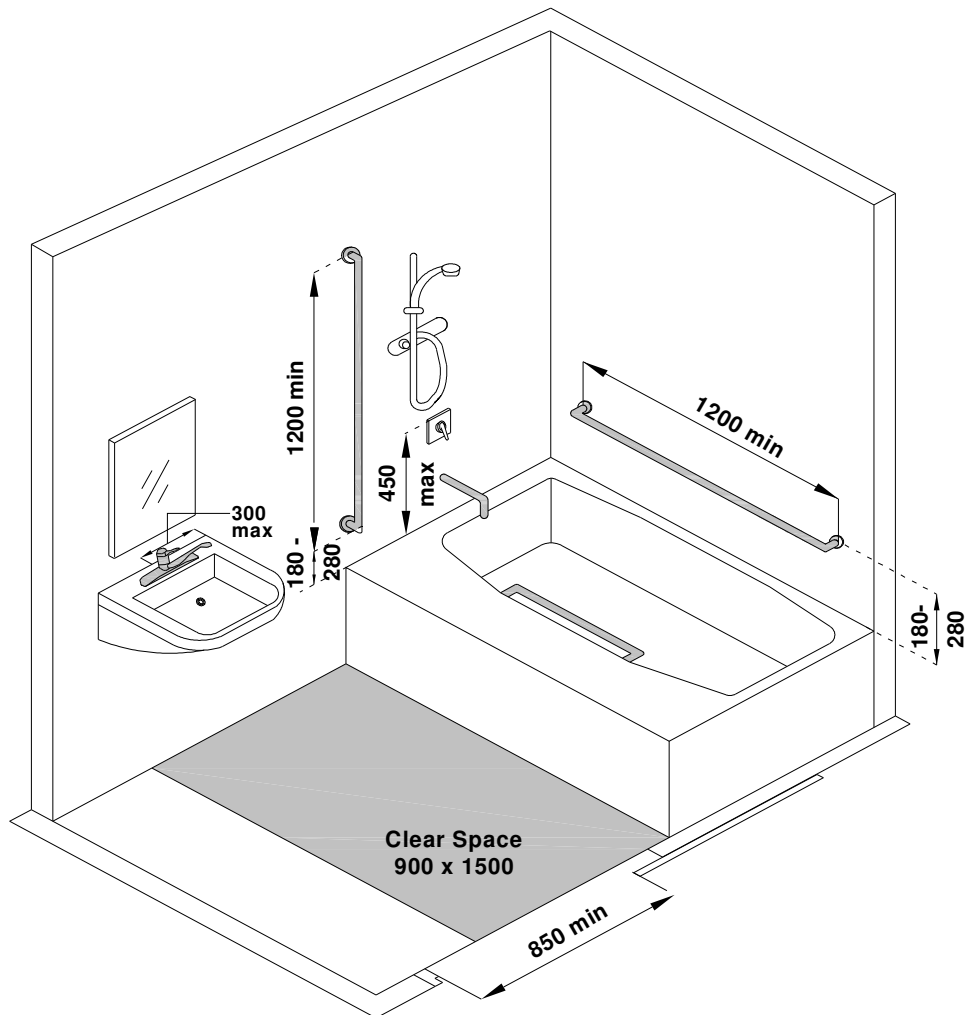
(a) Layout plan of bathtub

Figure 43
Bathtub for Persons with Disabilities



(b) Side view of bathtub

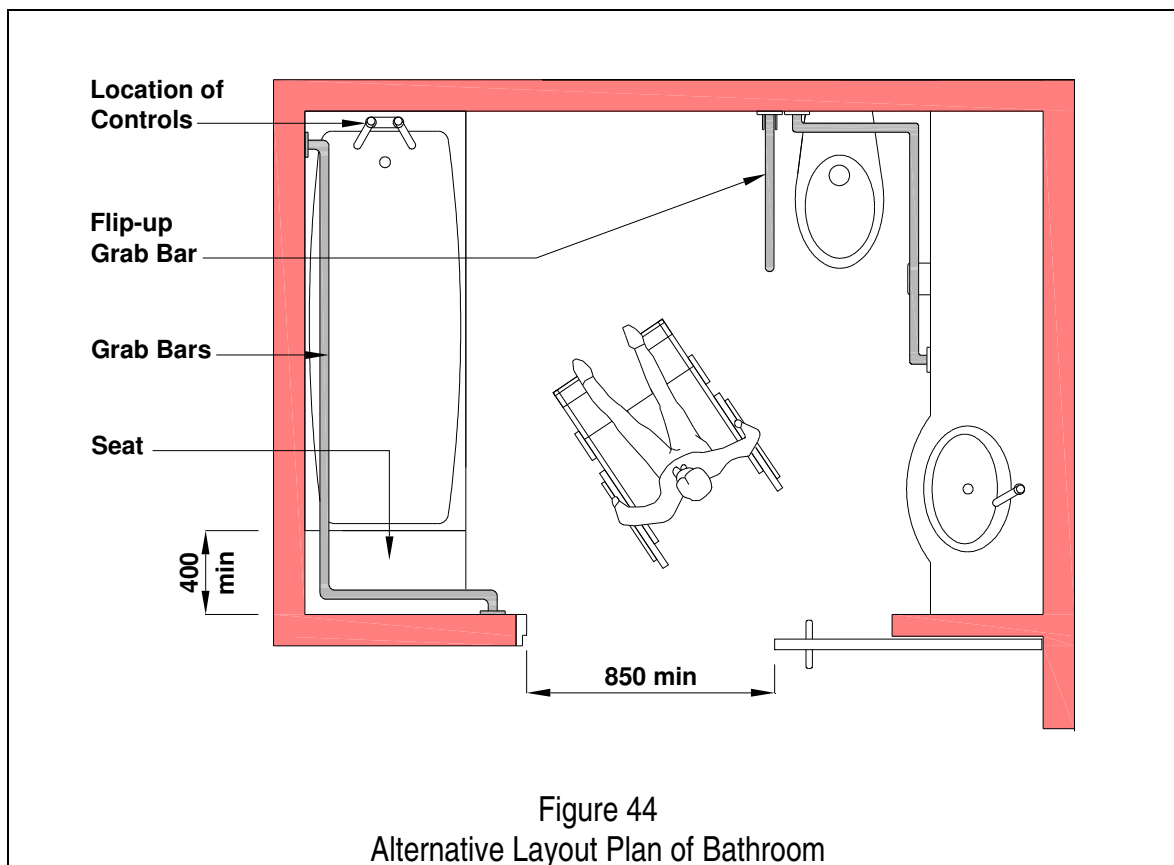
Figure 43
Bathtub for Persons with Disabilities



(c) Isometric view of bathtub

Figure 43
Bathtub for Persons with Disabilities

- 4.12.2.5 As an alternative to clause 4.12.2.2, a seat of at least 400 mm deep across its width shall be provided. The seat shall be located at the opposite end of the controls to allow for easier access as illustrated in *Figure 44*.



4.12.3 Grab bars

4.12.3.1 Grab bars shall:

- (a) comply with clause 3.5;
- (b) be at least 1200 mm long, located horizontally along the length of the bathtub and 180 mm to 280 mm above the bathtub rim; and
- (c) be at least 1200 mm long, located vertically at the control end of the bathtub adjacent to the clear floor space with the lower end 180 mm to 280 mm above the bathtub rim as shown in *Figure 43*.

4.12.4 **Faucets and controls**

4.12.4.1 Faucets and other controls shall:

- (a) comply with clause 3.10;
- (b) located at the control end of the bathtub between the centre line and to the outer edge;
- (c) be not more than 450 mm above the bathtub rim; and
- (d) have clearly visible colour contrasted and embossed signs indicating hot and cold water supply.

4.12.5 **Shower heads**

4.12.5.1 Shower heads shall:

- (a) be of the hand-held type;
- (b) be provided with a hose not less than 1500 mm long; and
- (c) allow use in a fixed position.

4.12.5.2 Where shower heads are mounted on a vertical bar, the bar shall –

- (a) have a minimum length of 500 mm with the lower end at least 1000 mm above the floor level; and
- (b) be installed so as not to obstruct the use of grab bars.

4.12.6 **Bath enclosures**

4.12.6.1 Enclosures for bathtubs shall not:

- (a) obstruct controls;
- (b) interfere with a person transferring from a wheelchair; and
- (c) have tracks mounted on the bathtub rim.

4.13 ROLL-IN SHOWER STALL FOR WHEELCHAIR USER

4.13.1 General

4.13.1.1 A roll-in shower stall shall have internal dimensions of at least 1500 mm by 1500 mm as shown in *Figure 45*.

4.13.1.2 The minimum clear floor space in front of the shower entrance shall be 900 mm by 1500 mm parallel to the shower entrance.

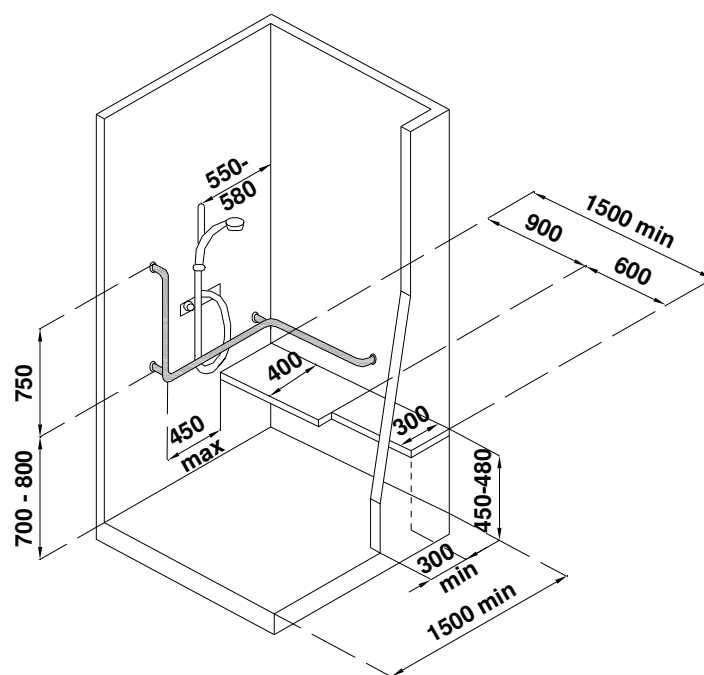


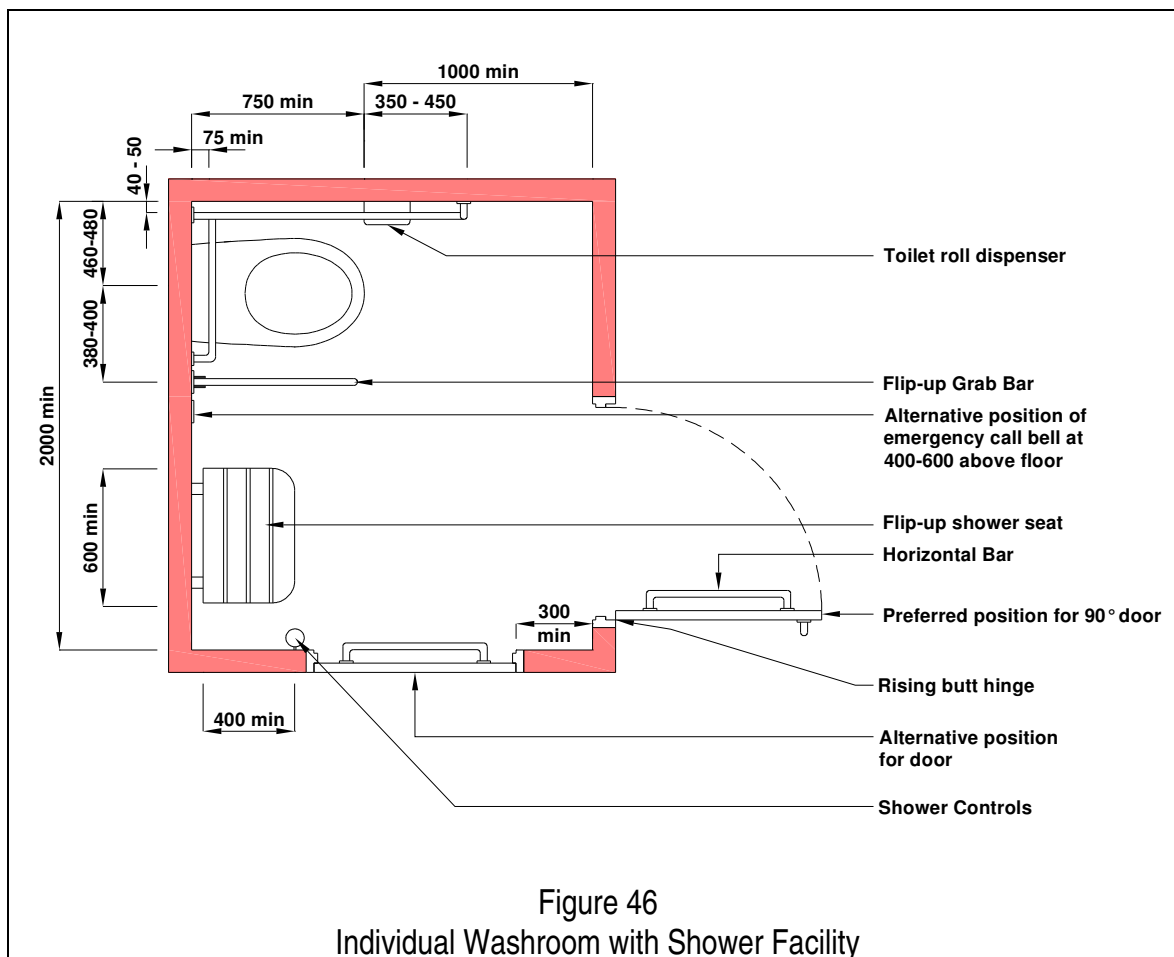
Figure 45
Roll-in Shower Stall for Wheelchair User

4.13.1.3 The floor of the roll-in shower stall shall be slip-resistant.

Note: *Additional information and guidance on slip-resistant finishes are given in Appendix B.*

4.13.1.4 Enclosures for shower stalls shall comply with clause 4.12.6.

- 4.13.1.5 Where an individual washroom is designed to include shower facility, the minimum internal dimensions shall be 2000 mm by 1750 mm as shown in *Figure 46*.



4.13.2 Grab bars

4.13.2.1 Grab bars for roll-in shower stall shall:

- (a) comply with clause 3.5;
- (b) comprise an L-shaped bar or 2 bars arranged in L-shaped configuration; and
- (c) be at least 750 mm by 900 mm and mounted between 700 mm and 800 mm from the shower floor as shown in *Figure 45*.

4.13.3 **Faucets and controls**

4.13.3.1 Faucets and other controls as shown in *Figure 45* shall comply with clause 4.12.4.

4.13.4 **Shower heads**

4.13.4.1 Shower heads shall comply with the requirements of clause 4.12.5.

4.13.5 **Kerbs**

4.13.5.1 Kerbs for roll-in shower stall shall –

- (a) not be more than 10 mm high, bevelled at a slope of 1:2; and
- (b) have colour that contrasts with the flooring colour to reduce the possibility of dangerous tripping.

4.13.6 **Shower seats**

4.13.6.1 The shower seat shall:

- (a) have a rounded edge, self-draining and slip-resistant;
- (b) be installed on the wall nearest to the controls;
- (c) have the following minimum dimensions –
 - (i) 400 mm wide by 900 mm long for a roll-in shower as shown in *Figure 45*; or
 - (ii) 400 mm wide by 600 mm long for individual washroom with shower facility as shown in *Figure 46*;
- (d) have its top between 450 mm and 480 mm from the floor; and
- (e) have a clear toe space of not less than 750 mm wide by 230 mm deep and 230 mm high as shown in *Figure 45*.

Note: *If a roll-in shower stall is attached to a room, it is possible for a wheelchair user to use the bed to help him to dress. However, the length of the seat in an individual washroom with shower facility needs to be longer as the wheelchair user needs the additional space to facilitate his dressing.*

4.14 BATHROOM FOR FUTURE RETROFITTING IN A RESIDENTIAL UNIT

4.14.1 There shall be at least one bathroom in every residential unit that can be retrofitted for the elderly persons and wheelchair users when the need arises;

4.14.2 The bathroom shall be located at the same level as the entrance of the unit;

4.14.3 The width of the access route leading to the bathroom, or the room where the bathroom is, shall be 1000 mm minimum, subject to the provisions in *Table 2B*;

4.14.4 The doorway of the bathroom and the clear space in front of the doorway shall comply with the dimensions in *Table 2B*; and a typical layout illustrating the width of doorway at right angle to an access route is shown in *Figure 47(a)*;

TABLE 2B

Minimum Clear Width of Door Opening

Width of the doorway	Minimum corridor width perpendicular to the doorway
900 mm	1000 mm
850 mm	1100 mm
800 mm	1200 mm

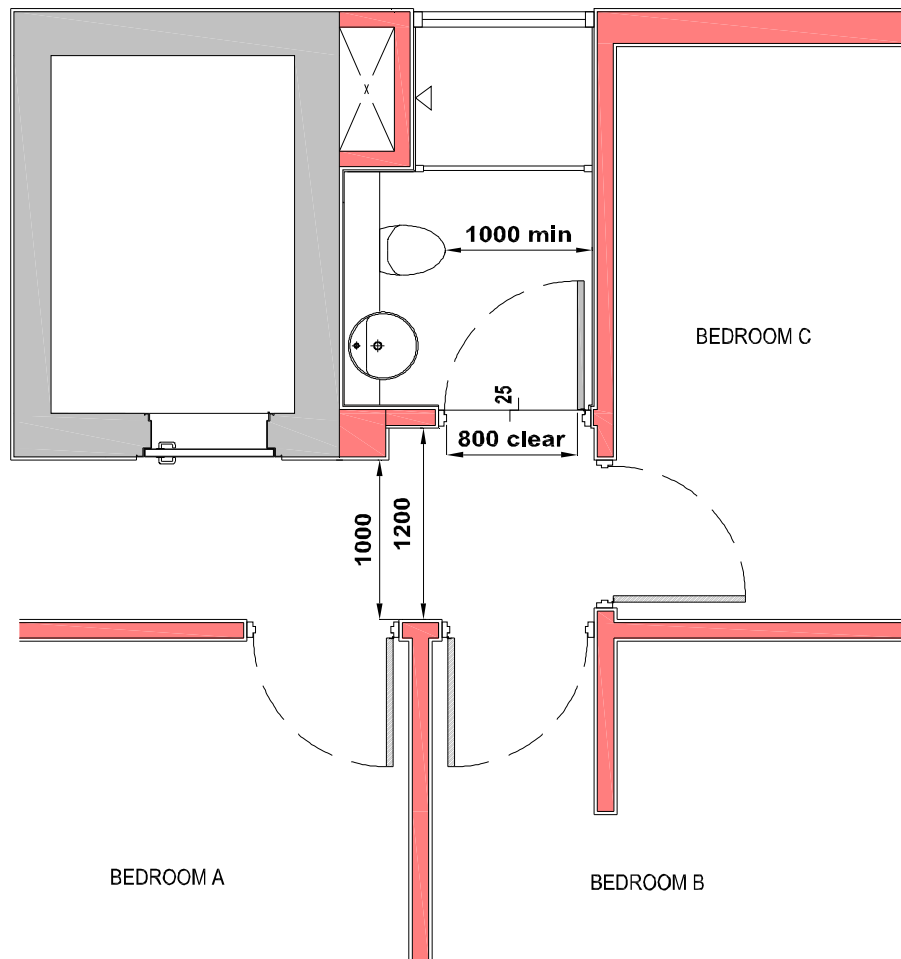


Figure 47(a)
Width of Doorway at right angle to an Access Route

- 4.14.5 There shall be an unobstructed space of not less than 1000 mm in diameter next to the doorway within the bathroom;
- 4.14.6 The change in level of the floor surface at the doorway of the bathroom shall not be more than 25 mm;
- 4.14.7 Provision shall be made for retrofitting the necessary grab bars in the bathroom and may be in accordance with clause 4.3;

4.15 **BATHROOM FOR FUTURE RETROFITTING SITED IN ANOTHER ROOM**

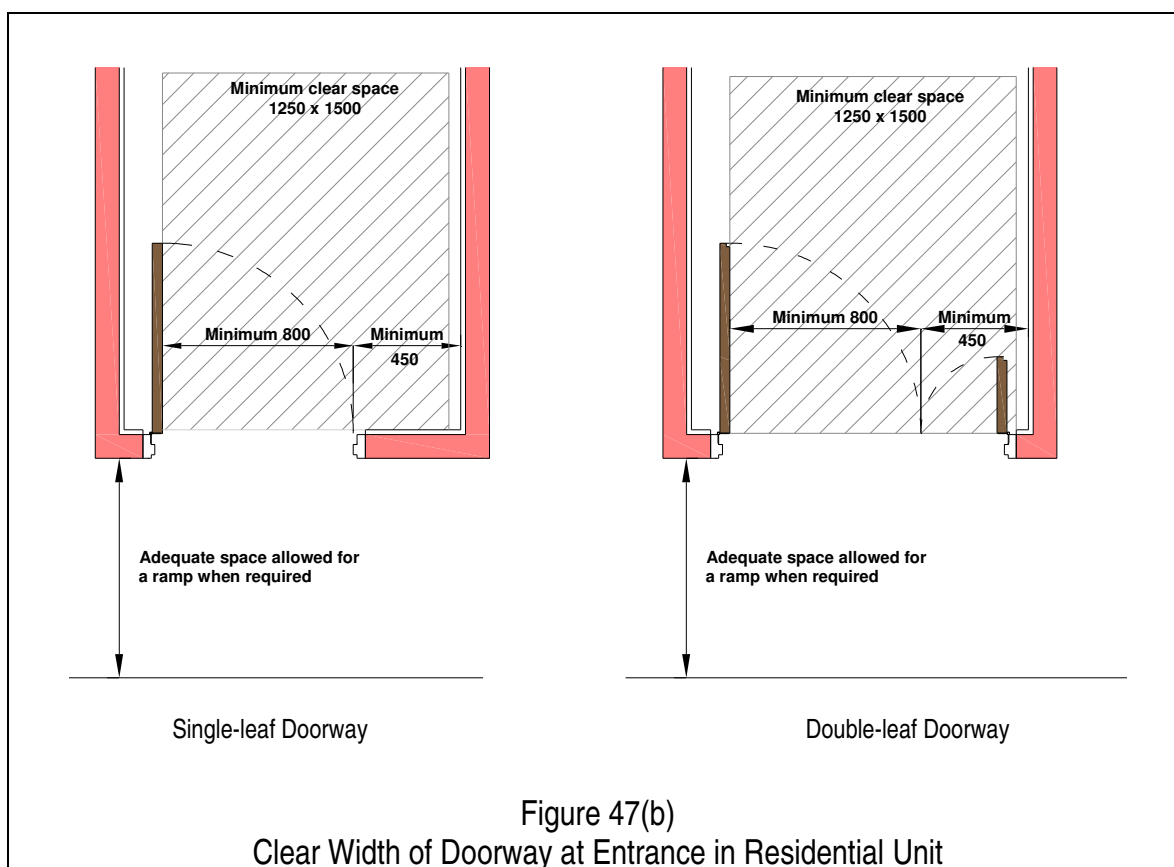
4.15.1 If the bathroom for future retrofitting is accessed through another room, the clear opening of the doorway of the room shall comply with the minimum dimension specified in *Table 2B*;

4.16 **ENTRANCE TO THE UNIT**

4.16.1 The difference in levels between the floor of the entrance to the unit and the abutting common area shall not be more than 50 mm;

4.16.2 The doorway of the entrance shall be 800 mm minimum for a single leaf door. If the doorway has two independently operated door leaves, at least one active leaf shall be 800 mm minimum. The clear width of entrance for single-leaf and double-leaf doorway is shown in *Figure 47(b)*;

4.16.3 The manoeuvring space at the entrance, within the unit, shall have a minimum space of 1250 mm wide X 1500 mm deep;



4.17 **SWITCHES AND SOCKET OUTLETS IN RESIDENTIAL UNIT**

4.17.1 The switches and socket outlets shall be provided at a height of between 450 mm and 1200 mm from the floor level.

Note: *All measurements shall be to the centre line of the switches and socket outlets.*

CHAPTER 5

PASSENGER LIFT

5.1 GENERAL

5.1.1 All lifts provided in a building shall include suitable provisions for persons with sensory impairments and ambulant disabled as a means of access from one level to another.

5.1.2 The emergency bell in the lift must be connected to a blinking light in the lift car to signal to persons with hearing impairment that the emergency bell has been activated.

Note:

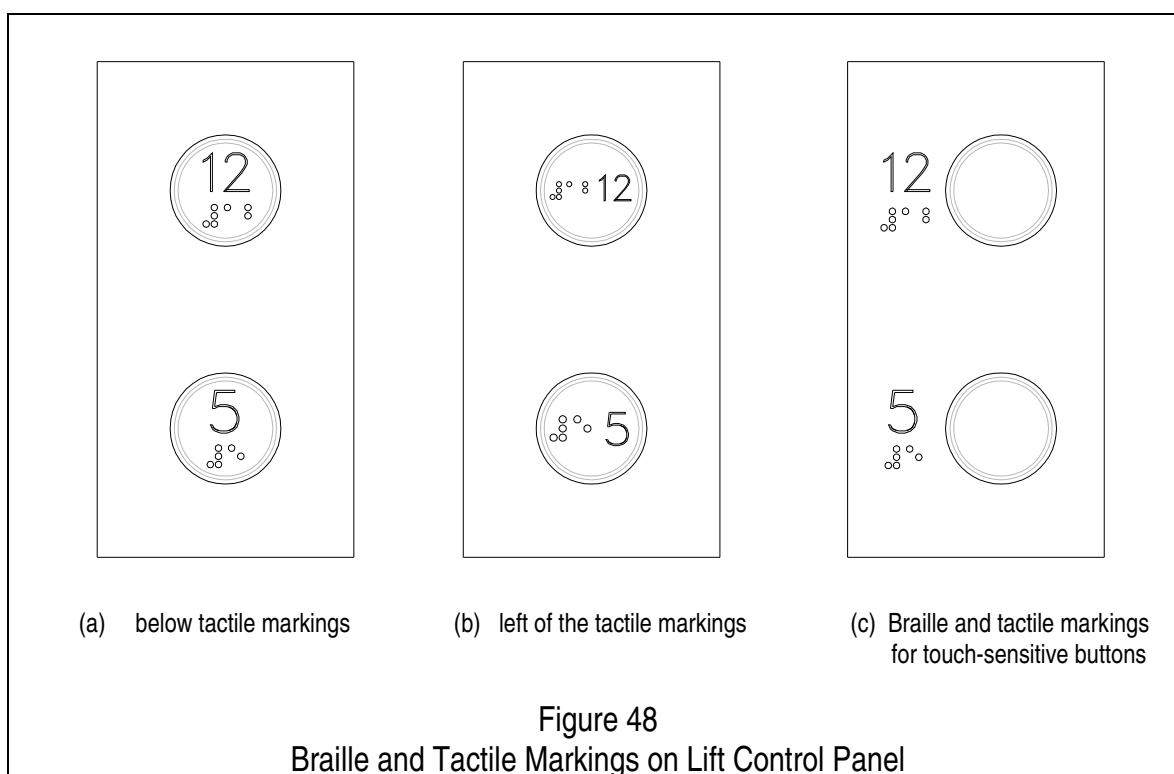
- (1) *The lift door is recommended to have a vision panel to enable persons with hearing impairment to signal for help or assistance in the event of an emergency.*
- (2) *It is acceptable for a light in the button to blink when depressed and stops when released.*

5.1.3 Lift control buttons

5.1.3.1 Braille and tactile markings shall be provided on the lift control buttons. Such buttons shall not be touch-sensitive and have a minimum activation force of 3.5 N or 350 g. The Braille markings -

- (a) shall be placed below the tactile markings as illustrated in *Figure 48(a)*;
- (b) can be provided to the left of the tactile markings only if it is not possible to be placed as described in clause 5.1.3.1(a) and is illustrated in *Figure 48(b)*; and
- (c) shall be placed at a minimum distance of 4 mm from tactile markings.

5.1.3.2 Alternatively, Braille and tactile markings may be provided to the left of lift control buttons if the buttons are touch-sensitive and is illustrated in *Figure 48(c)*.



Note: *The use of paste-on Braille on the control panel is not recommended as it is likely to cause injury to the users of the lift when operating the lift control buttons.*

5.1.3.3 Tactile markings shall –

- (a) be in Arabic numerals or symbols;
- (b) have a dimension of between 15 mm to 20 mm high;
- (c) be raised a minimum of 1 mm; and
- (d) have a high contrasting colour background.

5.1.3.4 The lift landing call button shall be mounted adjacent to the lift and the colour shall contrast with the wall finish.

5.1.3.5 Lift landing call and car control buttons shall not be touch-sensitive but shall require a light positive pressure to activate them.

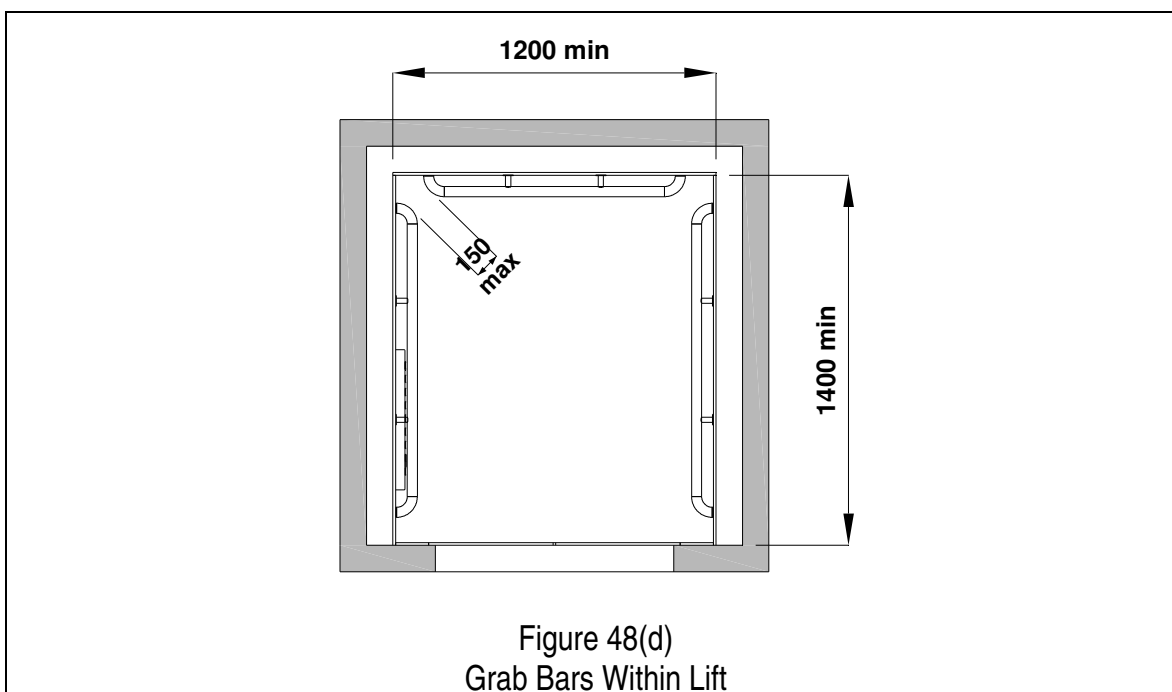
5.1.3.6 A momentary audible announcement shall be provided to signal each call registered and the storey reached.

5.1.3.7 A visual information display system shall be suitably colour contrasted as it is easier for persons with visual impairment to read.

5.1.4 **Grab bars**

5.1.4.1 Grab bars shall –

- (a) comply with clause 3.5;
- (b) be placed at a height of between 800 mm and 900 mm from the floor level;
- (c) be fixed on both sides and at the rear of the lift car; and
- (d) be allowed to have a gap not greater than 150 mm where the grab bars at the side and rear walls meet as illustrated in *Figure 48(d)*.



- Note:
- (1) *Grab bars shall be constructed such that there are no open ends to cause hooking when used by passengers;*
 - (2) *The height of grab bars is measured from the floor level to the top of the bars.*

5.1.5 Safety system

- 5.1.5.1 The closing of lift doors shall be controlled by a photo-eye or infra-red detection or sensing device to ensure that doors do not make physical contact with people standing in their path. In addition, an audible signal shall be provided to signal the closing of doors to alert the lift passengers.

5.2 LIFT DESIGNATED FOR WHEELCHAIR USER

- 5.2.1 Where lifts are provided in a building, at least one lift shall be made accessible for wheelchair users from the entrance level for vertical circulation.

Note: *It is recommended to provide non-breakable mirrors in the lift interior to allow visual feedback for wheelchair users when reversing backward into the lift lobby.*

- 5.2.2 The lift shall serve all levels intended for access by wheelchair users.

- 5.2.3 Lift designated for use by wheelchair users is illustrated in *Figure 48(e)*.

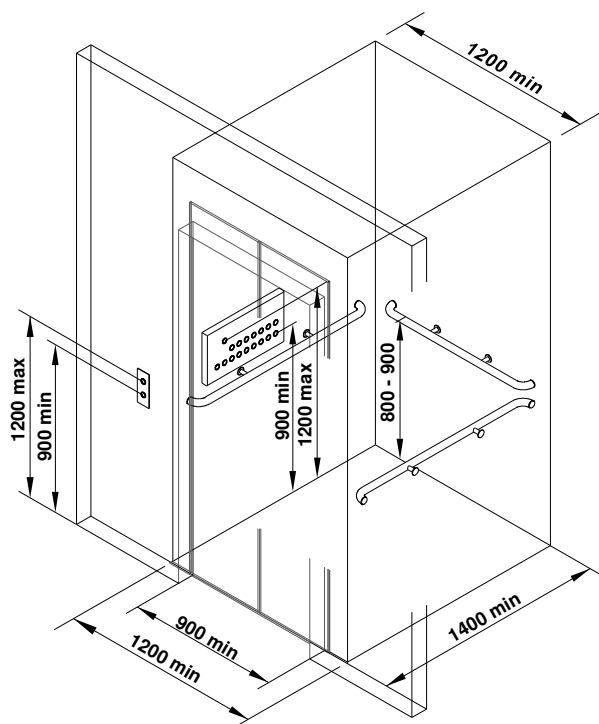


Figure 48(e)
Lift for Wheelchair User

5.2.4 **Lift size**

5.2.4.1 The minimum size of the lift car shall be 1200 mm wide by 1400 mm deep.

5.2.5 **Door width**

5.2.5.1 The lift car shall have a clear door opening of not less than 900 mm.

5.2.6 **Lift landing call button**

5.2.6.1 The lift landing call button located outside the lift shall –

- (a) have a clear floor space of at least 900 mm by 1200 mm with no obstruction placed to prevent a wheelchair user from reaching the call button;
- (b) be placed at a height of between 900 mm and 1200 mm from the floor level; and
- (c) be dedicated to call the lift designated for wheelchair users.

5.2.7 **Lift car control button**

5.2.7.1 The lift car control buttons located inside the lift –

- (a) shall be placed at a height of between 900 mm and 1200 mm from the floor level; and
- (b) may be placed vertically or horizontally or both vertically and horizontally.

- Note:
- (1) *It is recommended that all lifts should be made accessible to persons with disabilities. Where different lifts are programmed to serve certain floors during ordinary or peak periods, the lift that is designated for wheelchair user should be programmed to serve all the floors.*
 - (2) *If there are two control panels inside the lift car, that is, one for the wheelchair user and the other which is mounted at eye level, the control buttons at eye level shall be provided with Braille and tactile markings.*

- (3) *With regard to Note (2), ten-key pad control panel for wheelchair user is acceptable if it is installed in high-rise building together with the other panel which is mounted at eye level.*

5.2.8 Signage

- 5.2.8.1 The symbol identifying the location of such lifts shall be provided and shall be in accordance with the requirements of Chapter 10.

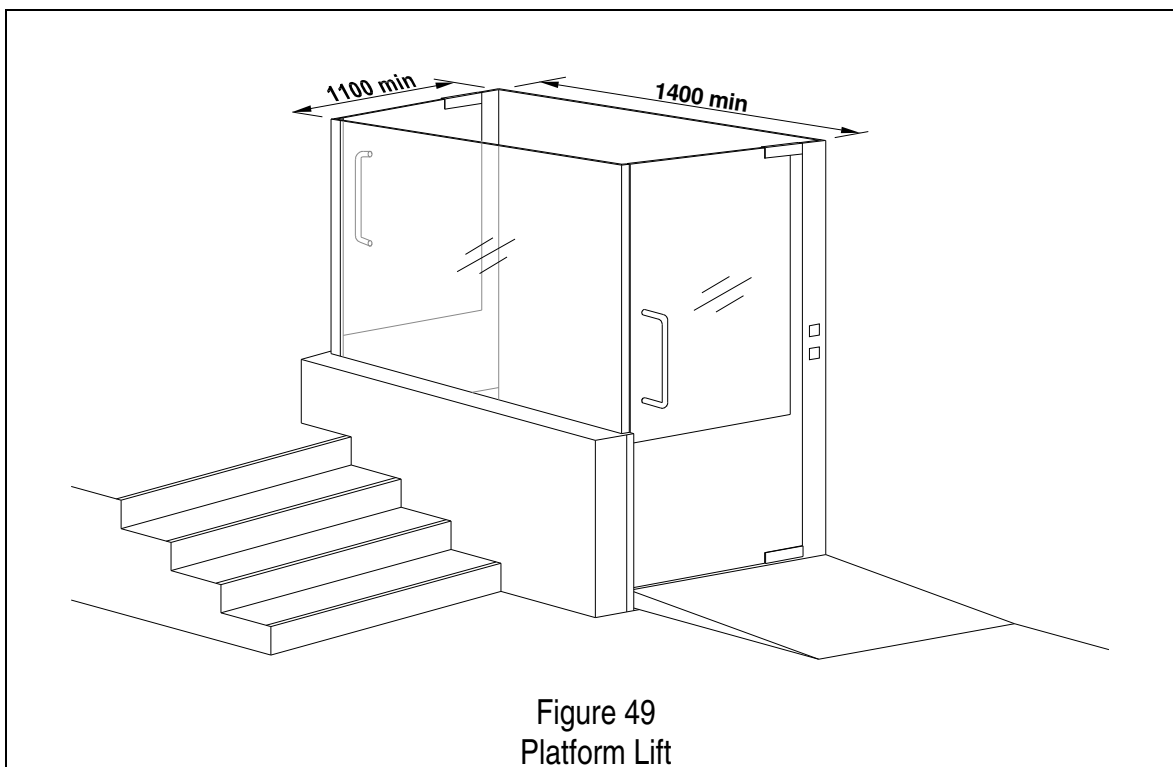
5.3 PLATFORM LIFT AND WHEELCHAIR STAIRLIFT

5.3.1 General

- 5.3.1.1 Where it is impracticable to provide a passenger lift or a ramp, a platform lift or a wheelchair stairlift should be considered as a reasonable alternative for vertical circulation within the building.

5.3.2 Platform lift

- 5.3.2.1 A platform lift, as illustrated in *Figure 49*, shall have a clear door opening of 900 mm.



- 5.3.2.2 The minimum size of a platform lift shall be 1100 mm wide by 1400 mm deep.
- 5.3.2.3 If full height enclosure is not required, the minimum height of the partition shall be 900 mm.
- 5.3.2.4 The platform lift shall be provided with a barrier or flip-up ramp, if a door is not provided, to act as a safety barrier for the wheelchair and serves as an access ramp.
- 5.3.2.5 Lift control buttons shall comply with clauses 5.1.3, 5.2.6 and 5.2.7
- 5.3.2.6 Grab bars complying with clause 5.1.4 shall be provided in the lift except clause 5.1.4.1(c) where at least one grab bar be placed to one side of the lift.
- 5.3.2.7 The platform lift shall be designed with an automatic homing device so that in the event of a power failure the platform lift will home to the entrance level.
- 5.3.3 **Wheelchair stairlift**
- 5.3.3.1 A wheelchair stairlift is illustrated in *Figure 50*.

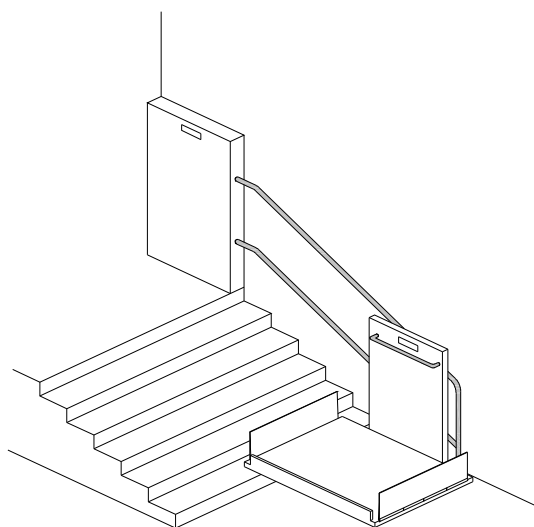


Figure 50
Wheelchair Stairlift

CHAPTER 6

PUBLIC TELEPHONE**6.1 GENERAL**

6.1.1 Where payphones are provided, at least one payphone shall be made accessible.

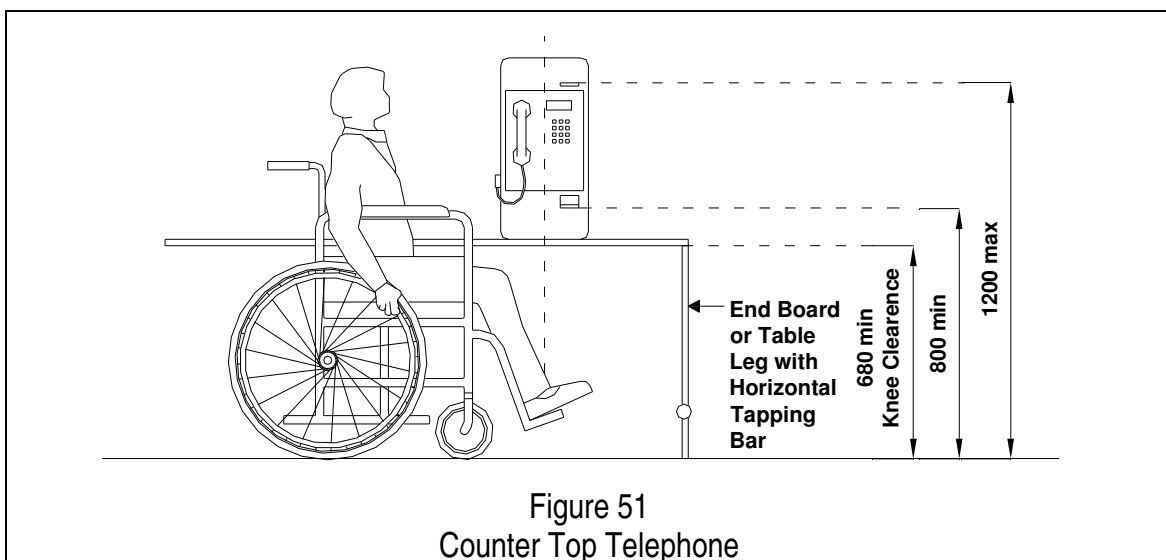
6.1.2 A seat adjacent to the payphone is recommended for the ambulant disabled but shall not impede the approach by a wheelchair user to the telephone.

6.2 CLEAR FLOOR SPACE

6.2.1 A clear floor space of not less than 900 mm by 1200 mm shall be provided in front of the telephone booth or counter.

6.3 COUNTER TOPS

6.3.1 Counter tops, where provided, shall be between 700 mm and 800 mm from the floor level and have a minimum clear knee space of 680 mm as shown in *Figure 51*.

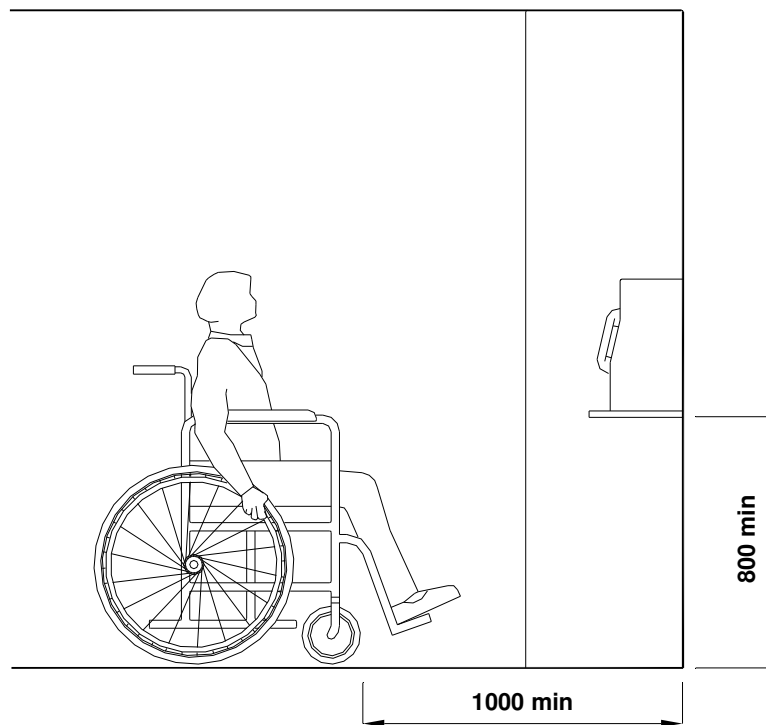


6.3.2 The depth of the counter top shall not be less than 480 mm.

6.4 **TELEPHONE BOOTH**

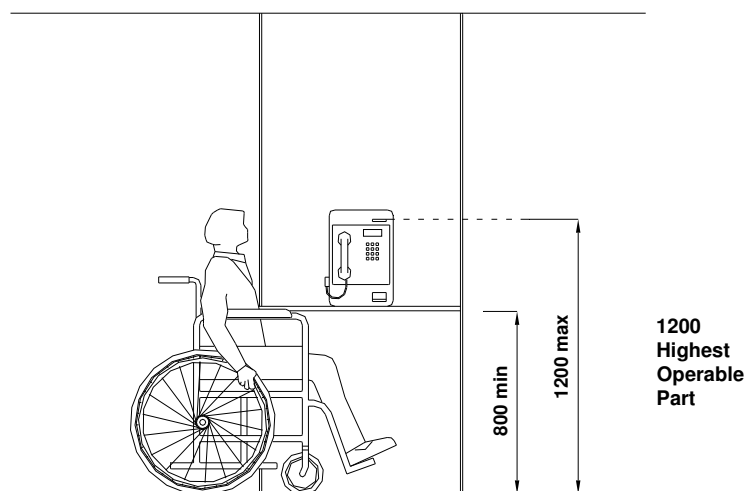
6.4.1 The opening of the telephone booth shall have a clear width of at least 900 mm.

6.4.2 The enclosed space shall have dimensions of at least 900 mm by 1000 mm as shown in *Figure 52* and shall not be restricted by fixed seats.

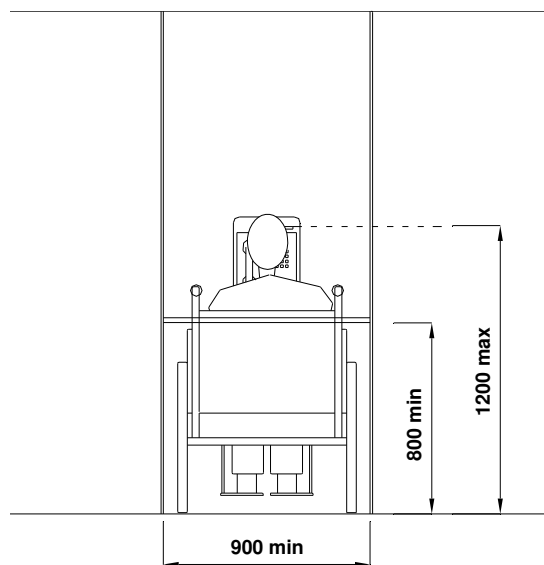


(a) Frontal approach

Figure 52
Telephone Booth



(b) Parallel approach



(c) Front view

Figure 52
Telephone Booth

6.5 **HEIGHT**

6.5.1 The height of all operable parts of the telephone shall be between 800 mm and 1200 mm.

6.6 **TELEPHONE CORD**

6.6.1 The minimum length of the telephone cord shall be 900 mm.

6.7 **TELEPHONE BOOKS**

6.7.1 Telephone books, if provided, shall be located within reach of a wheelchair user.

6.8 **SIGNAGE**

6.8.1 The symbol shall be displayed to identify the location of such telephones.

CHAPTER 7

EATING OUTLETS

7.1 GENERAL

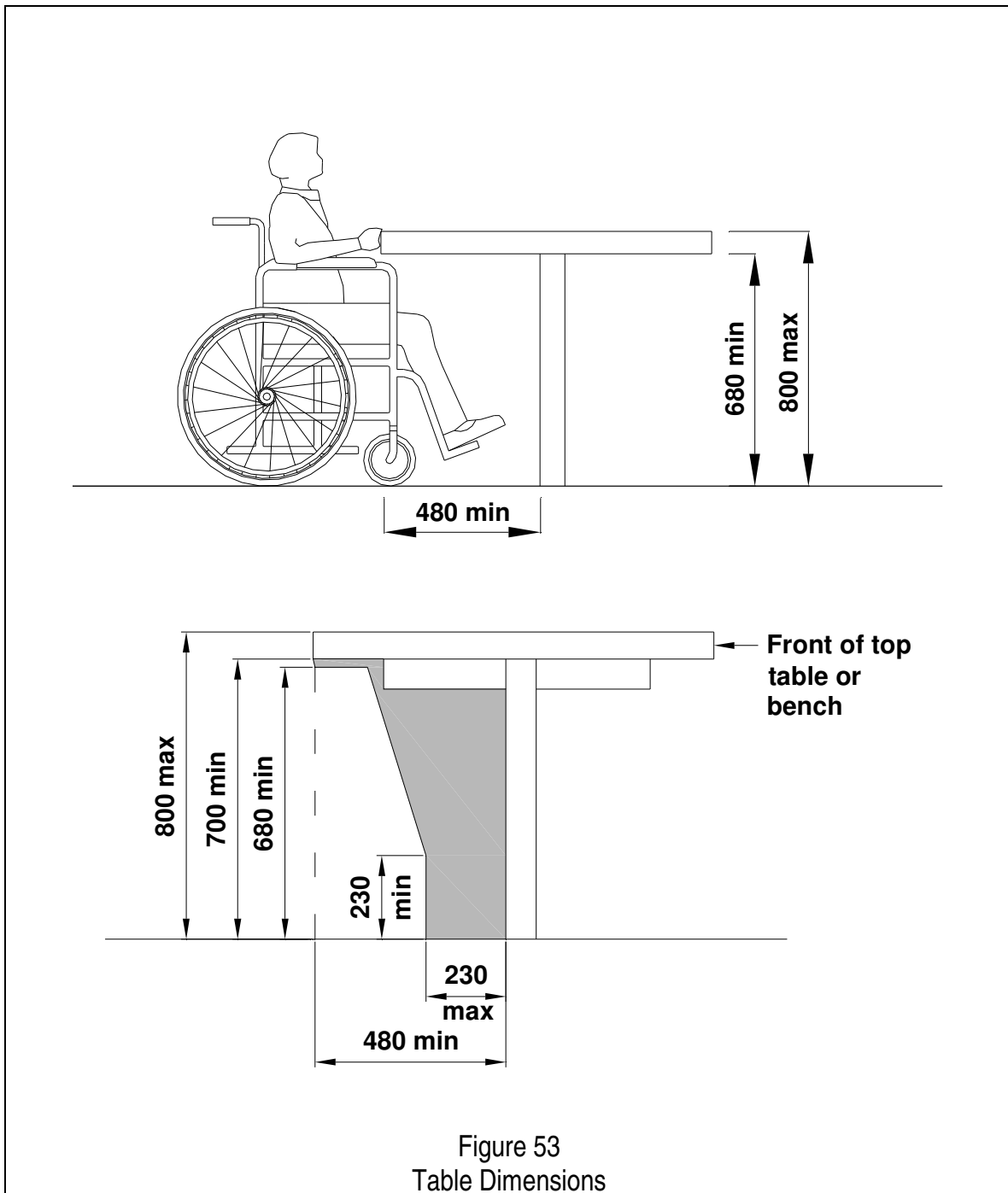
- 7.1.1 Provisions of access shall be made available to persons with disabilities in accordance with clause 7.3 at all eating outlets and establishments, such as hawker centres, food courts or centres, fast food outlets and restaurants.

7.2 WALKWAYS WITHIN OUTLET

- 7.2.1 A circulation path of at least 1200 mm wide shall be provided in front of the stalls.
- 7.2.2 An accessible route with a minimum clear width of 900 mm shall be provided from the circulation path to the tables intended for persons with disabilities.

7.3 SEATING ARRANGEMENT

- 7.3.1 Where fixed seating is provided in eating outlets and establishments, at least one table for every 10 tables or part thereof shall be provided for use by persons with disabilities or at least two tables, whichever is the greater.
- 7.3.2 The height of the table provided for persons with disabilities shall not be higher than 800 mm with a minimum clear knee space of 680 mm high and 480 mm deep as shown in *Figure 53*.



- 7.3.3 Where the eating outlet or establishment is provided with fixed seats, the minimum clear space between the seats shall be 750 mm measured along the edge of the table as shown in *Figure 54*.

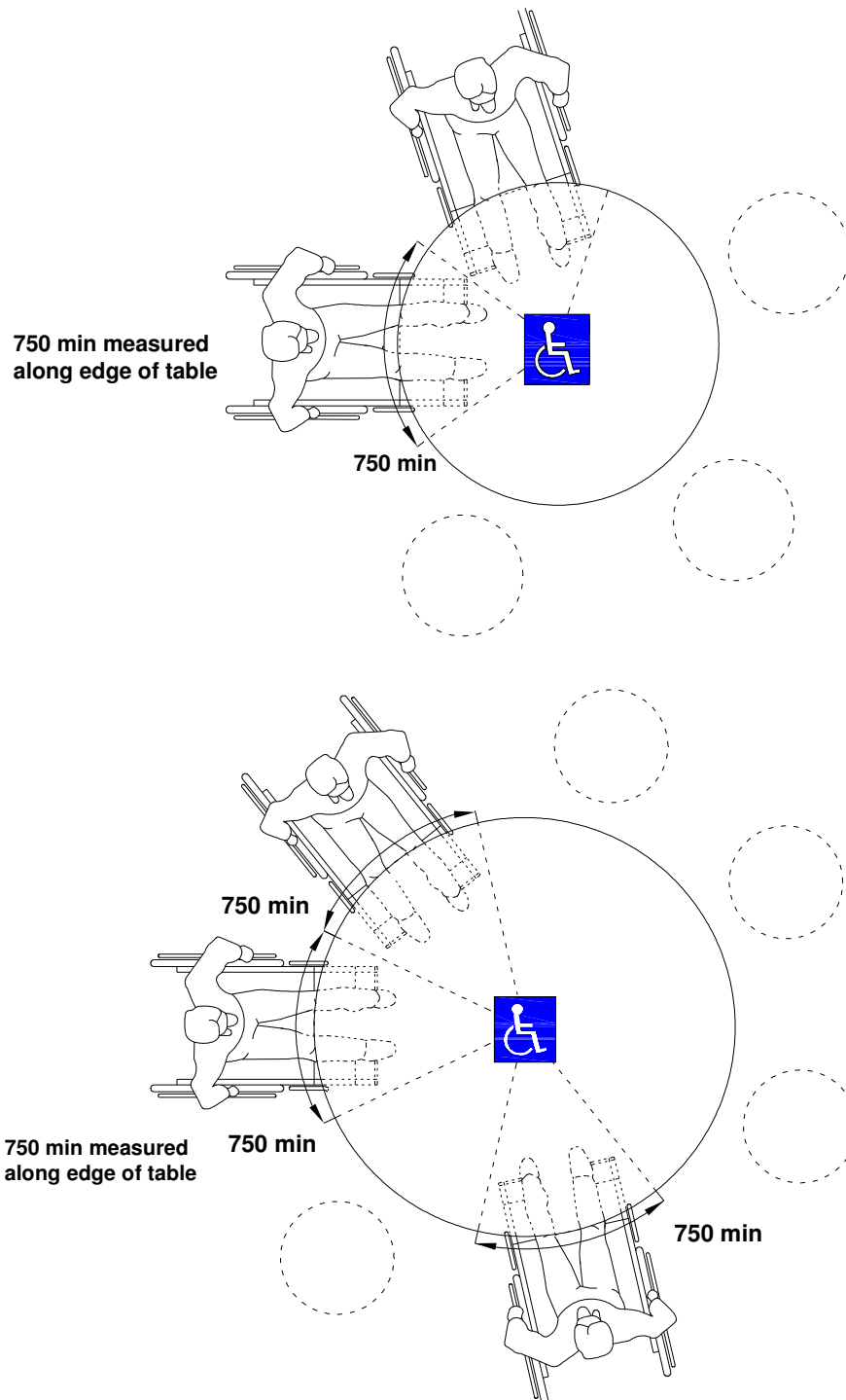


Figure 54
Seating Arrangements

- Note:
- (1) *Where fixed seats are provided, it is advisable to provide empty spaces between the seats to accommodate wheelchair users.*
 - (2) *It is recommended that about 40% of the total table capacity be provided with fixed seats.*
 - (3) *The fixed seats will cater to the ambulant disabled as well as family/friends who may accompany them.*

7.4 **SIGNAGE**

- 7.4.1 Directional signs shall be clearly displayed to direct persons with disabilities to the reserved table intended for their use.
- 7.4.2 A symbol in accordance with Chapter 10 shall be placed on the table intended for persons with disabilities as shown in *Figure 54*.

CHAPTER 8

TAXI SHELTER

8.1 GENERAL

8.1.1 At least one accessible route shall be provided from the alighting and boarding point of a taxi shelter to the walkway that leads to the accessible building entrance.

8.1.2 The symbol, in accordance with the requirements of Chapter 10, shall be installed to direct persons with disabilities to an accessible entrance.

8.2 LOCATION

8.2.1 Taxi shelter should be located nearest to an accessible entrance.

8.2.2 A taxi bay should, where possible, be provided at the level of approach for persons with disabilities to alight and to board the vehicle.

8.2.3 Where transfer has to be made from a vehicular surface to a pedestrian surface, the driveway, pathway or walkway shall be blended to a common level or ramped in accordance with *Table 2* of Chapter 3.

8.3 WIDTH

8.3.1 A clear passageway with a minimum width of 1200 mm shall be provided.

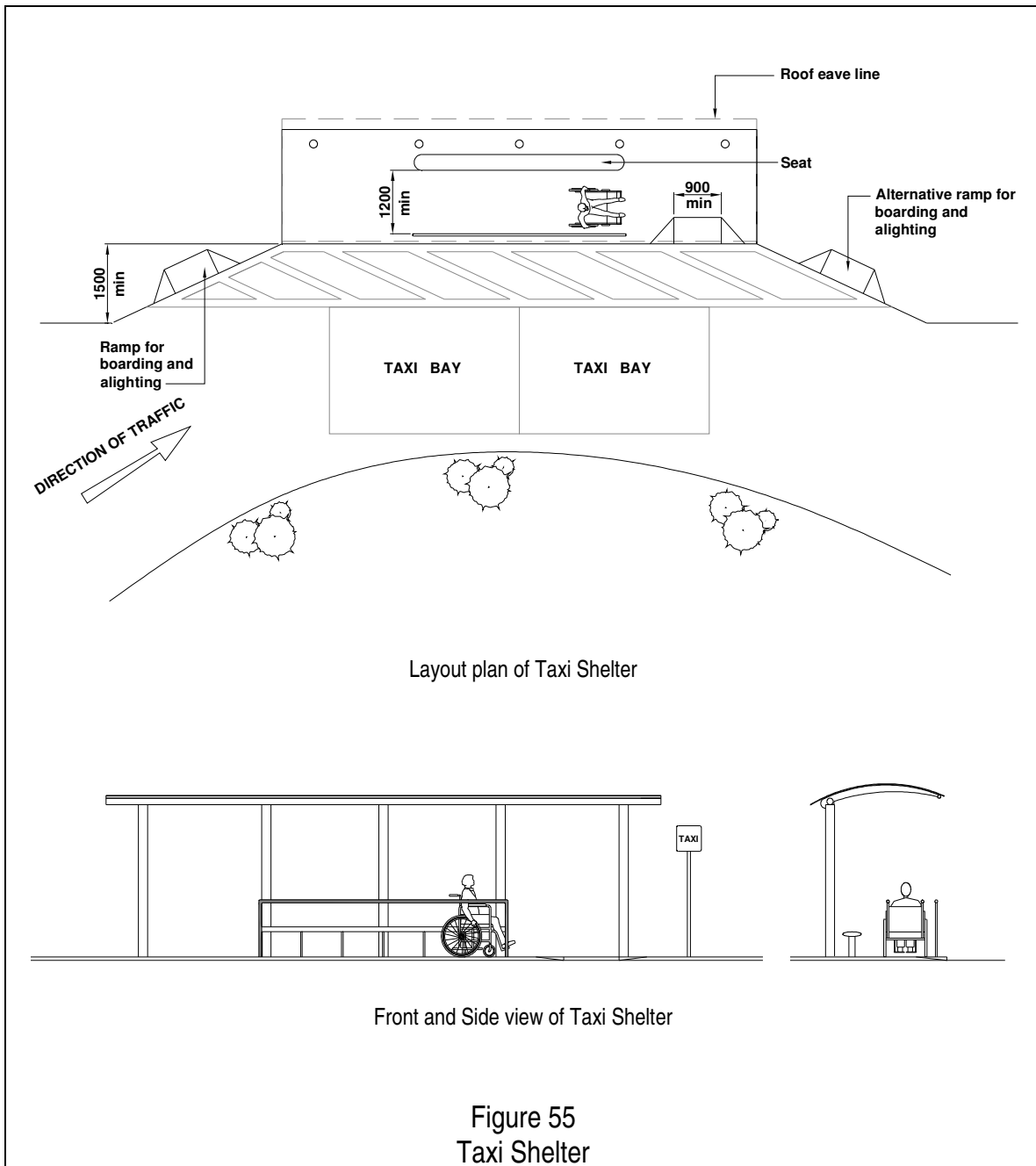
8.4 HANDRAILS

8.4.1 Handrails shall:

- (a) comply with clause 3.5; and
- (b) be placed at a height of between 800 mm and 900 mm from the floor level.

8.5 RAMPS

- 8.5.1 Where a taxi shelter is not on the same level with the walkway or pathway, it shall have two separate ramps, conforming to *Table 2* of Chapter 3, for boarding and alighting as shown in *Figure 55*.



8.5.2 Where there are kerbs between the access aisle and the vehicle pick-up space, it shall have a kerb ramp complying with clause 3.4.

8.6 **SEATS**

8.6.1 Seats shall be provided at the taxi shelter for the ambulant disabled and these shall not impede the movement of the wheelchair user.

8.6.2 Suitable armrests should be provided at the ends of the seats to assist ambulant disabled and older persons to get up.

Note: *Bum rests should be avoided as they are not suitable for ambulant disabled or older persons.*

CHAPTER 9

VEHICLE PARK**9.1 PARKING PROVISION**

- 9.1.1 Where vehicle parks are required to be provided, the number of accessible parking lots for vehicles driven by persons with disabilities shall be in accordance with *Table 3*:

TABLE 3

Accessible Parking Lots

Number of vehicle park lots	Number of accessible lots
First 50 lots	1
Next 50 lots	1
Every subsequent 200 lots as may be required by the Commissioner of Building Control	1

9.2 SYMBOL

- 9.2.1 The Symbol of Access, in accordance with the requirements of Chapter 10, shall be clearly marked on the accessible parking lots for vehicles driven by persons with disabilities only.
- 9.2.2 The Symbol painted or marked on the designated lot shall comply with clause 10.2 and the following:
- (a) a square with dimensions of at least 1000 mm but not more than 1500 mm in length;
 - (b) be located in the centre of the lot; and

- (c) the colour of the Symbol shall be white on a blue background.

9.3 VEHICLE PARK ENTRANCE

9.3.1 Clear directional signs shall be displayed at appropriate place to direct drivers with disabilities the location of accessible parking lots before approaching the vehicle park entrance.

9.3.2 Vehicle park entrance shall have a height clearance of at least 2000 mm.

9.4 LOCATION

9.4.1 Accessible parking lots that serve a particular building shall be located nearest possible to an accessible entrance and/or lift lobby.

9.4.2 For a vehicle park that does not serve a particular building, accessible parking lots shall be located nearest possible to and linked by an accessible walkway which shall not be part of the driveway.

9.4.3 The accessible route should not require wheelchair users to pass behind vehicles that may be backing out.

Note: *It is recommended that a telephone be installed at the vicinity of the accessible parking lot to enable persons with disabilities to call the building management for assistance. The building management may impose appropriate sanctions for the unauthorised use of the parking lot.*

9.5 ACCESSIBLE VEHICLE PARKING LOTS

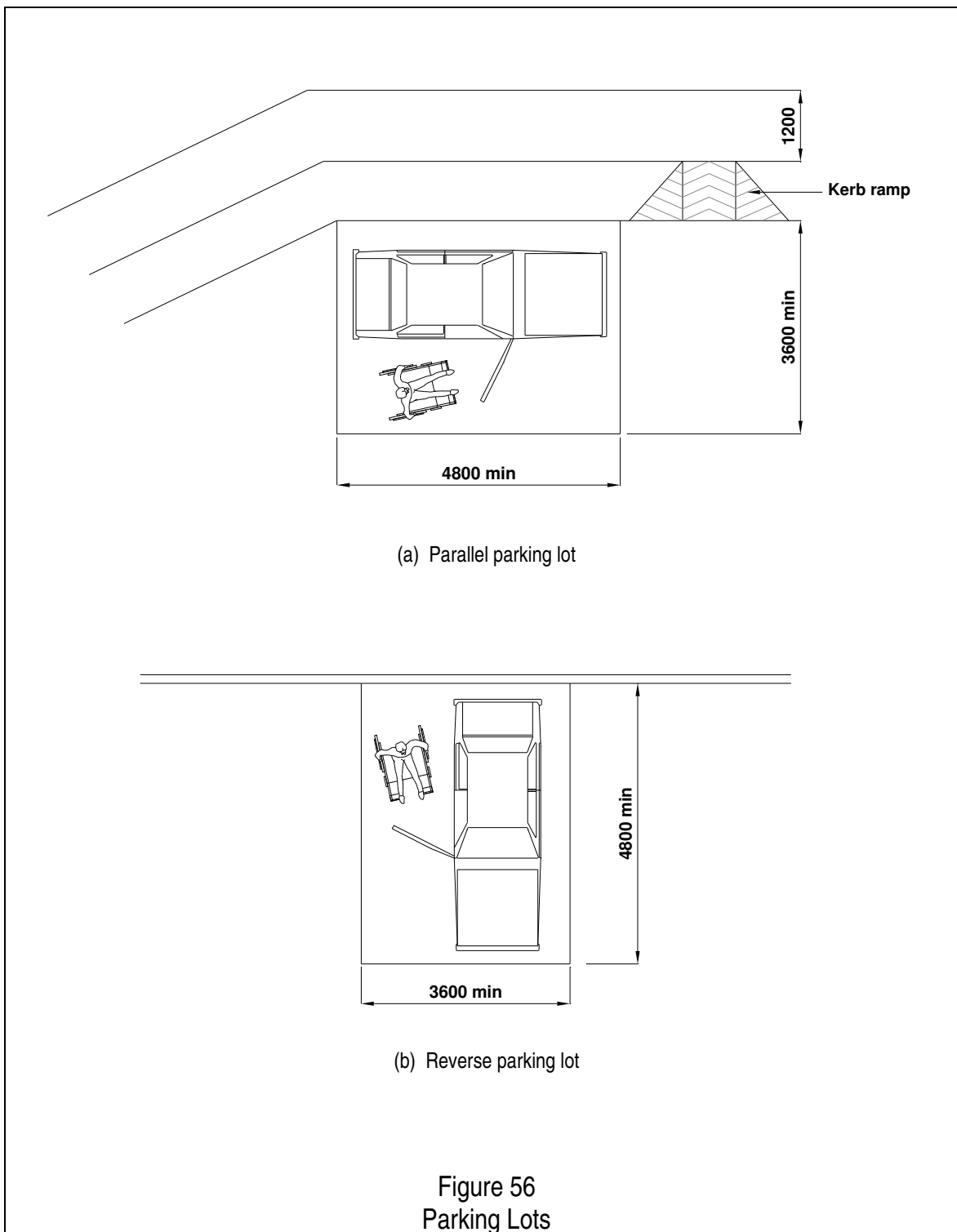
9.5.1 An accessible vehicle parking lot, as illustrated in *Figure 56*, shall:

- (a) have dimensions of 4800 mm by 3600 mm;
- (b) have a firm, level surface without aeration slabs; and
- (c) wherever possible, be sheltered.

Note: (1) *Where a building is required under clause 2.1.1 of this Code to be accessible and where the provision of accessible parking lots is waived under section 14 of the Act, that building must be accessible from the vehicle park.*

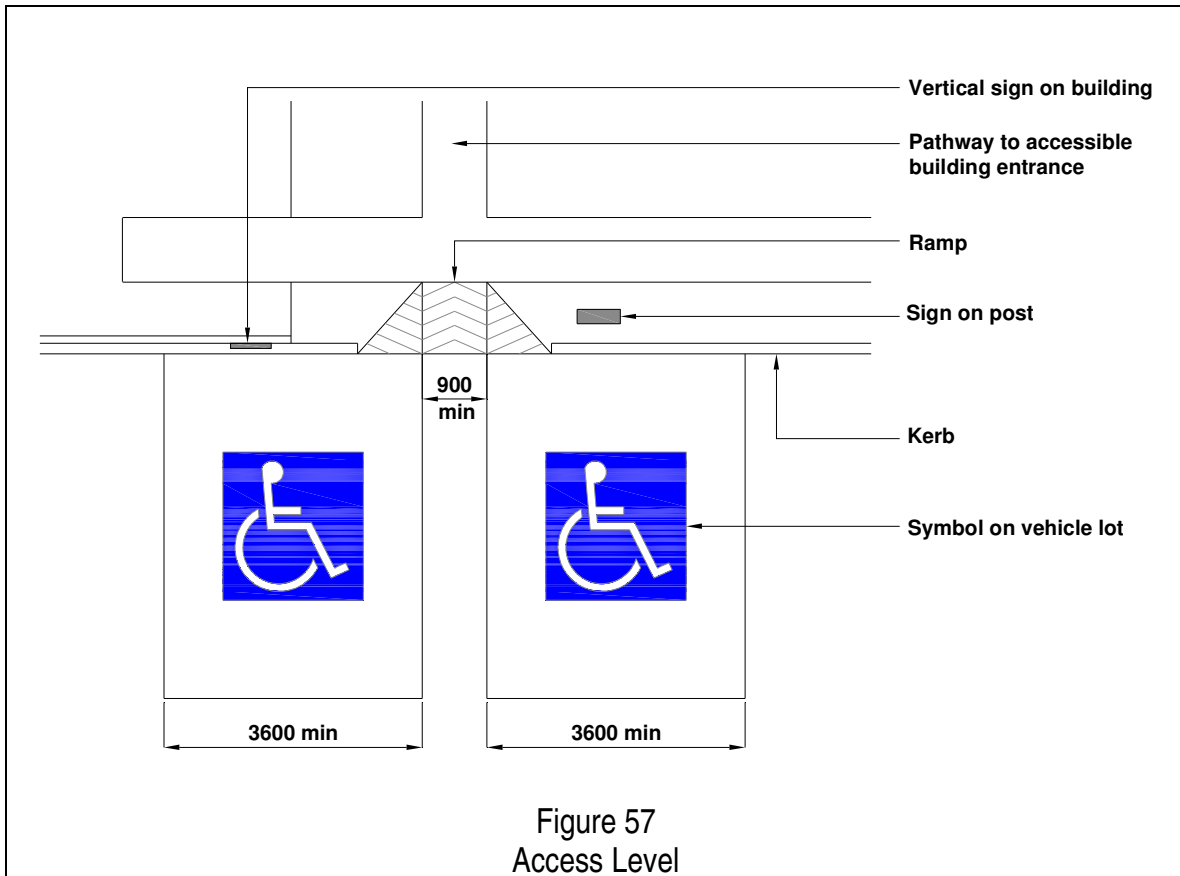
- (2) *Parallel parking for persons with disabilities is discouraged.*

- (3) *It is recommended that the minimum lighting for accessible parking lot should be in accordance with the current edition of SS 531.*



9.6 **ACCESSIBLE ENTRANCE**

- 9.6.1 An accessible path leading to the entrance of the building, as shown in *Figure 57*, shall be level or have a kerb ramp complying with clause 3.4.



9.7 **AUTO PAY MACHINE**

- 9.7.1 Vehicle park auto-pay machines shall:
- (a) be located on the same level as the accessible vehicle parking lots; and
 - (b) have the operable parts complying with clause 3.10.2.

9.8 **SIGNAGE**

- 9.8.1 The symbol shall be displayed at approaches and entrances to car parks to indicate the provision of accessible vehicle parking lots for persons with disabilities within the parking vicinity.
- 9.8.2 Directional signs as shown in *Figure 58* shall be displayed at points where there is a change of direction to direct persons with disabilities to the accessible parking lots.

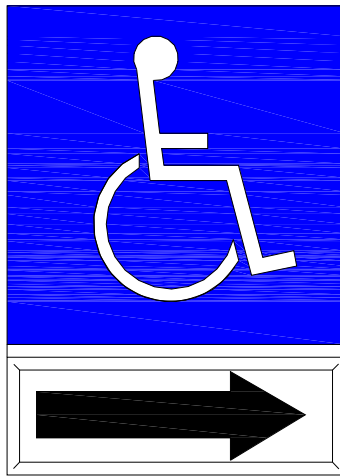


Figure 58
Directional Signs

- 9.8.3 Where the location of the accessible parking lots is not obvious or is distant from the approach viewpoints, directional signs should be placed along the route leading to the accessible parking lots.
- 9.8.4 Accessible parking lots shall be identified by the Symbol of Access in accordance with clause 10.2.1. A vehicle parked in the designated lot shall not obscure such signs.
- 9.8.5 Vertical signs shall be provided immediately adjacent to the parking lots to make it readily visible.

9.8.6 Vertical signs shall:

- (a) have dimensions of at least 450 mm by 450 mm;
- (b) be installed at a height of at least 1500 mm from the floor surface to the centre of the sign; and
- (c) have the telephone number of the building management, Town Council or the relevant authority clearly printed on them for the purpose of reporting unauthorised parking.

CHAPTER 10

**INTERNATIONAL SYMBOL OF ACCESS
FOR PERSONS WITH DISABILITIES**

10.1 GENERAL

10.1.1 Where a building is required to be made accessible in compliance with clause 2.1 of Chapter 2, the attention of all users shall be drawn to the facilities available in order that persons with disabilities are made aware of the existence of suitable provisions for them.

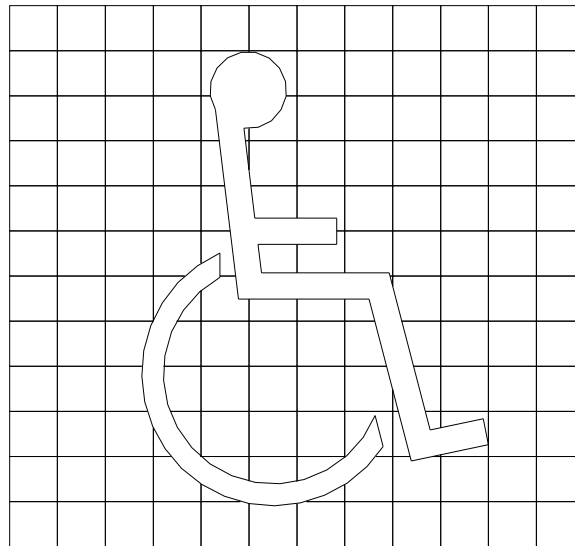
10.1.2 The International Symbol of Access shall be permanently and conspicuously displayed to direct or indicate the location of the various facilities in the building.

10.1.3 Persons with disabilities may have limitations in the movement of their head or a reduction in peripheral vision. Signs positioned perpendicular to the path of travel are easiest for them to notice. Persons can generally distinguish signs within an angle of 30° to either side of the centre line of their faces without moving their heads.

10.2 SYMBOL OF ACCESS

10.2.1 The form of the symbol of access shall comply with the following:

- (a) shall consists of two elements, namely, a symbolised figure in a wheelchair and a plain square background;
- (b) the proportional layout of the symbolised figure shall be in accordance with *Figure 59(a)*;
- (c) the colour of the symbolised figure shall be white on a blue background; and
- (d) the symbolized figure shall face to the right.



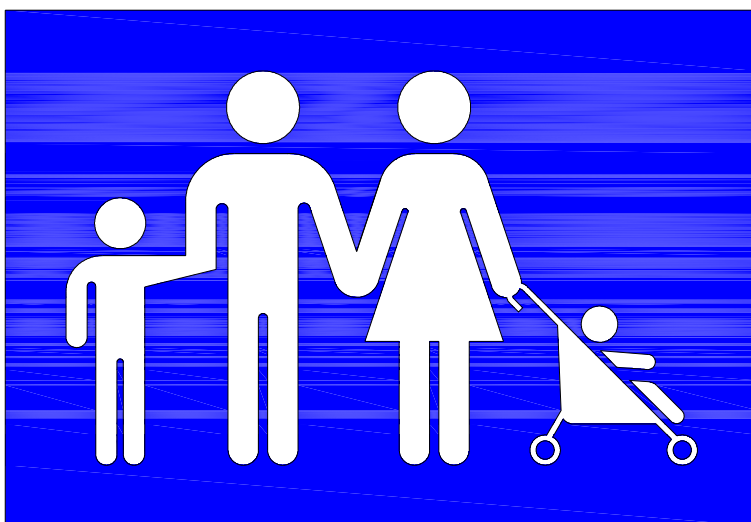
(Background squares are for reference only)

Figure 59(a)
Symbol of Access for Persons with Disabilities

- 10.2.2 The symbol of access shall be displayed:
- (a) outside the building to identify buildings with accessible facilities;
 and
 - (b) at areas where facilities are provided for persons with disabilities.
- 10.2.3 The Symbol shall be used to identify accessible features and facilities used by persons with disabilities.
- 10.2.4 Other appropriate access symbols for persons with different needs are shown in *Figures 59(b), 59(c) and 59(d) respectively*.
- Note: *The colour scheme for Figures 59(b), 59(c) and 59(d) may follow according to clause 10.5.1.4.*

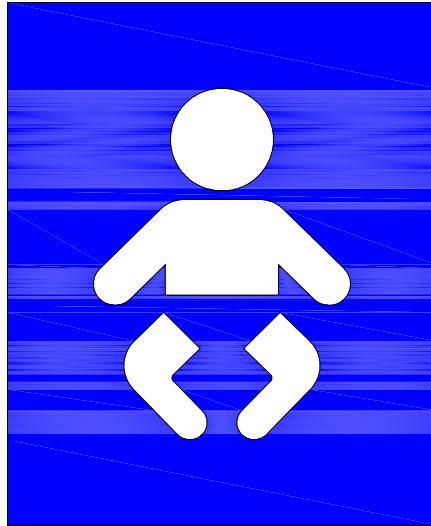


(b) Elderly Person or Ambulant Disabled



(c) Family with Young Children

Figure 59
Symbols for Persons with Different Needs



(d) Infant

Figure 59
Symbols for Persons with Different Needs

10.3 DIRECTIONAL SIGNS

- 10.3.1 Directional signs incorporating the symbol of access, as shown in *Figure 60*, shall be displayed at main lobbies or passageways and at points where there is a change of direction to direct persons with disabilities to the various facilities such as lifts, entrances, telephone booths, toilets, vehicle parks and the like.

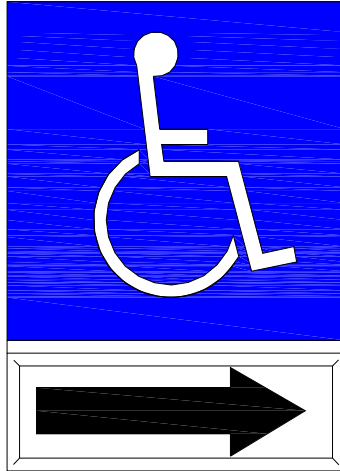


Figure 60
Directional Signs

- 10.3.2 Where the location of the designated facility is not obvious or is distant from the approach viewpoints, directional signs incorporating the symbol of access, as shown in *Figure 61*, should be placed along the route leading to the facility.



Figure 61
Signs Directing to Facility

- 10.3.3 The contents of signs shall be simple, short and easy to understand. The text and use of pictographs shall be consistent throughout the building.

10.4 **SERVICE IDENTIFICATION SIGNS**

- 10.4.1 Service identification signs incorporating the symbol of access, as shown in *Figure 62*, shall be displayed at various facilities and destinations for persons with disabilities such as lifts, entrances, telephone booths, toilets, vehicle parks, staircases and the like.

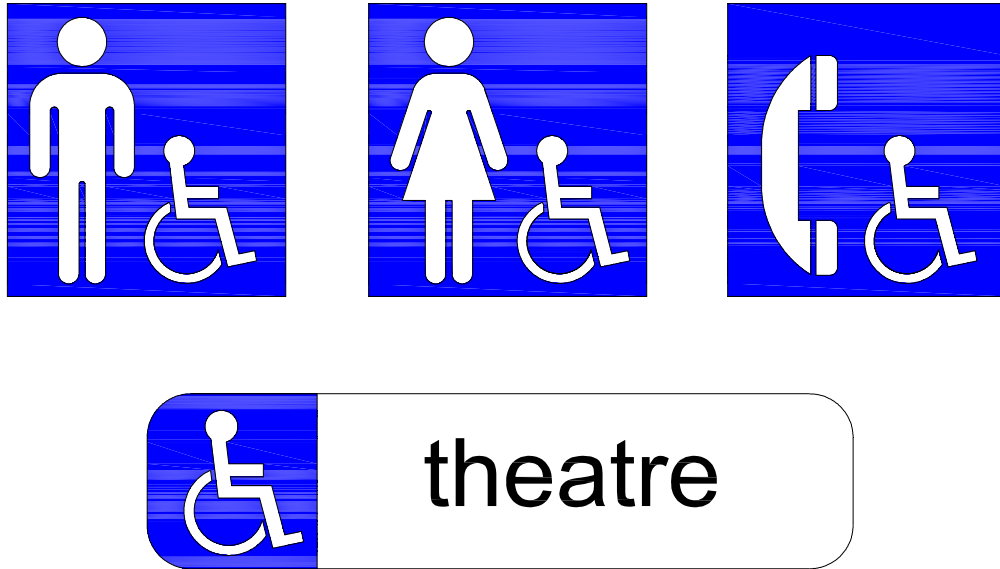


Figure 62
Service Identification Signs at Destination

- 10.4.2 Tactile signs incorporating pictographs shall indicate whether the toilet is for male or female.

10.5 **SIGNAGE**

10.5.1 **Character and symbol specifications**

- 10.5.1.1 Letters and numbers on signs shall —

- (a) use sans serif font; and
- (b) have Arabic numbers.

- 10.5.1.2 The size of symbols should be based on the intended viewing distance and determined in accordance with *Table 4*:

TABLE 4

Size of Symbols

Viewing Distance (m)	Size (mm)
Up to 7.0	60 x 60
7.0 to 18.0	100 x 100
Above 18.0	200 x 200 to 450 x 450

- 10.5.1.3 The height of letters in signs for varying viewing distances shall be determined in accordance with *Table 5*:

TABLE 5

Height of Letters

Required Viewing Distance (m)	Minimum Height of Letters (mm)
1.5	50
2.0	60
2.5	100
3.0	120
4.5	150
6.0	200
8.0	250

- 10.5.1.4 Characters and graphics shall —

- (a) be glare free; and
- (b) have colour and tone that contrast with the following background:
 - (i) within the sign; and
 - (ii) with the surrounding or substrate. Examples of colour contrast are illustrated in *Table 6*.

TABLE 6

Colour Contrast

Background	Sign Background	Graphics
Red brick or dark stone	White	Black, dark green or dark blue
Light brick or light stone	Black or dark	White or yellow
White-washed walls	Black or dark	White or yellow
Green vegetation	White	Black, dark green or dark blue

- Note:
- (1) *Graphics refers to the entire artwork of the sign, which includes the text/characters and symbols.*
 - (2) *To enable a sign to be located on both light and dark backgrounds or for corporate signage where the colour cannot be changed, a contrasting border shall be placed around the sign.*
 - (3) *The sign shall not have any sharp edges and if fitted into a frame, the frame shall not have any sharp edges.*
 - (4) *Illuminated clear glass or acrylic signs with coloured etched legend are not acceptable for legibility reasons.*
 - (5) *Signs indicating washrooms for different sexes should have clear and simple symbols or words preferably with colour distinction between male and female e.g. blue colour for male and pink colour for female.*

10.5.2 Text and pictographs

10.5.2.1 All text shall be --

- (a) in title case; and
- (b) arranged with left alignment.

10.5.2.2 Arrows shall be located on the side of the sign to which they are pointing, that is, arrows pointing left shall be on the left and arrows pointing right shall be on the right.

10.5.2.3 Braille shall be located directly below the text or arrow and arranged with left alignment.

10.5.3 **Location and height of signs**

10.5.3.1 The height of letters at different locations shall be in accordance with clause 10.5.1.3 and *Table 5*.

10.5.3.2 The size of symbols or pictographs shall be in accordance with clause 10.5.1.2 and *Table 4*.

10.5.3.3 Internal signs shall be mounted on the wall next to the latch-side of the door and not on the door in case the door is opened when the sign is being read.

10.5.3.4 The centre line of the sign shall be at a height of 1500 mm (+/- 25 mm) above the floor level. Where there is no wall space to the latch-side of the door including double-leaf doors, signs shall be placed on the nearest adjacent wall.

10.5.3.5 Suspended signs should be avoided as it is not within the field of vision for some persons with visual impairment.

10.5.4 **Tactile characters or symbols**

10.5.4.1 Characters, symbols or pictographs on tactile signs shall —

- (a) be raised at least 1 mm;
- (b) be between 16 mm and 50 mm high; and
- (c) be mounted at a height complying with clause 10.5.3.4.

10.5.4.2 The letters or numbers shall comply with the specifications in clause 10.5.1.1.

10.5.5 **Braille and pictographs**

10.5.5.1 Braille shall be used, if possible, wherever embossed characters are used.

10.5.5.2 The Braille dot shall be dome shaped and the sign shall be easy to touch and read.

- 10.5.5.3 The sign shall be mounted at a height complying with clause 10.5.3.4.
- 10.5.5.4 Pictographs shall be accompanied by the equivalent textual description placed directly below the pictographs. The border dimension of the pictograph shall have a minimum height of 152 mm.
- 10.5.6 **Illumination**
- 10.5.6.1 The minimum level of illumination on signs shall be 200 lux.
- 10.5.6.2 Signs may be illuminated by the use of back illumination but not located where the glare of lights reduces legibility.

APPENDIX A

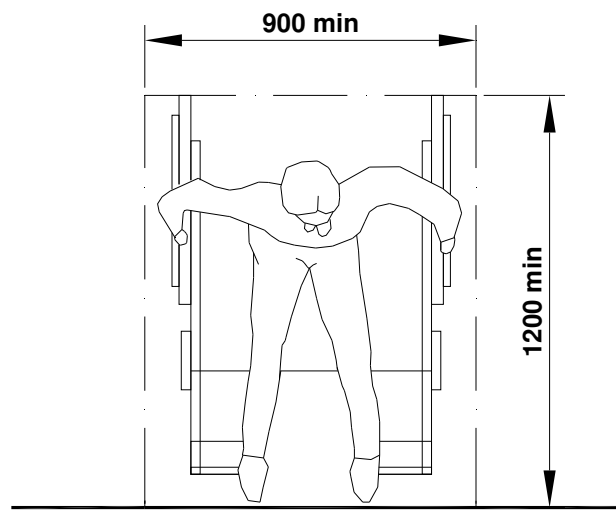
ANTHROPOMETRICS**A.1 SCOPE**

A.1.1 This Appendix contains dimensions that can be used for guidance when designing facilities and equipment to be used by persons with disabilities.

A.1.2 SPACE ALLOWANCES

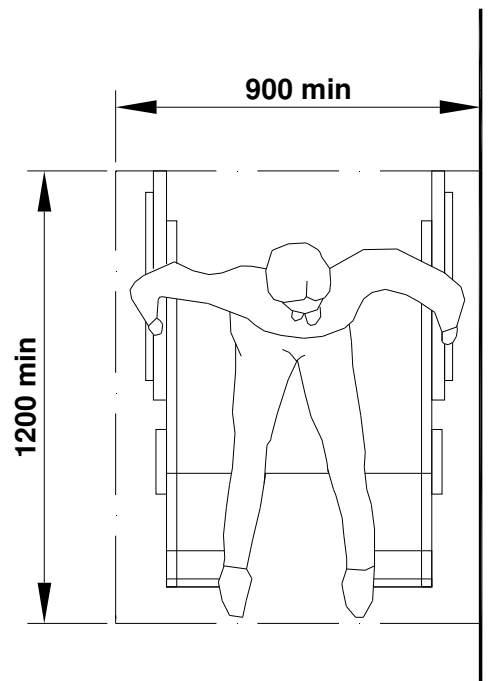
A.1.2.1 The minimum clear floor space required to accommodate a single, stationary wheelchair and occupant shall be 900 mm x 1200 mm as illustrated in *Figure A1(a) and (b)*.

A.1.2.2 A minimum clear floor space of 1200 mm x 1200 mm, as illustrated in *Figure A1(c)*, would allow access for both forward and parallel approaches.

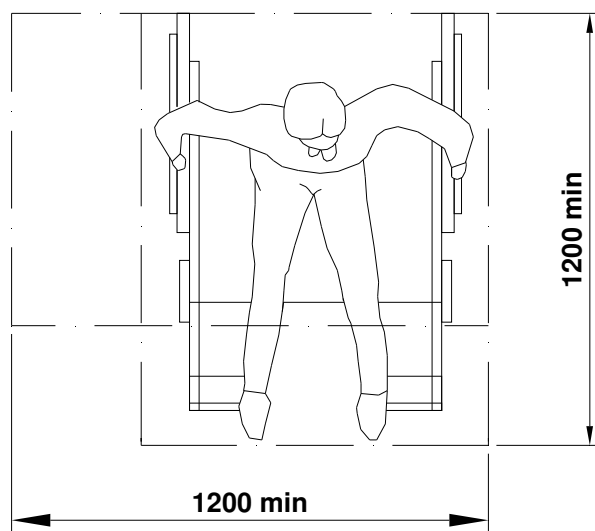


(a) Forward approach

Figure A1
Minimum Clear Floor Space



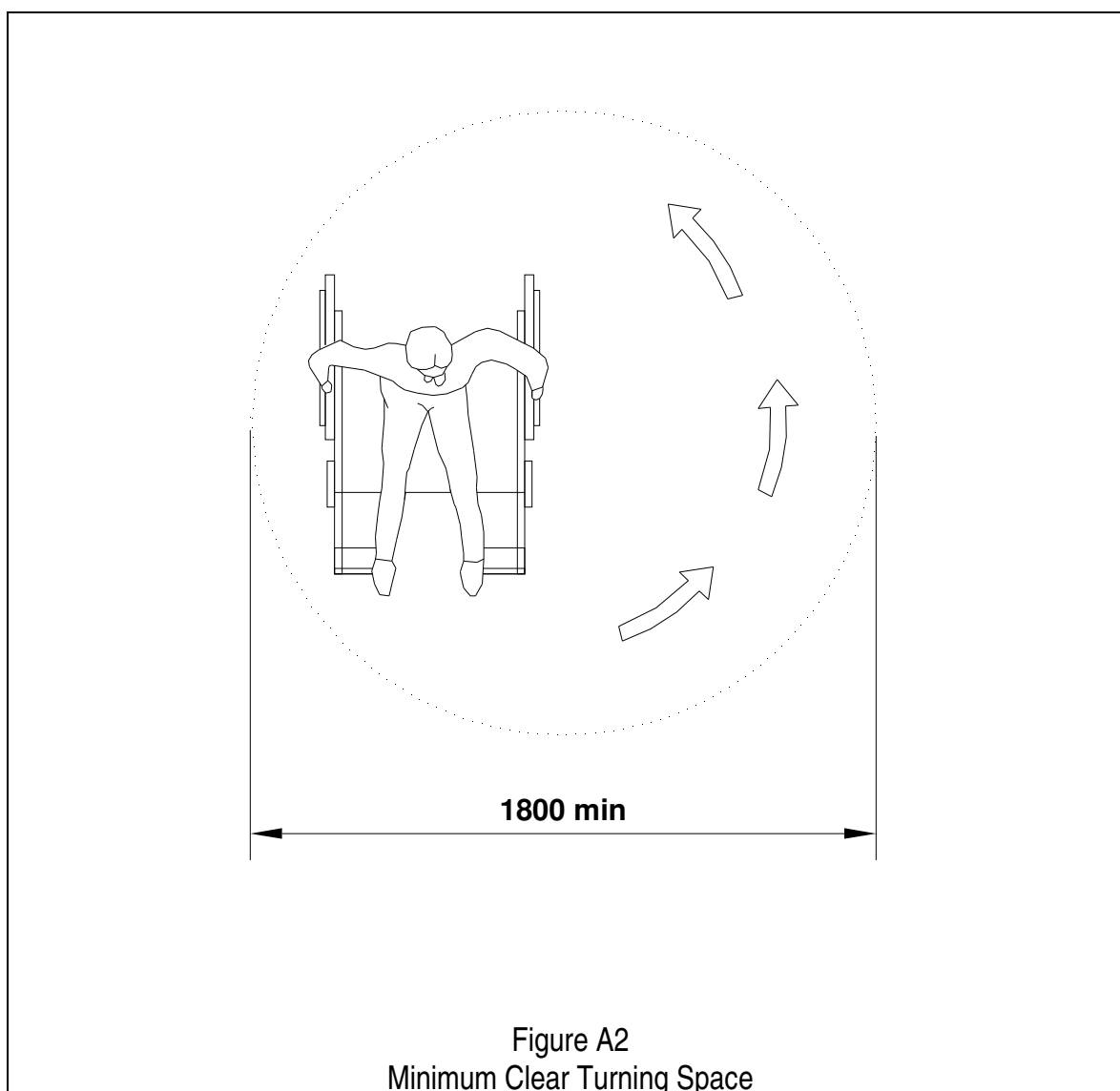
(b) Parallel approach



(c) Clear floor space

Figure A1
Minimum Clear Floor Space

- A.1.2.3 The minimum clear floor space for a wheelchair to turn shall be 1800 mm x 1800 mm as illustrated in *Figure A2*.



A.2 REACH RANGES FOR PERSON IN A WHEELCHAIR

A.2.1 Forward reach

- A.2.1.1 The maximum forward reach, without obstruction, is 1200 mm from the floor and the minimum forward reach is 400 mm from the floor as shown in *Figure A3*.

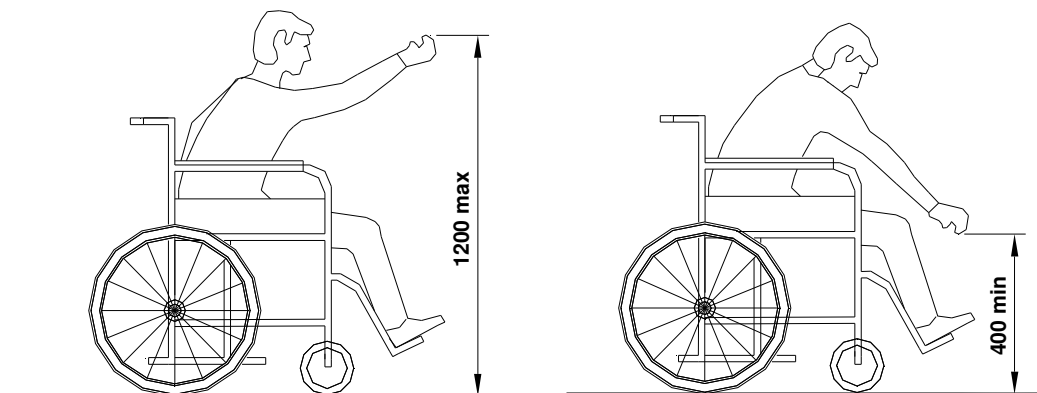


Figure A3
Forward Reach Without Obstruction

A.2.1.2 The maximum forward reach over an obstruction 500 mm deep is 1100 mm from the floor as shown in *Figure A4*.

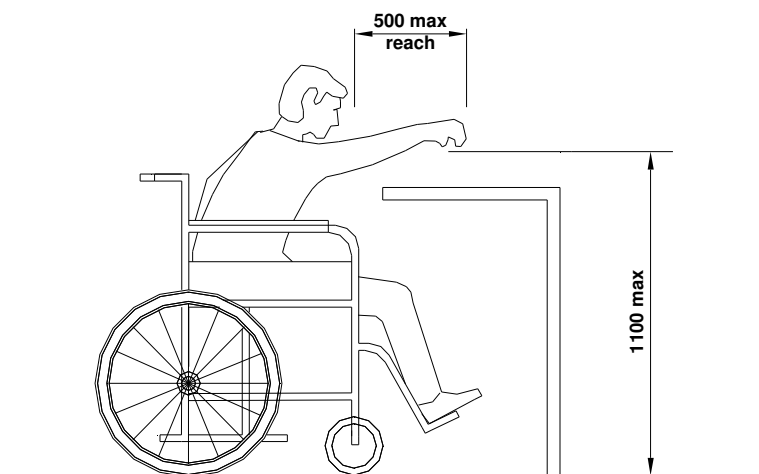
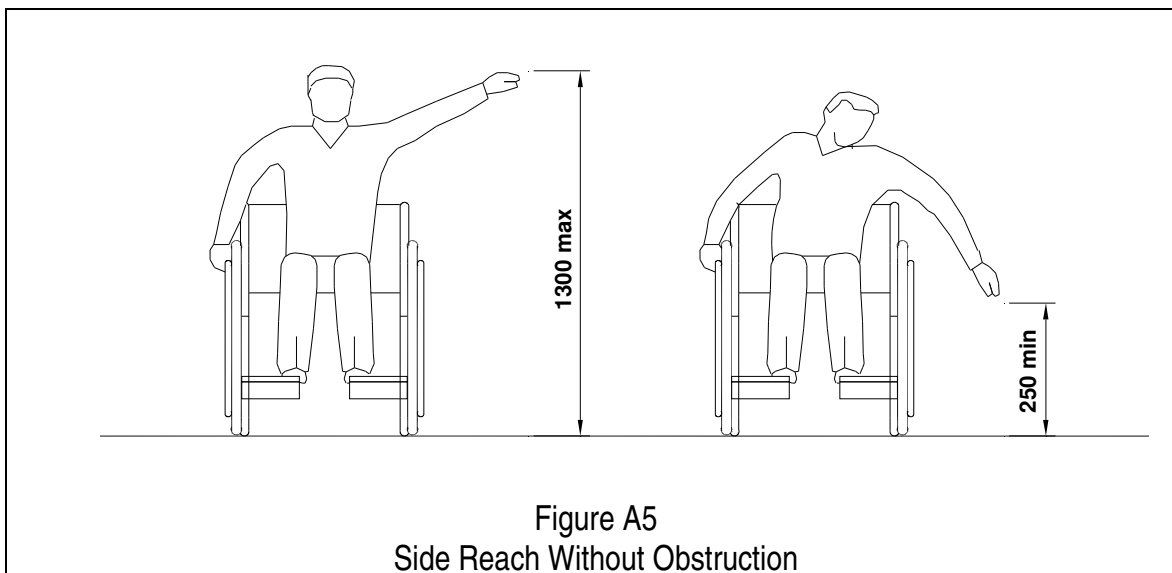


Figure A4
Forward Reach Over Obstruction

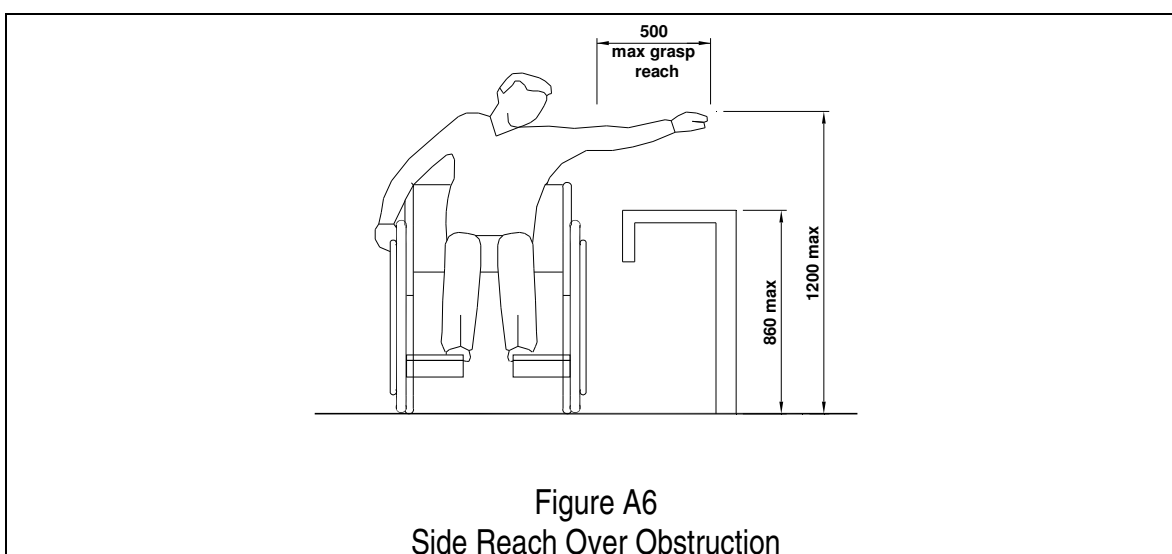
A.2.2 Side reach

- A.2.2.1 The maximum side reach, without obstruction, is 1300 mm from the floor and the minimum side reach is 250 mm from the floor as shown in *Figure A5*.



- A.2.2.2 The maximum side reach over an obstruction 860 mm high by 500 mm deep is 1200 mm from the floor as shown in *Figure A6*.

Note: *When designing for a specific individual, the actual reach limitations should be taken into account.*



A.3 WHEELCHAIR DIMENSIONS

A.3.1 *Figure A7* describes some of the typical dimensions of a standard wheelchair. Electric wheelchairs may be of a larger dimension, much heavier and do not have the same manoeuvrability or capability as manual wheelchairs.

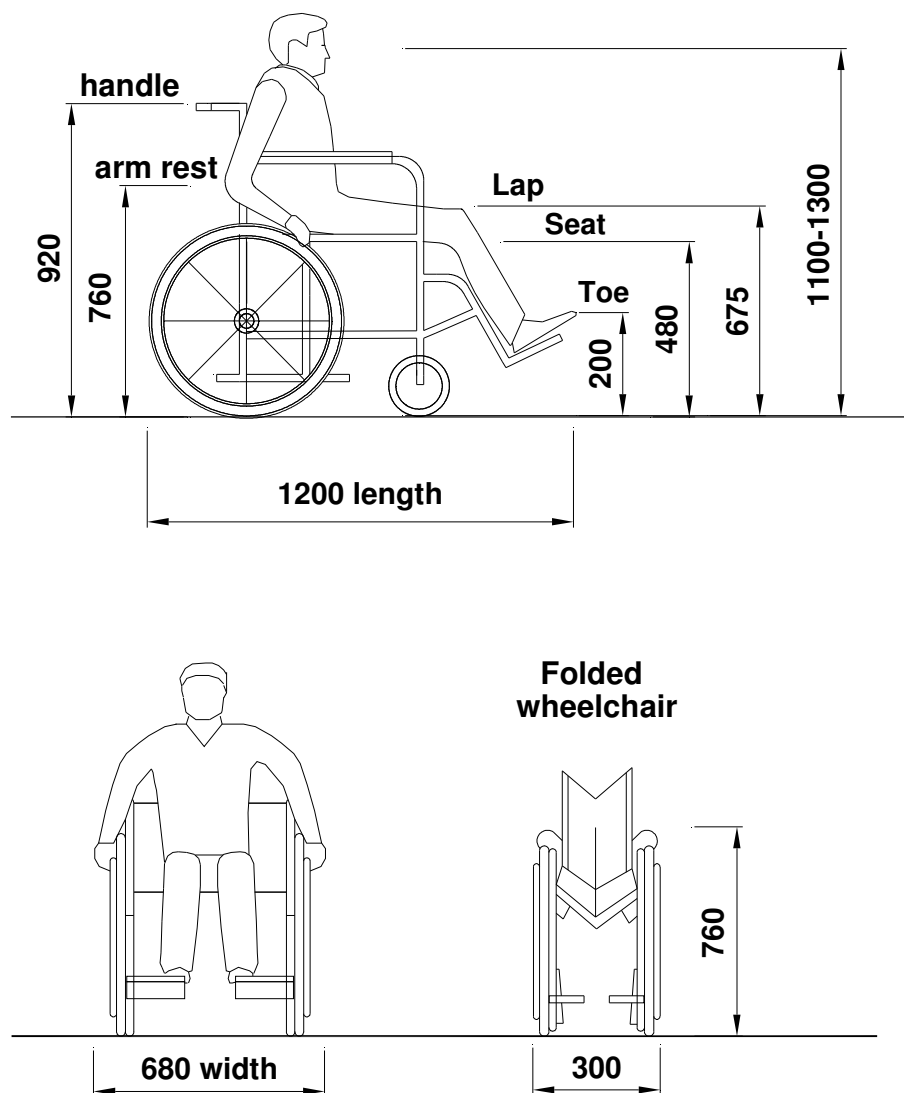


Figure A7
Typical Dimensions of Wheelchairs Commonly Used By Adults

A.4 WALKWAY WIDTHS FOR PERSONS USING CRUTCHES

- A.4.1 Although people who use walking aids can manoeuvre through door openings of 900 mm clear width, they need wider passageways or walkways for comfortable gaits as shown in *Figure A8*. Crutch tips, often extending down at a wide angle, are a hazard in narrow passageways where they might not be seen by other pedestrians.

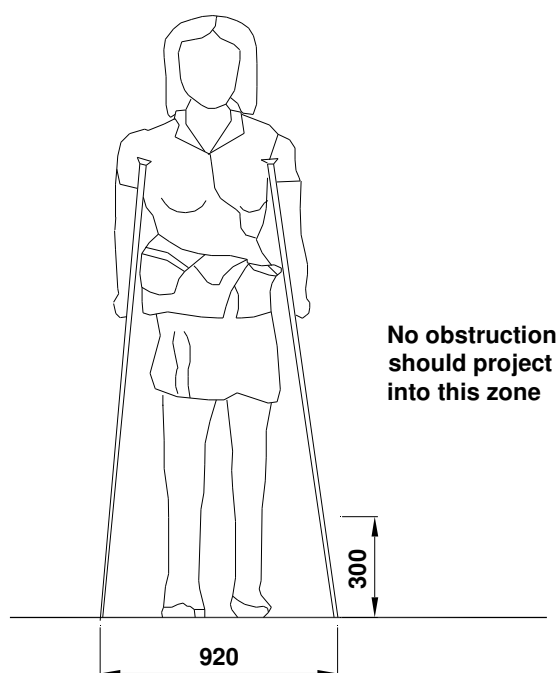


Figure A8
Comfortable Walking Width for Persons Using Crutches

APPENDIX B

SLIP RESISTANCE OF FLOOR FINISHES**B.1 GRADING OF SLIP RESISTANCE**

B.1.1 Materials to be used as floor finishes are graded under dry or wet conditions. The grading of the slip resistance of some of the typical materials is shown in *Table B1*.

TABLE B1

Slip Resistance of Typical Flooring Surfaces

Material	Slip-resistance*		Remarks
	Dry and Unpolished	Wet	
Clay tiles (carborundum finish)	very good	very good	May be suitable for external stairs
Carpet	very good	good	
Clay tiles (textured)	very good	good	May be suitable for external stairs
Cork tiles	very good		
PVC with non-slip granules	very good	good	
PVC	very good	poor to fair	Slip-resistance when wet may be improved if PVC is textured. Edges of sheet liable to cause tripping if not fixed firmly to base.
Rubber (sheets or tiles)	very good	very poor	Not suitable near entrance doors.
Mastic asphalt	good	good	
Concrete pavers (Interlocking)	good	good	
Vinyl tiles	good	fair	
Linoleum	good	poor to fair	Edges of sheets may cause tripping if not securely fixed to base.

TABLE B1

Slip Resistance of Typical Surfaces - Continued

Material	Slip-resistance*		Remarks
	Dry and Unpolished	Wet	
Concrete	good	poor to fair	If a textured finish or a non-slip aggregate is used, slip-resistance value when wet may be increased to good.
Granolithic	good	poor to fair	Slip-resistance when wet may be improved to good by incorporating carborundum finish.
Cast iron	good	poor to fair	Slip-resistance may be acceptable when wet if open treads are used.
Clay tiles	good	poor to fair	Slip-resistance when wet and polished – very poor
Terrazzo	good	poor to fair	Non-slip nosing necessary on stairs. Slip-resistance when polished or if polish is transferred by shoes from adjacent surfaces – very poor.
Marble/granite	good	very poor to fair	Slip-resistance when wet and polished – very poor

B.1.2 In *Table B1* the grading:

*Very good – means surface suitable for areas where special care is required, with an approximate coefficient of friction of more than 0.75;

*Good – means surface satisfactory for normal use with an approximate coefficient of friction of 0.4 to 0.75;

*Poor to fair – means surface below acceptable safety limits with an approximate coefficient of friction of 0.2 to 0.4; and

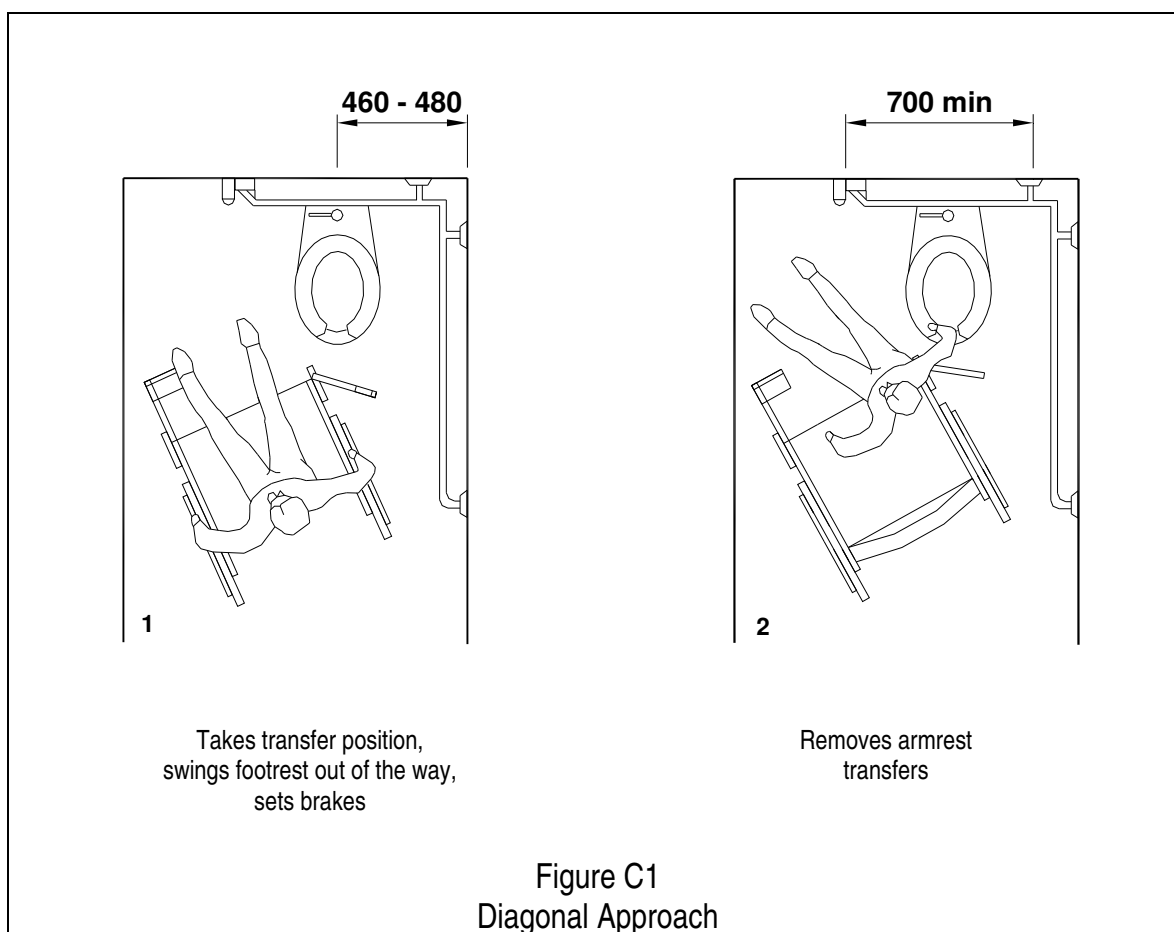
*Very poor – means unsafe surface with an approximate coefficient of friction of less than 0.2.

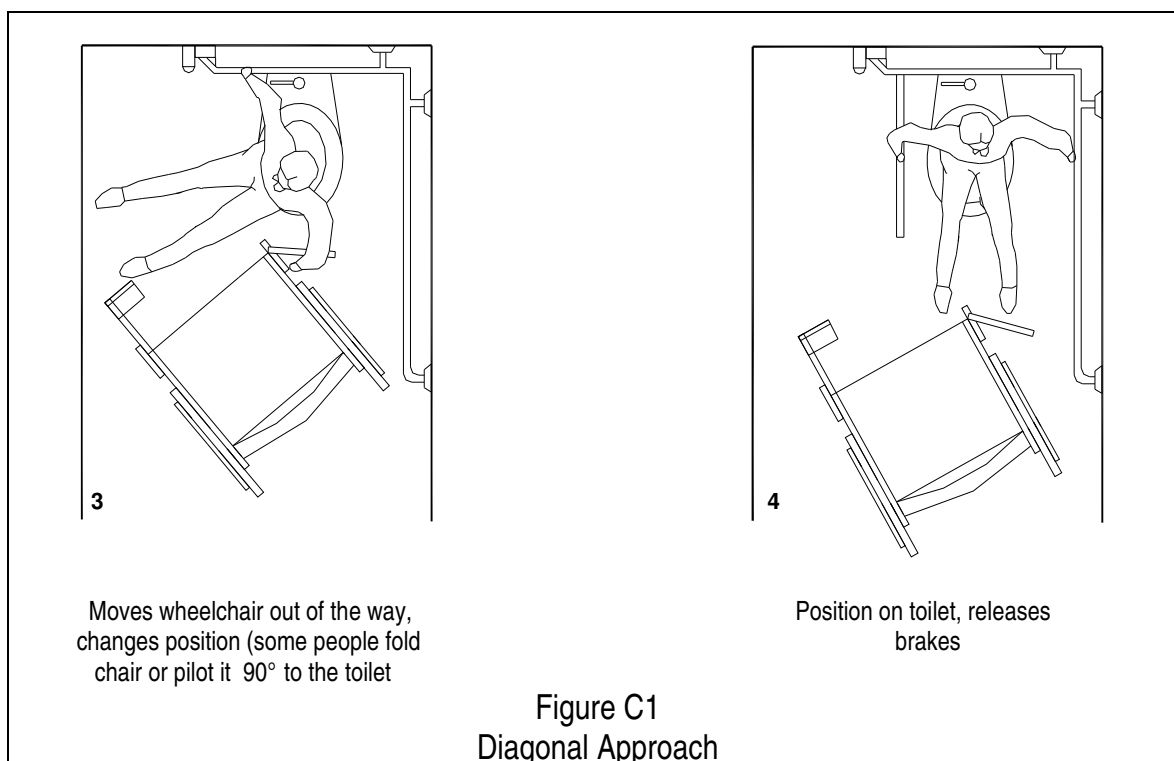
Note: *Thick carpets are not recommended for wheelchair movement.*

APPENDIX C

**GUIDELINES FOR WHEELCHAIR TRANSFER
AND MOVEMENT****C.1 WHEELCHAIR TRANSFER****C.1.1 Diagonal approach**

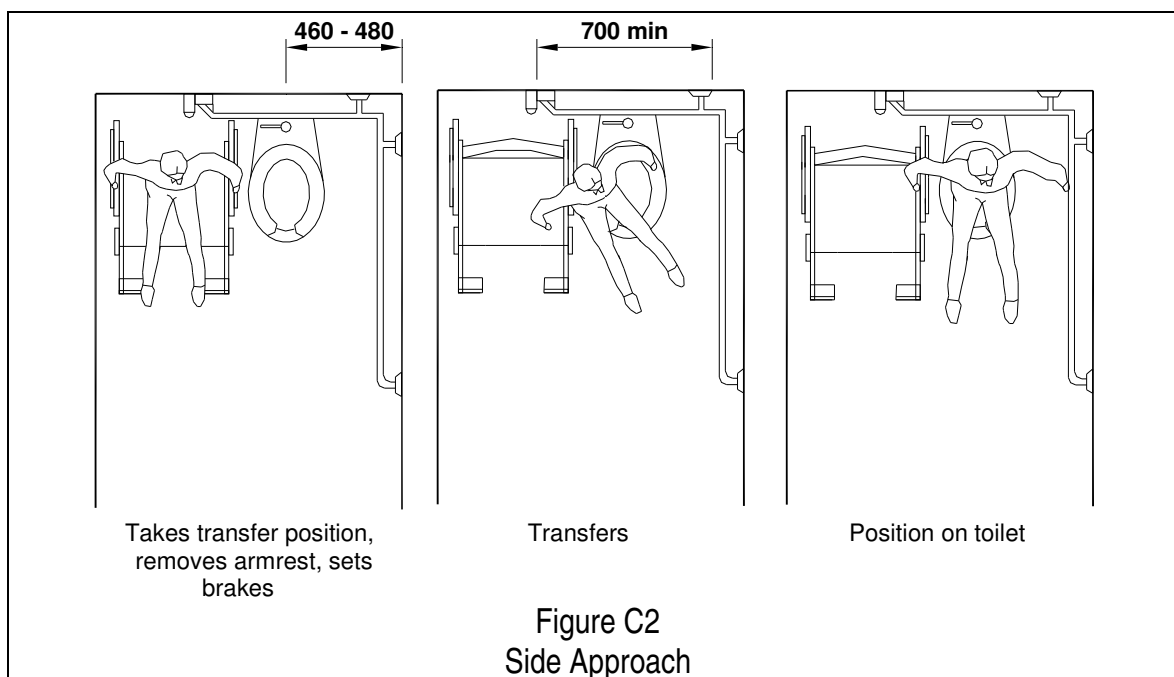
C.1.1.1 The diagonal approach for wheelchair transfer is as illustrated in *Figure C1*.





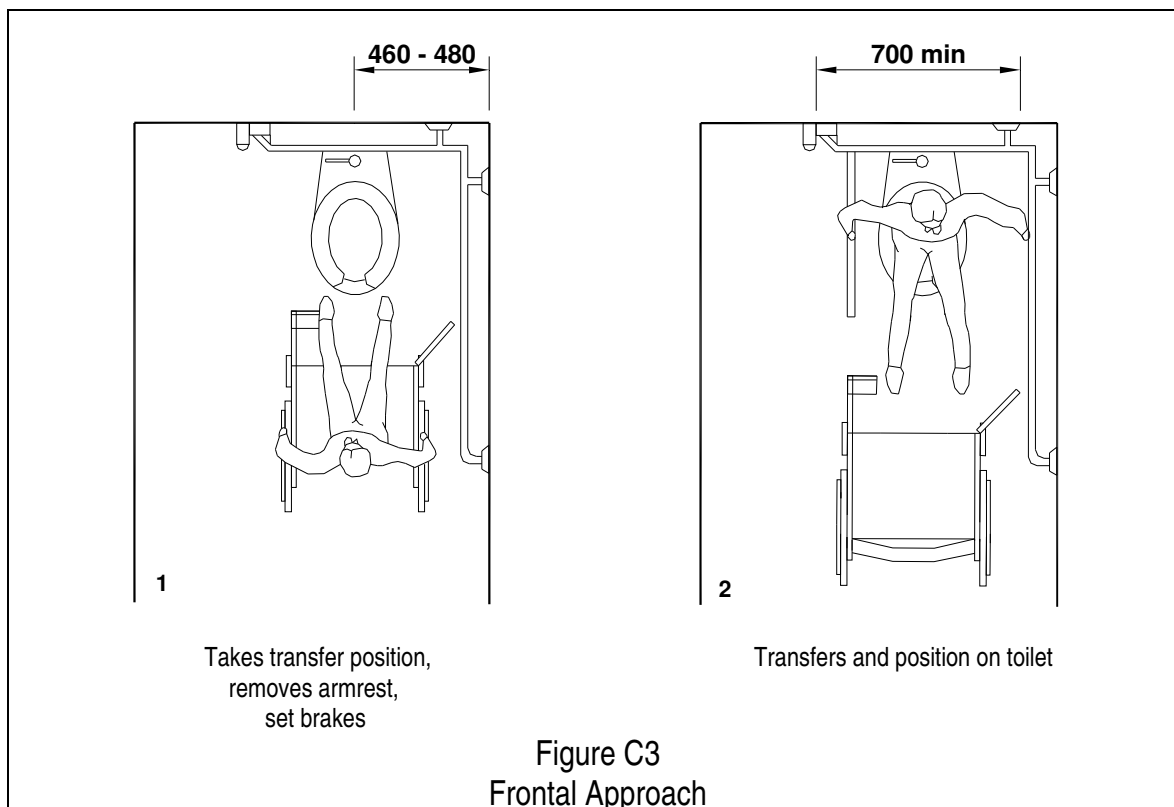
C.1.2 Side approach

C.1.2.1 The side approach for wheelchair transfer is as illustrated in *Figure C2*.



C.1.3 Frontal approach

C.1.3.1 The frontal approach for wheelchair transfer is as illustrated in *Figure C3*.

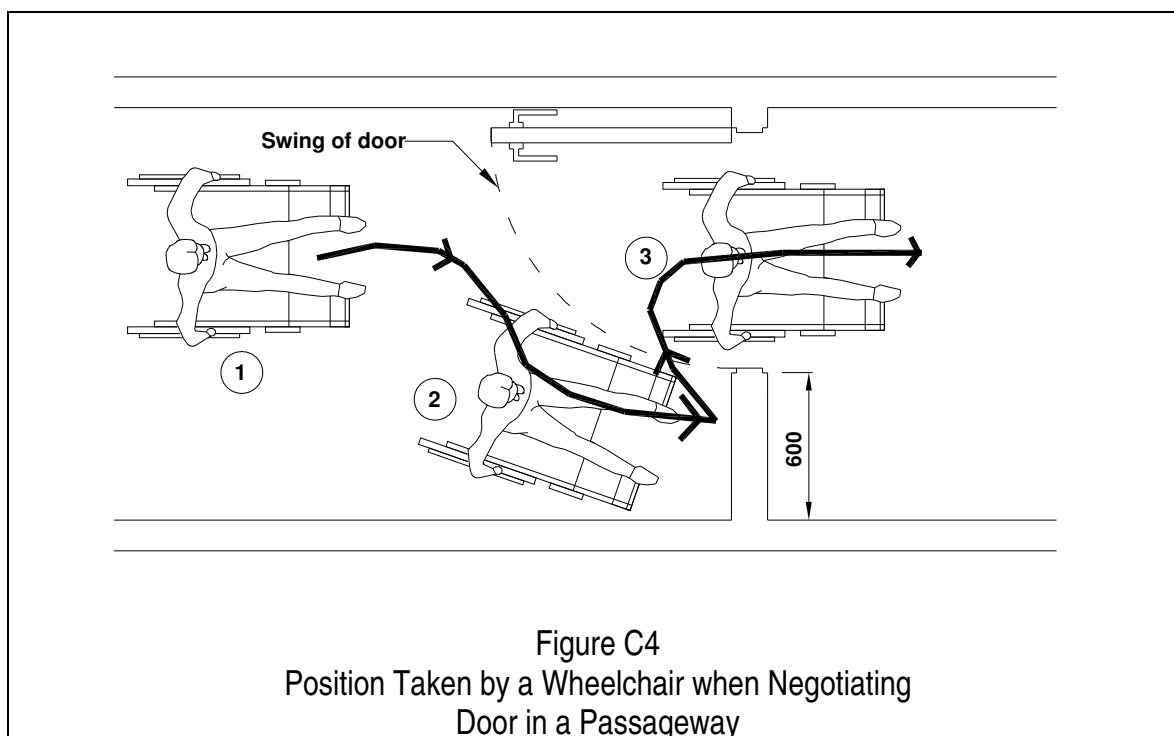


C.2 NEGOTIATING DOOR IN A PASSAGEWAY

C.2.1 The position taken by a wheelchair user when negotiating a door in a passageway is illustrated in *Figure C4*.

C.2.2 From position 1, the wheelchair must move to position 2 so that the user can reach the door latch and swing the door open. Since lateral shift of the rear drive wheels of a wheelchair cannot be achieved in straight travel other than by turning, the chair must follow the track 1 to 2 to 3.

C.2.3 After swinging the door open, the chair needs to be backed and turned to open doorway and then follow path of travel to position 3.



APPENDIX D

DESIGN GUIDELINES FOR OLDER PERSONS**D.1 GENERAL**

- D.1.1 One of the strategies adopted in the November 1999 Inter-Ministerial Committee Report on the Ageing Population (IMC Report) is the creation of elderly-friendly homes and environment. The IMC Report recognises that homes should be designed so that people can stay in them for a lifetime if they wish, even when they are old and frail. Some of the examples of structural design features such as level flooring, at least one large toilet which can accommodate a wheelchair user and doors which are wide enough for a wheelchair to pass through, if not incorporated, would become difficult or expensive to modify after the erection of the building.
- D.1.2 The concept of “Ageing-in-Place” is now accepted as fundamental to housing design. If properly designed and equipped the family apartment, as well as the smaller one- or two- person unit, can sustain people well into old age. In many cases this can prevent or delay the disruptive and expensive need for older persons living in apartments not designed for use by older people to move to more suitable places like nursing homes or sheltered care homes should they become less mobile.
- D.1.3 The IMC Report also deliberated on whether these codes should be made compulsory in the design of homes in Singapore. The Working Committee’s preference is not to make it mandatory in the first instance but to develop the demand for elderly-friendly homes through public education.
- D.1.4 The following guidelines are offered as recommended additions to the Code and should be read in conjunction with it. Many aspects of design for persons with disabilities are already covered in the mandatory sections of this Code and can be usefully applied to the design of interiors of all homes to make them more friendly to older persons.

D.2 AGEING AND SAFETY

D.2.1 Throughout the life of a person, his level of ability increase and then decline sometimes dramatically, but more often in a progressive manner. Ageing does not necessarily bring disability but various impairments will reduce abilities in sight, hearing, mobility, stamina and balance as well as increased difficulty in gripping and manipulating controls, keys and other every day tasks. All these can affect an older person in differing combinations and degrees of severity with implications on personal safety, mobility and convenience.

D.2.2 Ageing is a gradual process and these physical changes often occur almost imperceptibly so that an individual may not be aware of the potential risks of some of his habitual actions. For instance, many older persons will unthinkingly put themselves at risk by walking on shiny and slippery floor surfaces with wet feet, even though this could lead to a serious fall. Similarly, a combination of low vision and slow reaction time could lead to tripping over a step or threshold to a room, particularly in low lighting conditions.

D.3 FALLS IN THE HOME

D.3.1 A fall can be a very serious occurrence for an older person. When a younger person trips, he is usually able to recover his balance, whereas an older person will have less balance and slower reaction times. He may fall awkwardly, so causing injury. Most significantly, injuries may take much longer to heal in older persons. An accident to a frail older person can cause permanent disability or even fatality from secondary causes.

D.3.2 Fear of falling or of being embarrassed about their reduced ability to perform everyday activities may cause people to become inhibited from going out, unaccompanied, in public. At worst this may lead to withdrawal from social contact, frustration, loss of sense of purpose and reduced quality of life.

D.4 ADVANTAGES OF CONSIDERATE DESIGN

D.4.1 Considerate design for safety and accessibility, making the home environment more suitable for older persons, can bring the following benefits:

- (a) increase convenience and make everyday tasks easier, both for the elderly and their carers;
- (b) reduce accidents in and around the home, thus saving on medical and social costs and prolonging the well-being of the individual;
- (c) promote personal independence in daily living, without fear of accidents;
- (d) encourage older persons to “age-in-place” without having to move out to nursing homes or other special housing until absolutely necessary;
- (e) allow individuals to continue to live in their own homes, even if they become disabled and have to use an assistive device such as a wheelchair, a walking frame, crutches and the like; and
- (f) allow for “visitability”. Although the residents of a dwelling may not need wheelchair accessibility, this is worth providing because it allows for their friends and relatives to visit, whatever their disabilities or needs. The concept of visitability can also enhance the future value of the property, because it will be attractive to a wider market of potential purchasers, once the concept of “ageing-in-place” becomes a norm.

D.5 MOBILITY

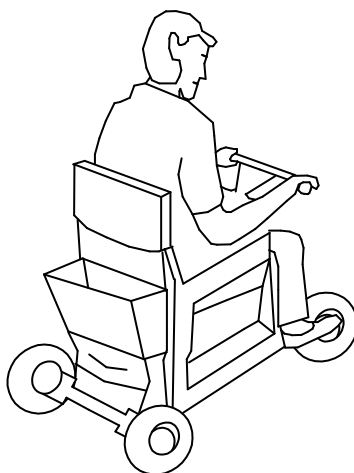
- D.5.1 Moving about by walking is one of the most common and natural activities that people enjoy every day. But for an older person it must not be taken for granted that this will be easy. An older person may be unstable in their gait, or be unable to see their path clearly, or be unable to recognise changes in level of floor surfaces.
- D.5.2 Decreased stamina from medical conditions and frailty in old age will restrict the distances that a person can comfortably walk, particularly if there are ramps and stairs. Provision of resting places on stair landings for instance, may be desirable features.
- D.5.3 Many people use “assistive devices” or “mobility aids” to help them move about more safely. These may take the form of walking sticks, zimmer

frames, crutches, rollators (for ambulant disabled) or wheelchairs for those who are unable or find it difficult to walk unaided.

- D.5.4 Space for parking a wheelchair, rollator or other devices should be provided close to the entrance. In future many older persons may use motorised scooters, in which case, suitable power points should be provided for battery charging. A rollator or motorised scooter is illustrated in *Figure D1*.



(a) Rollator



(b) Scooter

Figure D1
Scooter or Rollator

D.6 PREVENTION OF FALLS

D.6.1 Falls account for many serious accidents in homes. Most of these accidents can be avoided if designers or owners observe simple rules for safety in the built environment by reducing potential obstacles or barriers and providing adequate handrails and grab bars.

D.6.2 When older persons trip even over a small obstacle or slip on a wet or smooth floor they may not be able to recover their balance. If there is no handrail or grab bar to provide support, they might fall and seriously injure themselves.

D.7 DESIGN CONSIDERATIONS**D.7.1 Barrier-free and level floors**

D.7.1.1 Wherever possible, the design should avoid changes in floor level, such as door thresholds, steps and stairways or kerbs and small ramps, which could cause tripping. In practice, most changes in floor level are unnecessary and may be eliminated by intelligent design in the form of scupper drains covered with gratings and floor surfaces graded to a gentle fall away from door opening.

D.7.1.2 Where changes in level are unavoidable, handrails or grab bars should always be provided, no matter how slight the level change may seem.

D.7.1.3 Stairs should be designed in accordance with the provisions of this Code, providing correctly dimensioned handrails, contrasting colours or tones for stair nosings, both in public buildings and in private developments.

D.7.2 Floor surfaces

D.7.2.1 Floor surfaces should comply with the provisions of clause 3.6. Shiny and reflective floors using granite, marble, glazed tiles and the like are not recommended as they could be hazardous especially when they are wet or greasy, or if they have been highly polished. Floor surfaces of kitchen, bathroom and toilet are particularly hazardous, as these may be slippery when wet with soap solution. Non-slip floor surfaces are safer for use and should be specified. Information on slip-resistant surfaces is given in *Appendix B*.

D.7.2.2 Open jointed pavers or aeration concrete blocks should be avoided at external open spaces or vehicle parks where pedestrians are expected to walk. The voids in aeration concrete blocks can catch the foot or walking aids and cause injury or a fall especially when an older person who is ambulant may already be unstable.

D.7.3 **Bending and stretching**

D.7.3.1 Bending, stretching and stooping may cause an older person to fall. These risks can be minimised or avoided by having controls and operating mechanisms mounted at heights as recommended in clause 3.10 of this Code or at same level as door handles.

D.7.3.2 Cupboards at high or low level may be hazardous for older persons to reach with safety. Any shelf at a height that would require a person to stand on a stool or chair must be avoided.

D.7.3.3 Leaning out of windows to open or close them or to hang out laundry poles can also be dangerous. Alternative methods should be considered when designing and specifying components including alternative methods for cleaning windows.

D.7.4 **Lighting and services**

D.7.4.1 An older person will normally require about 2 to 3 times more illumination than a younger person and other aspects of eyesight may also become less reliable in older age.

D.7.4.2 Lighting levels of access routes, especially steps and stairways, should allow for persons with visual impairment to carry out every day tasks and to identify edges of steps, changes in level and other barriers as described in this Code.

D.7.4.3 Alternative light sources should be provided to illuminate any space so that if one lamp fails there is adequate light until proper replacement can be carried out.

D.7.4.4 Double-switching will mean that an occupant does not have to cross the room in the dark to turn the light on or off. Bedside switching is also recommended as a high proportion of older persons will need to use the toilet during the night.

- D.7.4.5 Motion-sensor lights that will light up upon detection of body motion to reduce the hassle for the elderly to walk all the way to the end to turn on the light can be considered as an alternative lighting option.
- D.7.4.6 Adequate illumination levels at different parts of the home including its surrounding should be in accordance with the recommendations specified in the current edition of SS 531.
- D.7.5 **Controls**
- D.7.5.1 For some older persons, gripping, turning and manipulating taps, switches, door handles and many controls can be painful or difficult. Rocker switches, lever-type controls and handles should always be used. Where these are placed in awkward positions requiring reaching such as at low or high level or across worktops, they may be hard to operate and should be avoided.
- D.7.5.2 Controls may also be difficult for older persons to see and understand how to operate. Contrasting colours and larger numerals or letters are recommended.
- D.7.6 **Design to prevent accidents**
- D.7.6.1 Even with the best-designed home environment, accidents may happen. If they do, sensitive design may prevent an accident turning into a tragedy. Once older persons have fallen, they may find it difficult to get up by themselves. If they are alone, this situation can be serious as they may need assistance and possibly medical treatment.
- D.7.6.2 Outward opening of doors to bathrooms and toilets can make it easier for a rescuer to enter if a person has fallen and is lying behind the door. Specifying locks and latches to bathrooms and toilets which can be opened from outside with a coin will allow for assistance in case of emergency.
- D.7.6.3 By providing emergency alarm system in the bathroom and by the bedside, operated by a floor-length pull-chord and connected to a bell or other signal in a warden's room and/or in the corridor outside the front door, a resident can summon help in an emergency.

D.7.7 Space standards

D.7.7.1 A well designed home of the future will provide adequate space for potential wheelchair use should any of the occupants become disabled. This should include doorways wide enough to allow a wheelchair to pass through and space for turning in bathrooms, kitchens and living rooms and to move around the bedroom.

D.7.7.2 For bathrooms and toilets, consideration should be given to allowing space at the side of the water closet for older persons to transfer from a wheelchair or to be assisted by their carer. Grab bars should be installed to facilitate transfer.

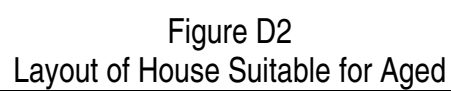
D.7.7.3 Adequate legroom should be provided under tables, worktops, wash basins and sinks for wheelchair users, giving consideration as to how they may be able to use the kitchen.

D.8 TOP TEN DESIGN POINTS

D.8.1 The following are minimum provisions recommended in design for older persons:

- (1) Barrier-free access without steps, thresholds or kerbs, wherever possible.
- (2) Non-slip floor finishes throughout especially where water may accumulate.
- (3) Grab bars, especially in showers, toilets and walking areas such as corridors, or provision should be made for these to be mounted in future.
- (4) Switches, handles and controls at reachable heights preferably at same level with door handles.
- (5) Lever handles to doors and cupboards, door keys, lever taps and controls that can be used by older persons with limited grip.
- (6) Circulation space and door widths should be adequate to allow a wheelchair to be used.

- (7) Staircase should be adequately designed including profile of treads and provision of handrails at both sides of stairways. There should be clear definition of nosings by colour contrast and adequate lighting should be provided at a recommended level of 200 lux in corridors or on stairways.
- (8) In toilet design, pedestal type water closet seats are the preferred choice rather than the squat type and outward opening of toilet door and adequate space to accommodate a wheelchair and helper.
- (9) Potentially dangerous activities such as hanging of laundry out of windows, standing on furniture to reach shelves or to carry out home maintenance should be eliminated or reduced in the design.
- (10) Emergency alarm systems with pull-cord extending to floor should be provided in bathrooms and bedrooms.



APPENDIX E

**DESIGN GUIDELINES FOR CHILDREN
WITH DISABILITIES****E.1 APPLICATION**

E.1.1 These guidelines are intended to apply to buildings or premises, such as kindergartens, pre-schools or primary schools, where children are the principal or predominant users.

E.1.2 Where such buildings or premises are required to be made accessible to children with disabilities, it is recommended that the provisions and facilities should be designed in accordance with the details and specifications in these design guidelines.

E.2 INTERPRETATION

E.2.1 The term “children with disabilities” in the context of these guidelines should be taken to mean children between the ages of 3 to 12 who are:

(a) wheelchair bound; or

(b) ambulant disabled.

E.2.2 The specifications contained in this Appendix are based on anthropometrics for children with disabilities.

E.3 HANDRAILS/GRAB BARS

E.3.1 A second set of handrails should be provided at approach ramps and staircases at an appropriate height to assist children with disabilities and help prevent accidents.

E.3.2 The handrails should be fixed at a maximum height of 700 mm measured vertically from the ramp surface or pitch line of the stairs to the top of the handrails.

- E.3.3 Where grab bars are required, the height should meet the need of specific age groups as recommended in *Table E1*.

TABLE E1

Grab Bar Height

Age (years)	Height of grab bar (mm)
3 to 6	450 to 580
7 to 12	580 to 700

- E.3.4 The grab bars should have a diameter between 30 mm to 35 mm or any shape that provides an equivalent gripping surface.

E.4 **SEATING SPACE**

E.4.1 **Clear floor space**

- E.4.1.1 Seating space, such as those provided at counters, tables, or work surfaces for children in wheelchairs should have a clear floor space 900 mm wide by 1200 mm deep.

E.4.2 **Clear knee space**

- E.4.2.1 Where a forward approach is used, a clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.

E.4.3 **Counter tops**

- E.4.3.1 Writing surface or service counters should be at a height between 700 mm to 780 mm from the floor.

E.5 **DRINKING FOUNTAIN**

- E.5.1 The spout opening of a drinking fountain should be located at the front of the unit between 740 mm to 780 mm from the floor or ground surface.

E.6 SANITARY PROVISIONS**E.6.1 Water closet compartment**

- E.6.1.1 Water closets should comply with the requirements of clause 4.7. The distance between the centre line of the water closet to the adjacent wall shall comply with *Table E2*.

TABLE E2

Water Closet Centre Line

Age (years)	Centre line (mm)
3 to 6	300 to 350
7 to 12	350 to 450

E.6.2 Height of water closet seat

- E.6.2.1 The height of water closet seat for the ambulant disabled should comply with *Table E3*:

TABLE E3

Toilet Seat Height

Age (years)	Height (mm)
3 to 6	290 to 400
7 to 12	400 to 450

- E.6.2.2 The height of water closet seat of 450 mm to 480 mm is recommended for wheelchair users to facilitate transfer.

E.6.3 Application of specifications

- E.6.3.1 The specifications of one age group should be applied consistently in the installation of a water closet and related elements.

Note: *The specifications for water closets suitable for children with disabilities should reflect the difference in size, stature and reach of children aged 3 to 12.*

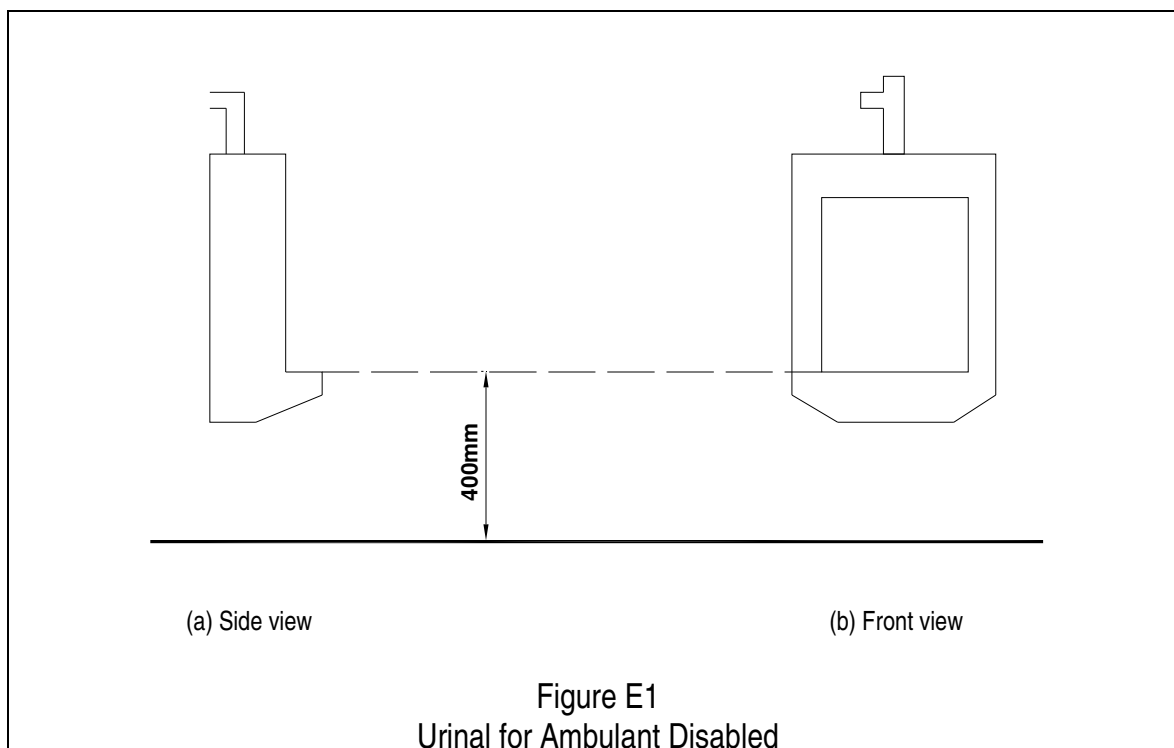
E.6.4 Water closet grab bars

E.6.4.1 Water closets should be provided with grab bars that comply with the following requirements:

- (a) one horizontal grab bar to be mounted at a height between 260 mm and 280 mm from the top of the water closet seat or at a height between 680 mm to 740 mm above the floor level on the side wall closest to the water closet and extending from the rear wall to at least 450 mm in front of the water closet seat;
- (b) one flip-up grab bar to be mounted on the side of the compartment adjacent to the water closet at a height between 680 mm to 740mm above the floor level when lowered from the wall and 360 mm to 400 mm to the centre line of the water closet;
- (c) a vertical or oblique bar of 400 mm to 500 mm long should be provided on the side wall closest to the water closet and the lower end should be at a height of 650 mm from the floor and 450 mm in front of the water closet seat; and
- (d) another horizontal grab bar to be mounted on the wall behind the water closet at a height between 680 mm and 740 mm and be at least 750 mm long.

E.6.5 Urinal

- E.6.5.1 At least one urinal mounted at a height of not more than 400 mm from the finished floor level, as illustrated in *Figure E1*, should be provided for young children.

**E.6.6 Wash basin**

- E.6.6.1 The wash basin for wheelchair users should have a knee clearance of at least 700 mm wide, 400 mm deep and 680 mm high and the rim or counter surface of the wash basin should not be higher than 780 mm.
- E.6.6.2 The height of the wash basin for ambulant disabled should not be higher than 550 mm.
- E.6.6.3 A wash basin with adjustable height is more appropriate to serve the needs of different age groups.

E.6.7 Mirror

E.6.7.1 If a mirror is to be provided for both ambulant disabled and wheelchair users, the height from the floor level to the top most edge should be at least 1900 mm high.

E.6.7.2 A clear floor space of 900 mm by 1200 mm for a forward approach should be provided in front of the full-length mirror. No door should swing into this clear floor space.

Note: *A single full-length mirror should be able to accommodate all people, including children and adults.*

E.6.7.3 The bottom edge of the reflecting surface of the mirror should be no higher than 800 mm above the finished floor level or at the lowest mounting height permitted by fixtures and related elements.

E.7 CHILDREN'S REACH RANGES

E.7.1 Where building elements, such as coat hooks, lockers, or controls and operating mechanisms are designed for use by children with disabilities the dimensions in *Tables E4* and *E5* should provide guidance on reach ranges for children according to their age groups. These dimensions apply to either forward or side reaches.

TABLE E4

Forward Reach

Age (years)	Reach (Low)	Reach (high)
3 to 6	500	900 to 1000
7 to 12	400	1000 to 1100

TABLE E5

Side Reach

Age (years)	Reach (Low)	Reach (high)
3 to 6	500	960 to 1070
7 to 12	400	1070 to 1170

E.8	LIFT
E.8.1	Lift control panel
E.8.1.1	The lift control panel for children with disabilities should be placed at a height between 800mm and 1000 mm from the floor level.
E.9	PUBLIC TELEPHONE
E.9.1	Height
E.9.1.1	The height of the operable parts of a telephone should be between the height of 800 mm to 1000 mm.
E.10	TUCKSHOP/CANTEEN
E.10.1	Height of Tables or Counters
E.10.1.1	The top of accessible tables and counters should be positioned from 700 mm to 780 mm above the finished floor level or ground.
E.10.2	Seating
E.10.2.1	If seating spaces for wheelchair users are provided at fixed tables or counters, a clear floor space of 900 mm by 1200 mm should be provided.
E.10.3	Knee clearance
E.10.3.1	A clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.
E.11	COMPUTER ROOM
E.11.1	Computer table
E.11.1.1	A clear knee space of at least 700 mm wide, 400 mm deep, 680 mm high should be provided.

E.11.1.2 A table with adjustable height is recommended. The computer's Central Processing Unit, Monitor, Printer should be within the reach of the user in accordance with *Tables E4 and E5*.

E.12 **LIBRARY**

E.12.1 **Door/entrance**

E.12.1.1 Where revolving doors or turnstiles are provided at an accessible entrance or along an accessible route, an auxiliary side-hung door or accessible gate should respectively be provided adjacent to the revolving doors or turnstiles complying with clauses 3.8.1.4 and 3.8.14.1.

E.12.2 **Table and counter**

E.12.2.1 An accessible table and counter with a clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.

E.12.2.2 The top of accessible table and counter should be from 700 mm to 780 mm above the finish floor level or ground.

E.12.2.3 A table with adjustable height is recommended.

APPENDIX F

**DESIGN GUIDELINES FOR PERSONS
WITH VISUAL IMPAIRMENT****F.1 INTRODUCTION**

F.1.1 Where buildings are required under clause 2.1 of Chapter 2 to be made accessible, qualified persons and designers are encouraged to adopt the recommendations in these guidelines to help create a conducive environment to meet the needs of persons with visual impairment. It will enable them to move about independently with safety and dignity.

F.1.2 The orientation and mobility of persons with visual impairment will be greatly enhanced by introducing the concept of –

- (a) visual contrast in building interiors; and
- (b) tactile ground surface indicators.

F.2 VISUAL CONTRAST IN BUILDING INTERIORS**F.2.1 Vision loss and contrast**

F.2.1.1 Partial loss of vision can make it very difficult to navigate in and around the built environment, especially in unfamiliar settings. While excessive contrast can create problems of glare, inadequate contrast can make it difficult for persons with low vision to discern objects or details in the environment.

F.2.2 Contrast and interior space

F.2.2.1 Safe and independent use of internal spaces can be greatly enhanced by incorporating effective contrast between building elements, particularly emphasising those elements that need to be identified, operated or interpreted.

- F.2.2.2 Walls and ceilings should be finished in plain colours (not complex patterns, which can be confusing) of light tones (to help diffuse light around the room) and matt finishes (to avoid unwanted glare or reflection).
- F.2.2.3 Floors should also be relatively plain (both to avoid confusion and to allow easy location of dropped objects), not glossy and a mid-tone to contrast with walls (for example when viewed through an open doorway).
- F.2.2.4 Doors should also be a mid-tone to contrast with walls, and skirtings, architraves and door-frames should be a dark tone to help define surface junctions and openings while contrasting with floors, walls and doors.
- F.2.2.5 Door handles, light-switches, lift buttons, coat hooks and similar elements should all contrast strongly with their backgrounds. This can be achieved either by having a dark element against a light background or by mounting a light toned operating element on a dark panel, which itself contrasts with a light background.
- F.2.2.6 Soft furnishings (for curtains, chairs etc) should contrast with both walls and floors. Introduction of a simple pattern can add life and homeliness to a room but strong patterns can make it difficult to locate spectacles, keys or similar objects placed on the patterned surface.
- F.2.3 **Types of contrast**
- F.2.3.1 Contrast refers to perceptible differences between different regions of an image or scene. There are two fundamental types of contrast:
- (a) Luminance or brightness contrast, and
 - (b) Colour contrast.
- F.2.4 **Luminance contrast**
- F.2.4.1 Luminance contrast is a measure of the relative amounts of light that are reflected from surfaces. Two quite differently coloured surfaces may have a similar luminance.

- F.2.4.2 A 30% difference in luminance is generally the minimum discernible by a person with partial sight. Black and white have a 100% luminance contrast. Grey and black or grey and white have a 50% luminance contrast as shown in *Figure F1*.

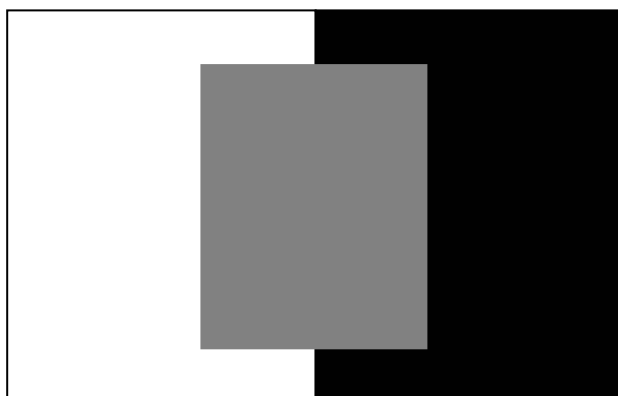


Figure F1
Effective luminance contrast

F.2.5 **Colour contrast**

- F.2.5.1 Ageing and sight loss diminish the sensitivity of colour perception. Colours that contrast sharply to someone with normal vision may be less distinguishable to a person with low vision.
- F.2.5.2 Colours can contrast on the basis of their lightness, saturation or hue. Designers can help to compensate for vision deficits by making colours differ more dramatically in all three attributes. In this context –
- (a) lightness measures the relative amount of light reflected from a colour;
 - (b) saturation relates to its intensity; and
 - (c) hue refers to elementary colour names, that is red, green, blue etc.

- F.2.5.3 Effective design will maximise lightness differences between foreground and background objects, and avoid using colours of similar lightness adjacent to one another, even if they differ in saturation or hue.



Figure F2
The Hue Circle

- F.2.5.4 Dark colours from the bottom half of the hue circle contrast best against light colours from the top half. Avoid viewing light colours from the bottom half against dark colours from the top half as shown in *Figure F2*. Lightness is the most important attribute in making contrast more effective.
- F.2.5.5 Avoid contrasting hues from adjacent parts of the hue circle, especially if the colours do not contrast sharply in lightness as shown in *Figure F3*.

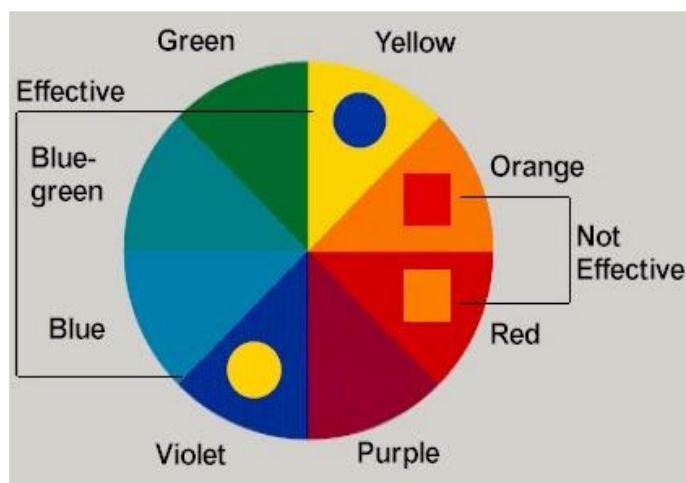


Figure F3
Effective Hue Contrast

F.2.5.6 Congenital and acquired colour deficits also make it difficult to discriminate between colours on the basis of saturation. Slate blue, for example, is a desaturated colour because it is similar to grey. A deep blue, even if it has the same lightness as slate blue, has greater saturation as shown in *Figure F4*.

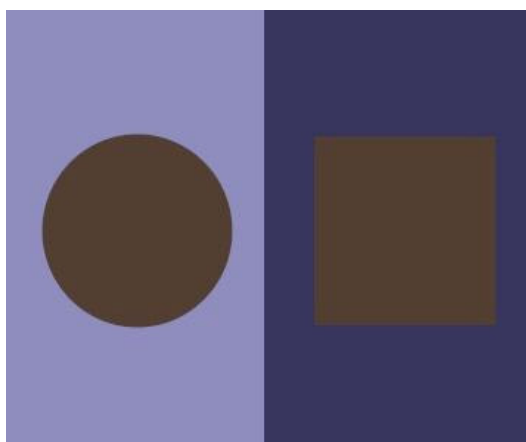


Figure F4
Saturation Contrast

F.2.5.7 To someone with partial sight, the left-hand panel may appear like the right-hand panel appears to a person with normal colour vision.

F.2.6 Glare

F.2.6.1 Excessive luminance contrast between interior elements can create glare. Windows, light fittings and reflective surfaces can all impact negatively on vision if not designed appropriately.

F.2.6.2 Direct glare can be minimised by ensuring that strong light sources, such as windows and light fittings are effectively screened.

F.2.6.3 Reflected glare can be reduced by eliminating reflective surfaces especially on floors and walls and by attention to the location of light sources relative to mirrors, glazing and the like.

F.2.7 Lighting

F.2.7.1 Contrast will only be of assistance to people with sight deficits if there is an appropriate quantity and quality of illumination with which to view the contrasting elements. At low light levels, the perception of contrast diminishes.

F.2.7.2 Lighting levels should generally be relatively uniform and about 25% higher for people with low vision. Strong directional lighting casts shadows that can mask contrasting surfaces. Significant fluctuations in illumination level can reduce visibility due to the slower adaptive response of the eye in someone with low vision.

F.3 TACTILE GROUND SURFACE INDICATORS

F.3.1 Mobility

F.3.1.1 People who are blind or visually impaired strive to maintain the highest possible level of independence. Many people who are blind have some small amount of residual vision and all people with visual impairment will use whatever vision they have, together with other techniques, to find their way around.

F.3.1.2 Some individuals will choose to travel with a sighted guide while others will choose to travel independently. For those who choose to travel independently, continual and extensive use is made of physical or other sensory cues, landmarks and mind maps.

F.3.2 **Physical cues**

F.3.2.1 Physical structures such as buildings, walls, fences and kerbs can act as cues to assist independent travel. A person using a white cane may be able to follow a fence line from one point to another assuming there is an appropriate clear way immediately adjacent to the fence. Intermittent contact between the fence and the white cane helps to keep the person on the correct line.

F.3.2.2 Physical cues can be identified either by use of a white cane, under foot, or sometimes by eco-location.

F.3.3 **Other sensory cues**

F.3.3.1 People with low vision are well experienced at gathering and interpreting information from sources other than by sight. In the light of restricted access to visual cues, people with low vision place a much greater emphasis on information obtained via other avenues including touch, sound and smell. Tactile and audible information can be gathered to substitute or enhance visual information. Such information may be provided deliberately or may already occur in a given environment. Where the presence of such information is insufficient to provide adequate assistance, the deliberate provision of additional tactile or audible information may have to be considered.

F.3.4 **Landmarks**

F.3.4.1 The concept of landmarks is a very important one. By definition, landmarks are unique features in a given location. As such they can be used to assist with orientation. Knowing the location of a landmark and the layout of its immediate surroundings will help those with low vision to orientate to the location and assist their mobility to and through the area.

F.3.5 Mind maps

F.3.5.1 People with low vision make extensive use of mind maps. Even where high quality access features have been provided, it will still be necessary for someone who is blind to be familiar with the location before they would be able to access it independently. Having been to the location with a sighted guide, or had it described to them, the person can build a mind map for future reference. This is a very common form of orientation and mobility technique.

F.3.6 Clear continuous accessible path of travel

F.3.6.1 In essence, a clear continuous accessible path of travel is one that provides a dedicated pedestrian space which is free from barriers, hazards or obstructions.

F.3.6.2 People who are blind or visually impaired, like disabled persons, are looking for access which is predictable, logical and barrier free. If a clear continuous accessible path of travel can be provided to and through a given environment it will greatly enhance independent travel.

F.3.7 Types of tactile ground surface indicator

F.3.7.1 This is one form of tactile indicators which, in essence, provide the blind or visually impaired a physical cue. It is detectable either under foot or by the use of a white cane. Tactile ground surface indicator is only one source, amongst many, of orientation information. Unlike some other tactile indicators which are basically generic in nature, tactile ground surface indicators have a specific function and impart specific information about the immediate surroundings.

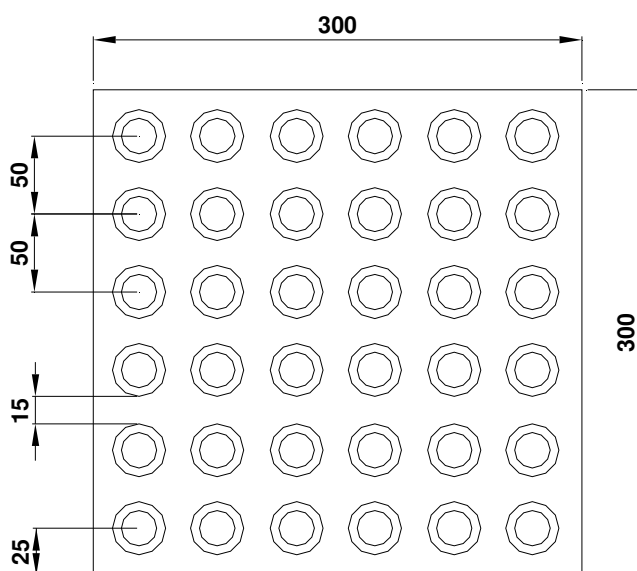
F.3.7.2 Tactile ground surface indicators act as, and is interpreted as, landmarks. There are two types of tactile ground surface indicators:

- (a) warning indicator; and
- (b) directional indicator.

F.3.8 Warning indicator

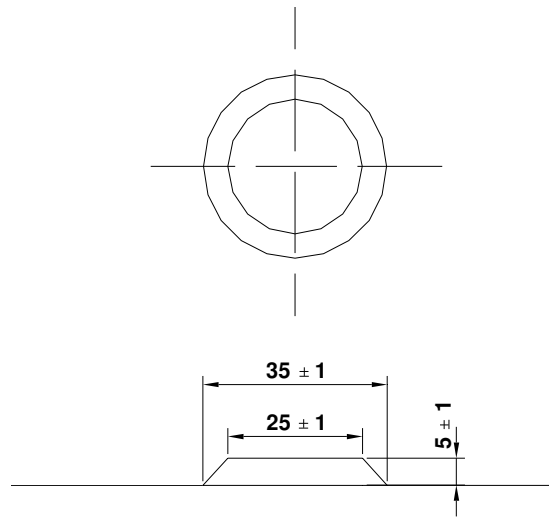
F.3.8.1 Warning indicator, as the name suggests, warn of either a hazard or a destination. For example, a warning indicator near the edge of a staircase landing warns of the edge of the landing which otherwise would pose a significant hazard to a pedestrian with low vision. As the person approaches the edge, the tactile warning treatment will be identified either by the white cane or under foot thus warning of an impending drop to the staircase.

F.3.8.2 The dimensions of a warning indicator are shown in *Figure F5*.



(a) Top view

Figure F5
Warning Indicator



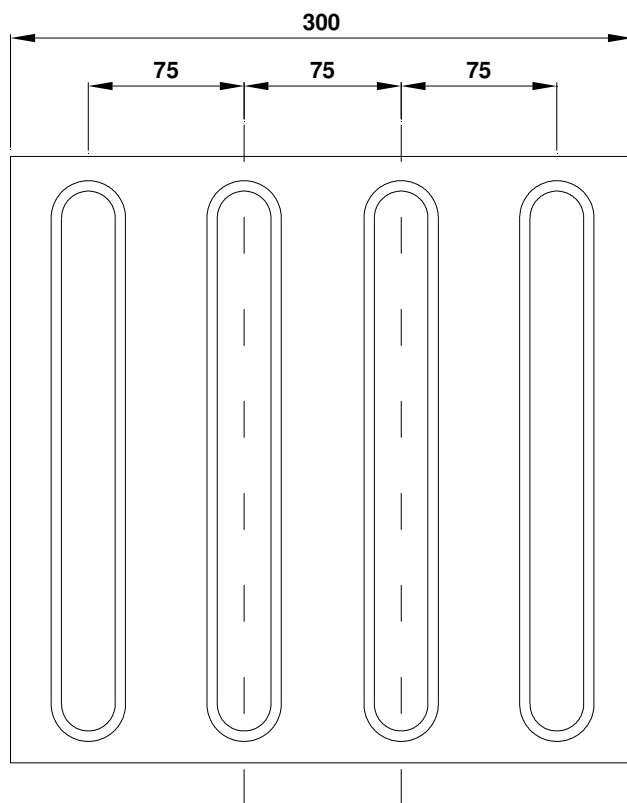
(b) Stud detail

Figure F5
Warning Indicator

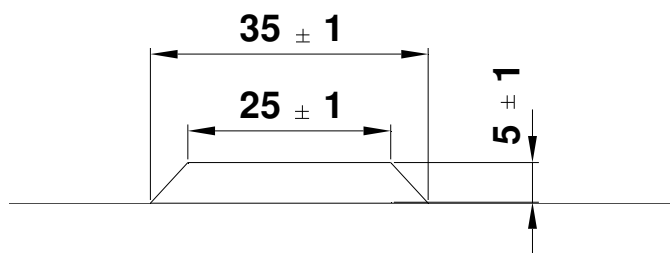
F.3.9 Directional indicator

F.3.9.1 Directional indicator is used to direct the user from one point to another along a safe path of travel. It is only required when there are insufficient cues from other sources to achieve the same result. For example, a directional indicator may be used in an open pedestrian plaza to indicate a clear path of travel in the absence of any other cues.

F.3.9.2 The dimensions of a directional indicator are shown in *Figure F6*.



(a) Top view



(b) Elongated pattern detail

Figure F6
Directional Indicator

F.3.10 Position of tactile ground surface indicator

F.3.10.1 The decision to apply tactile ground surface indicator will always have to be made in light of the particular circumstances applicable at any given site. In making such decision, consideration should be given to the orientation and mobility strategies and techniques adopted by people with low vision (such as those discussed above) and the potential hazards and barriers existing at a given location. However, there are some obvious situations where tactile ground surface indicator must be applied.

F.3.10.2 Warning treatment may be required at:

- (a) hazardous locations, such as steps, stairs, railway platforms, pedestrian crossings and wharves; and
- (b) destinations to provide information about the location of amenities such as ticketing machines, phone booths and the like.

F.3.10.3 Directional treatment may be required to assist with:

- (a) direction, that is, to indicate a clear continuous accessible path of travel; and
- (b) location, that is, to provide assistance to locate a target such as a pedestrian crossing, entrance to a public building, ticketing machine or phone booth.

F.3.11 Principles of application

F.3.11.1 When considering the application of tactile ground surface indicator, four major principles shall be taken into consideration.

F.3.12 Minimalist application

F.3.12.1 Tactile ground surface indicator acts as landmarks. As such, its application must be targeted and minimised as far as possible. Widespread ad hoc application of tactile ground surface indicator will confuse rather than inform and will compromise the effectiveness of the specific cue being provided.

F.3.13 Dimensions

F.3.13.1 The dimensions of the treatment are critical. Remembering that tactile ground surface indicator will be identified under foot, it is important to ensure that a minimum depth of treatment is applied. To be detectable under foot, the treatment must make contact with the ball of the foot. To ensure this will always occur, treatments must have a minimum depth of 600mm in the direction of travel. This dimension applies to both warning and direction treatments at their initial point of identification.

F.3.14 Colour and Luminance contrast

F.3.14.1 Tactile ground surface indicator should be coloured and luminance contrasted against their surrounding surfaces. This will greatly assist those using their residual vision to move around.

F.3.14.2 Many people with low vision also have difficulty distinguishing between different colours particularly if they appear next to each other. For example, the "tomato effect", that is red on green, does not provide adequate luminance contrast and as such will be extremely difficult to identify. For this reason, a minimum luminance contrast of 30% is required to fulfill this principle.

F.3.15 Orientation and position

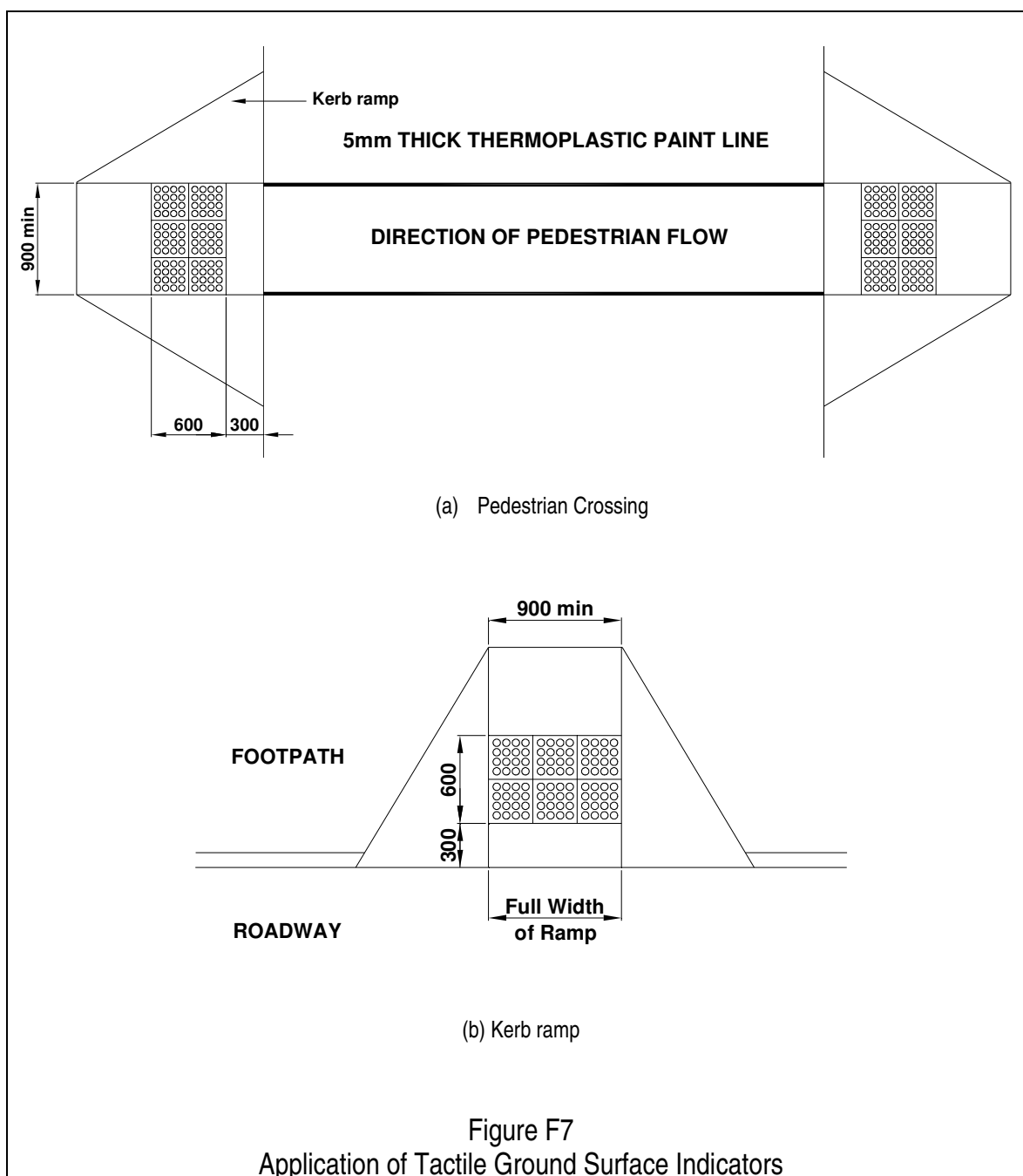
F.3.15.1 In general a warning treatment should be applied perpendicular, which is at 90 degrees, to the line of approach or to the target object. In addition, a warning treatment should be set back 300mm from the hazard or target object.

F.3.15.2 A directional treatment is usually applied along the center line of the indicated path of travel and must provide a minimum clear width on either side of at least 800 mm in which there is no obstacle or obstruction.

F.4 APPLICATION OF TACTILE GROUND SURFACE INDICATOR**F.4.1 Pedestrian crossings and kerb ramps**

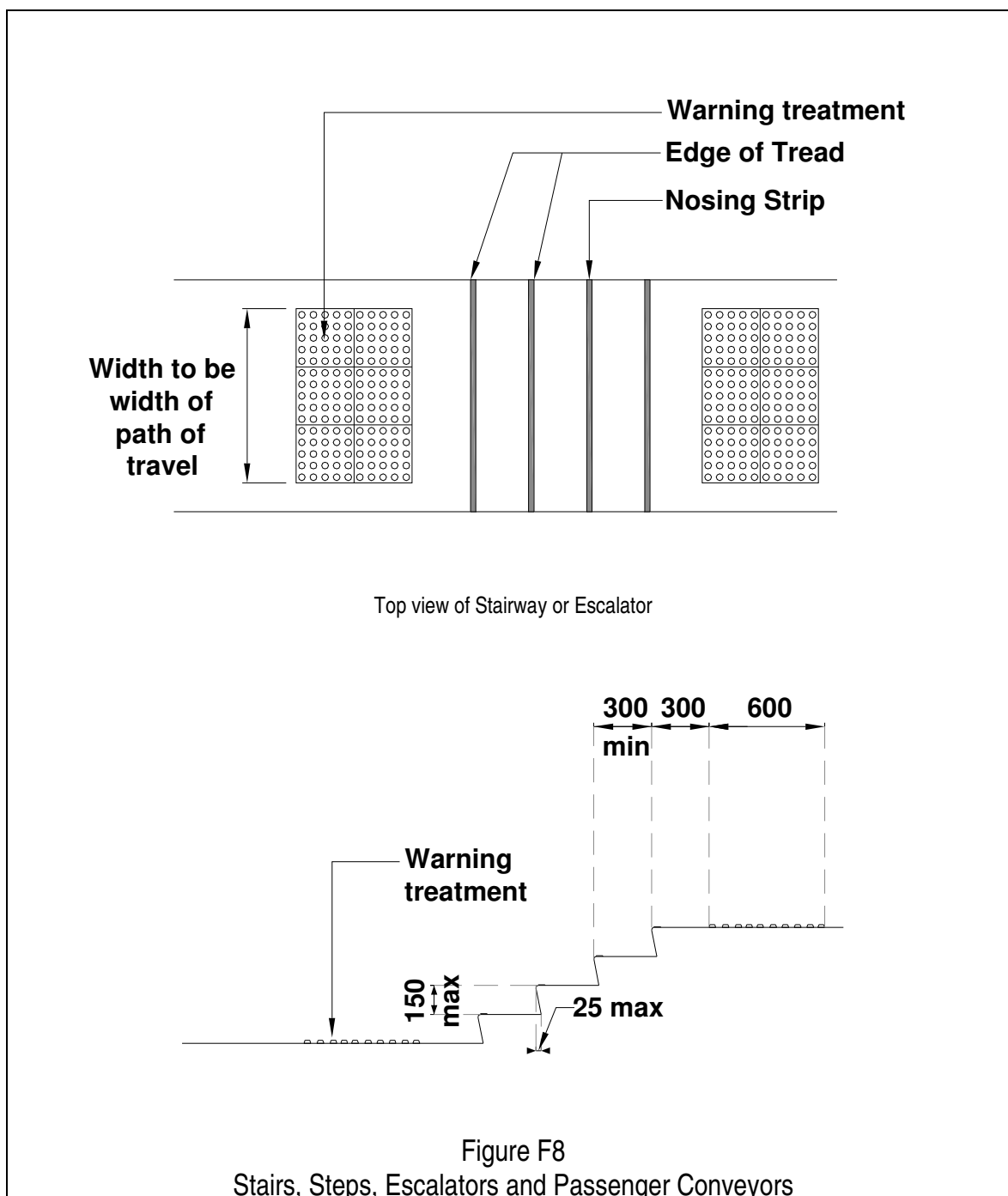
F.4.1.1 Tactile ground surface indicators should be applied at pedestrian crossings as illustrated in *Figure F7 (a)*.

F.4.1.2 Tactile ground surface indicators should be applied at kerb ramps as illustrated in *Figure F7 (b)*.



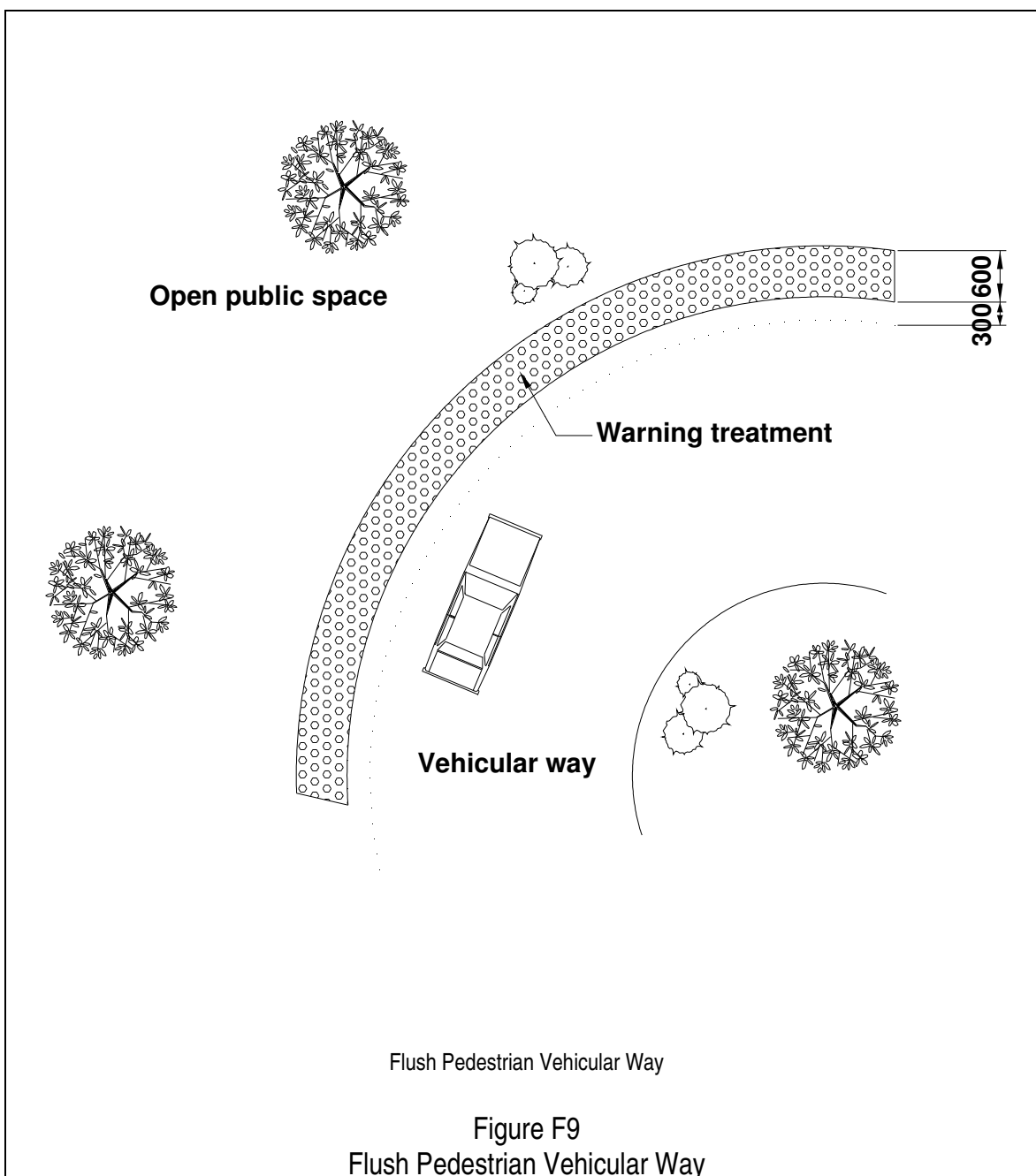
F.4.2 Stairs, steps, escalators and passenger conveyors

F.4.2.1 Tactile ground surface indicators should be applied to stairs, steps, escalators and passenger conveyors as illustrated in *Figure F8*.



F.4.3 Flush pedestrian vehicular way

F.4.3.1 Tactile ground surface indicators shall be applied to flush pedestrian vehicular way as illustrated in *Figure F9*.



F.4.4 Tactile guidance strips

F.4.4.1 Tactile guidance strips to guide persons with visual impairment around buildings should be applied as illustrated in *Figure F10*.

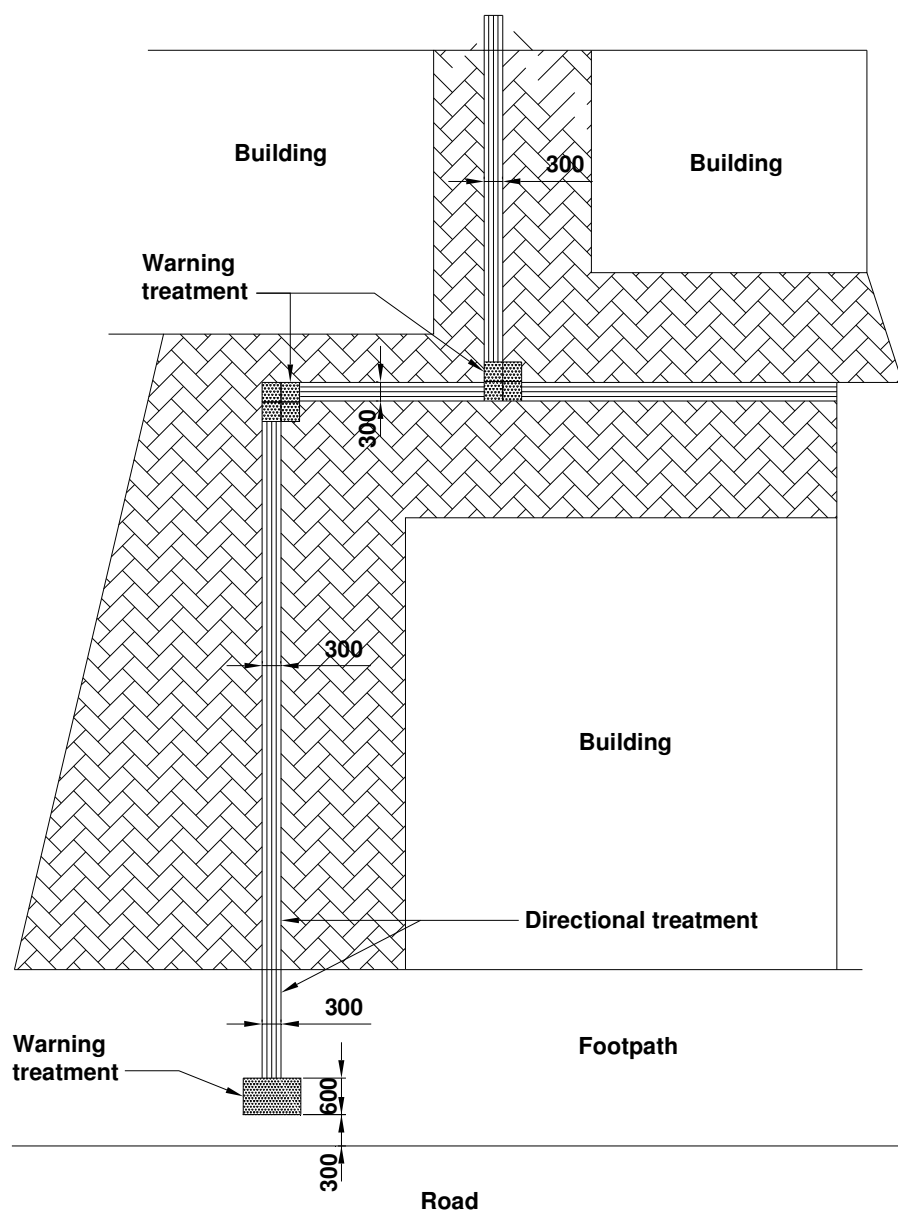


Figure F10
Tactile Guidance Strips

F.4.5 Materials

F.4.5.1 Tactile ground surface indicators are produced in a range of materials including concrete, ceramic, rubber, cork, steel and various resins. Some types are supplied in a tile format while others are applied with a spray-on technique.

F.4.5.2 When making a judgement as to which type to use, consideration should be given to:

- (a) Internal versus external applications;
- (b) New versus retrofit application; and
- (c) Availability and installation requirements.

F.4.6 Impact of tactile ground surface indicators on other pedestrians

F.4.6.1 A considerable amount of research has taken place to support the dimensional requirement for tactile ground surface indicators. This research has confirmed that the provision of tactile ground surface indicators at a dimensional height of 5 mm is sufficient to impart adequate tactile information whilst at the same time not adversely impacting on other pedestrians. The 5 mm pavement variance is generally accepted to be within the tolerances for pedestrian facilities.

APPENDIX G

**DESIGN GUIDELINES FOR FAMILY-FRIENDLY
FACILITIES****G.1 APPLICATION**

G.1.1 This Appendix contains guidelines for the design of family-friendly facilities or features in buildings. Although it does not form a mandatory part of the Code it is recommended for adoption so as to build a family-friendly environment.

G.1.2 The design guidelines are intended to apply to the following buildings which are places where families are likely to congregate:

- (a) Shopping complexes and supermarkets;
- (b) Places of public resort;
- (c) Sports complexes and public swimming pools;
- (d) Restaurants and eating establishments;
- (e) Markets and hawker or food centres; and
- (f) Transport interchanges and passenger terminals.

G.2 RECOMMENDED FACILITIES

G.2.1 The following are the minimum recommended facilities or features that will satisfactorily serve the needs of families with infants or young children aged 12 years and below:

- (a) Child-friendly sanitary facilities;
- (b) Child protection seat;
- (c) Family room;

- (d) Seating or resting areas;
- (e) Children's activity corner or playroom;
- (f) Locker provision for prams and other heavy belongings;
- (g) Pram and wheelchair rental facility; and
- (h) Flexible arrangement of tables and chairs.

G.3 DESIGN CONSIDERATIONS

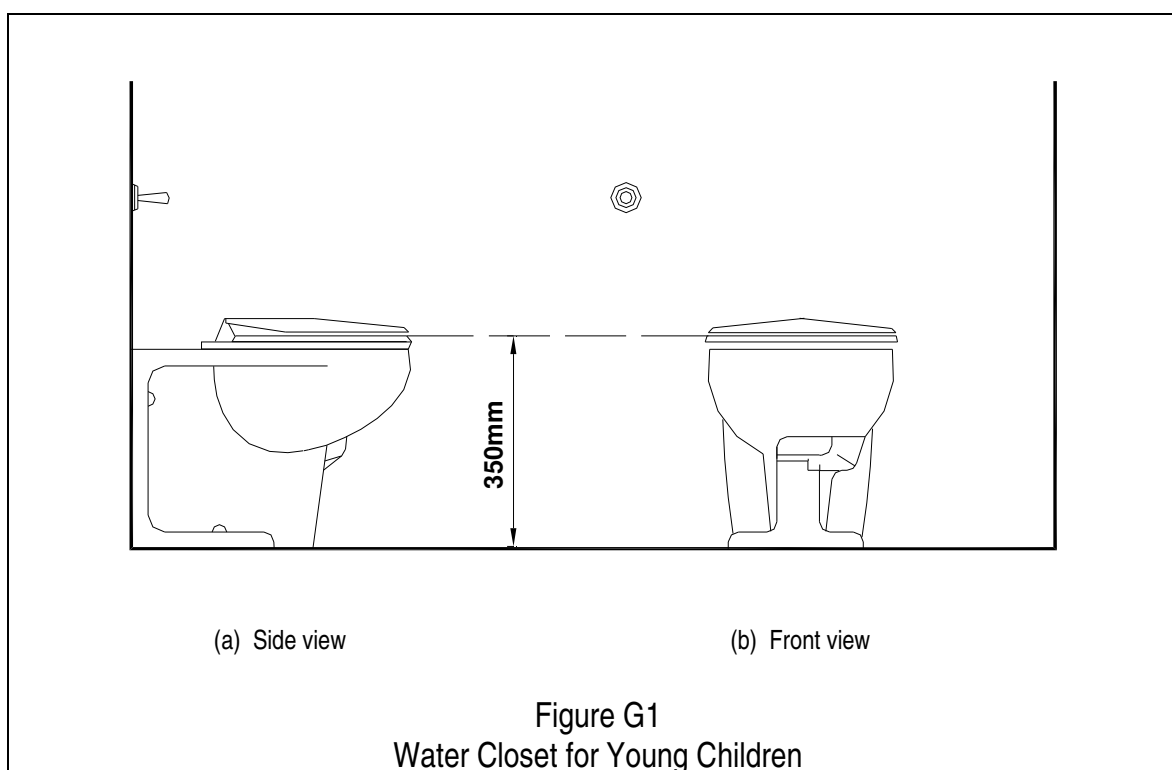
G.3.1 Child-friendly Sanitary Facilities

G.3.1.1 The following sanitary facilities should be provided in the toilets for use by young children:

- (a) at least one water-closet complying with clause G.3.1.2;
- (b) at least one urinal complying with clause G.3.1.3; and
- (c) at least one wash basin complying with clause G.3.1.4.

G.3.1.2 Water closet

G.3.1.2.1 Where a squatting-type water closet is not provided, at least one child-sized pedestal-type water closet, as illustrated in *Figure G1*, should be provided in each of the male and female toilets for young children. The recommended height of the water closet seat to the finished floor level should be 350 mm.

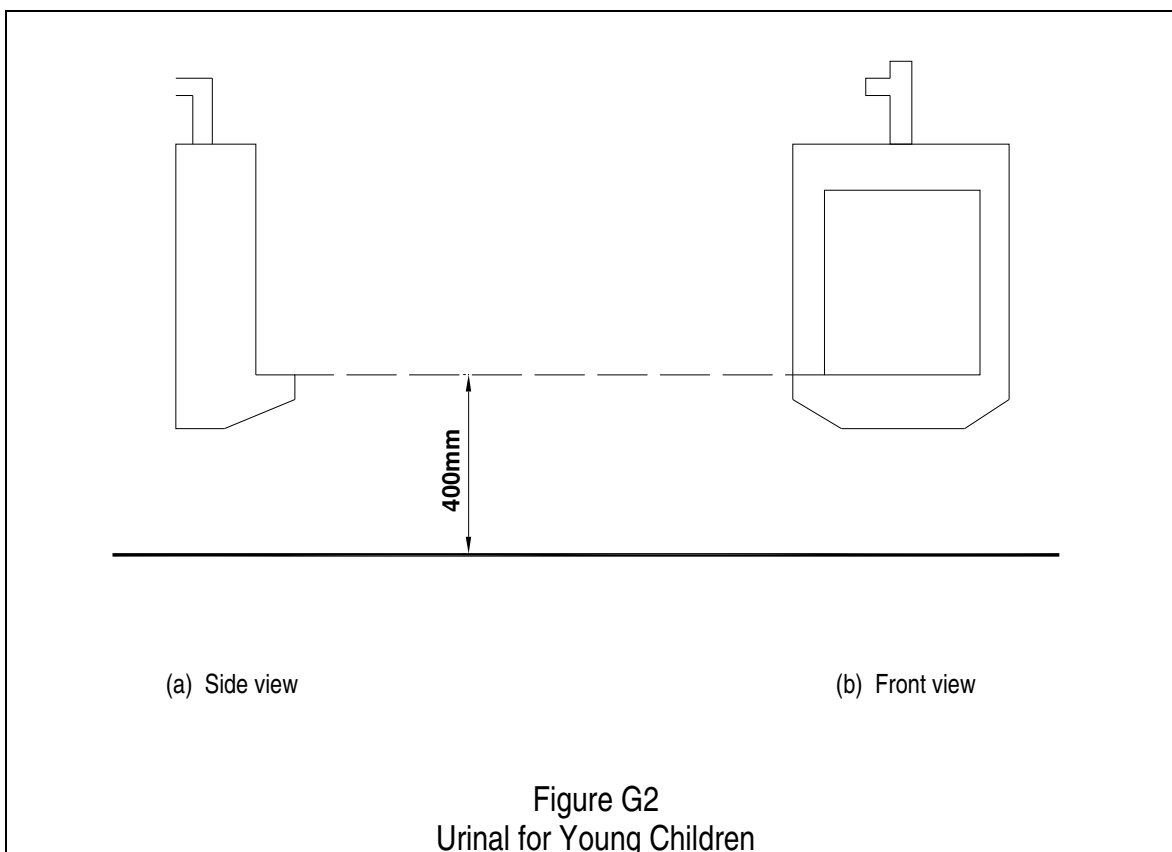


- G.3.1.2.2 Alternatively, a seat adaptor with a small seat cover suitable for use by young children may be provided. The hanger holding the seat cover should be mounted at a level that is easily accessible to young children. A portable and stable stool should also be provided as stepper for young children who may not reach the water closet.
- G.3.1.2.3 Grab bars should be provided on both sides of the water closet to provide support for young children.
- G.3.1.2.4 The water closet compartment should be provided with bath liquid dispenser and a flexible hose with water spray head as some parents or guardians may need to clean their child.

Note: *A child-friendly water closet need not be provided if a water closet for children with disabilities has been provided in accordance with clause E.6 of Appendix E.*

G.3.1.3 Urinal

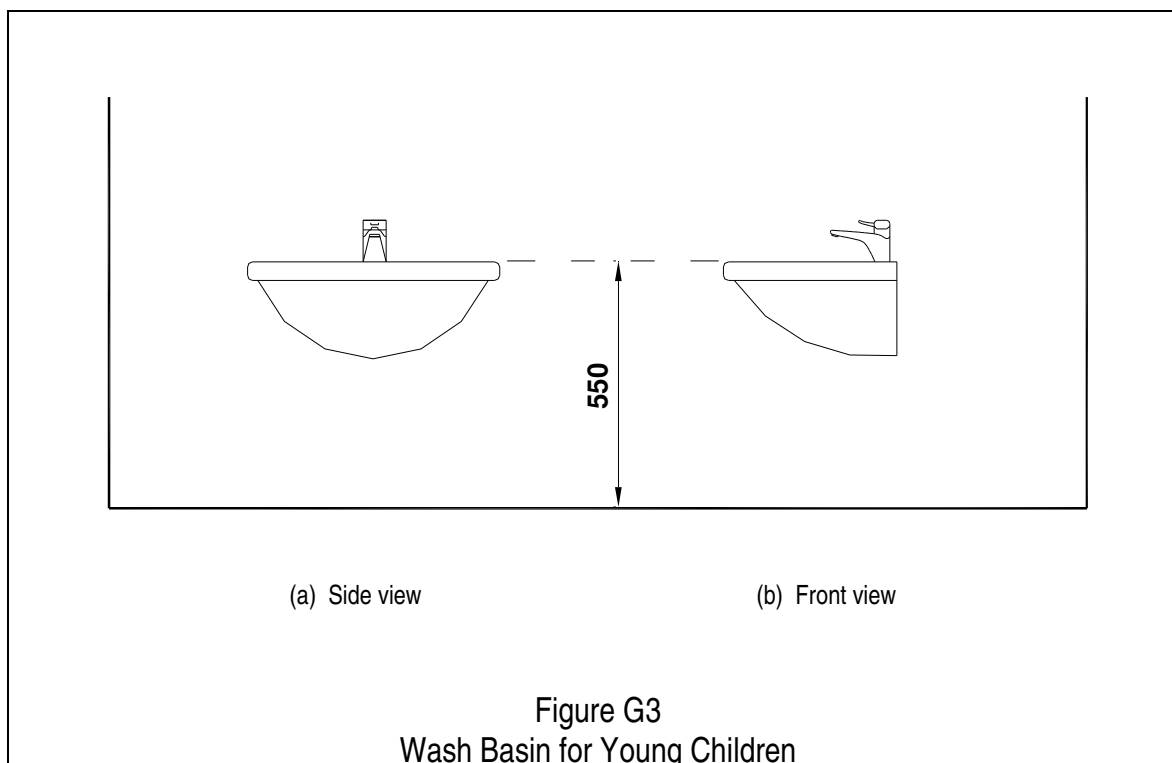
- G.3.1.3.1 At least one urinal mounted at a height of about 400 mm from the finished floor level, as illustrated in *Figure G2*, should be provided in the male toilets for young children.



Note: *Where squatting-type water closet is provided in the male toilet, a urinal for young children may be dispensed with.*

G.3.1.4 Wash basin

- G.3.1.4.1 A child-sized wash basin should be provided to enable young children to wash their hands without assistance. The wash basin should be equipped with a lever type or automatic stop taps. The height of the wash basin should be about 550 mm as illustrated in *Figure G3*.



G.3.1.5 **Floor finish**

- G.3.1.5.1 Toilets or washrooms should be provided with non-slip flooring to ensure the safety of children.

Note: *Information on Slip Resistance of Floor Finishes is given in Appendix B.*

G.3.2 **Child Protection Seat**

- G.3.2.1 A child protection seat, as illustrated in *Figure G4*, should --
- (a) be equipped with straps that can be extended over shoulders and between legs to ensure the safety of a baby; and
 - (b) preferably be mounted on solid wall for stability.

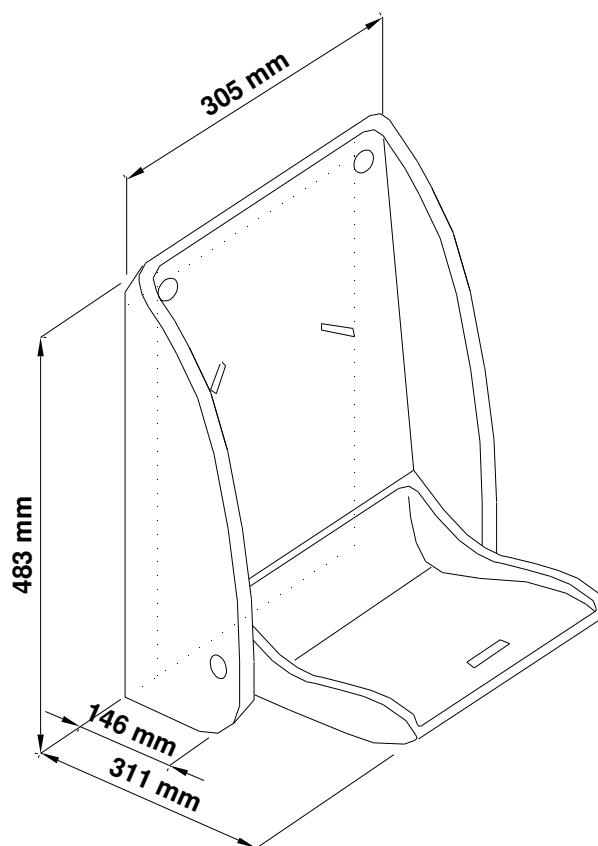
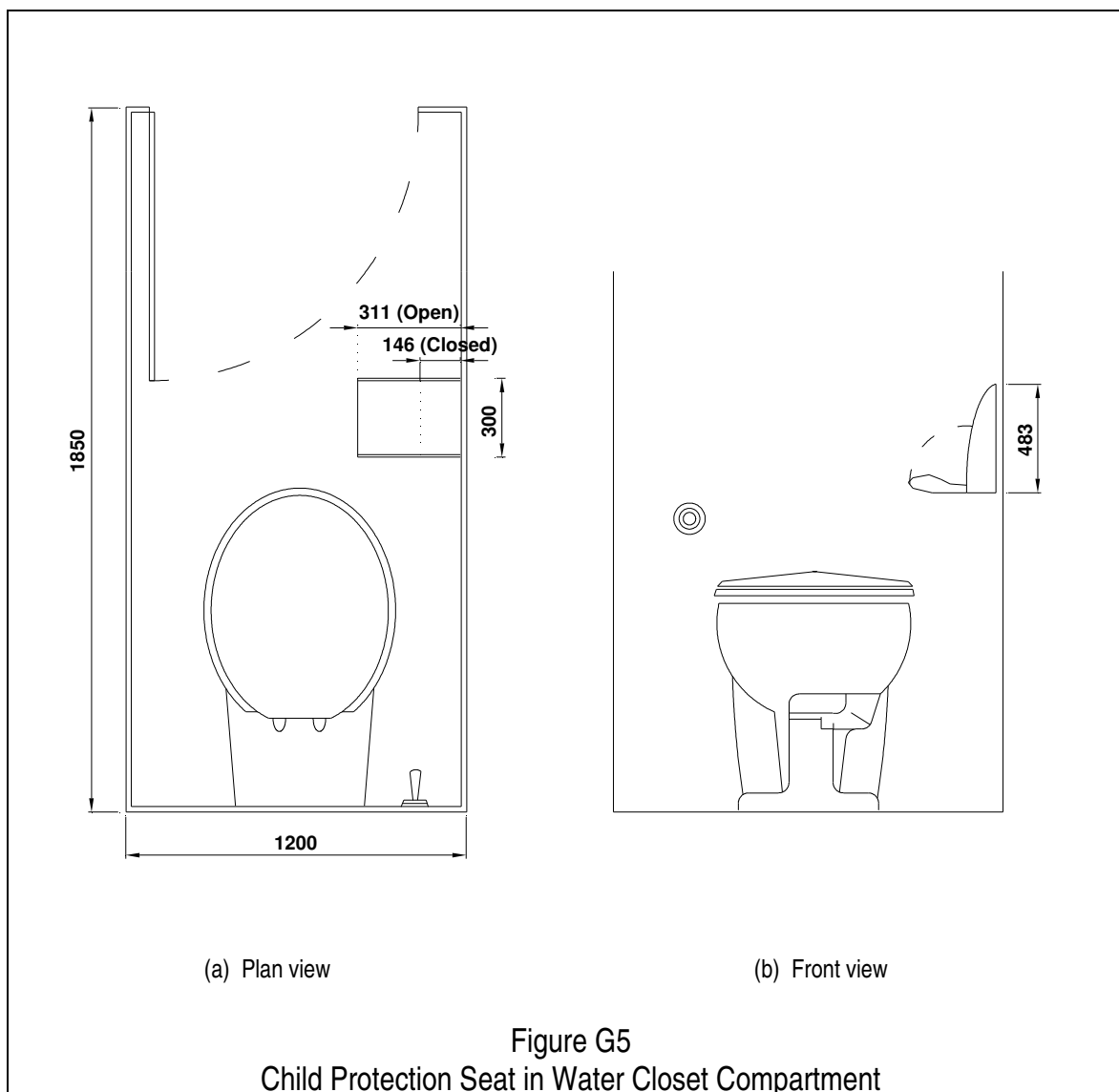


Figure G4
Flap-type Child Protection Seat

- G.3.2.2 A child protection seat should be provided in one of the water closet compartments in both male and female toilets, as shown in *Figure G5*, to allow parents to seat their baby safely in the restroom with them.



G.3.2.3 Alternatively, a child protection seat can be installed in individual washrooms for persons with disabilities, as illustrated in *Figure G6*. A flap-type seat is recommended to avoid causing obstruction to wheelchair users.

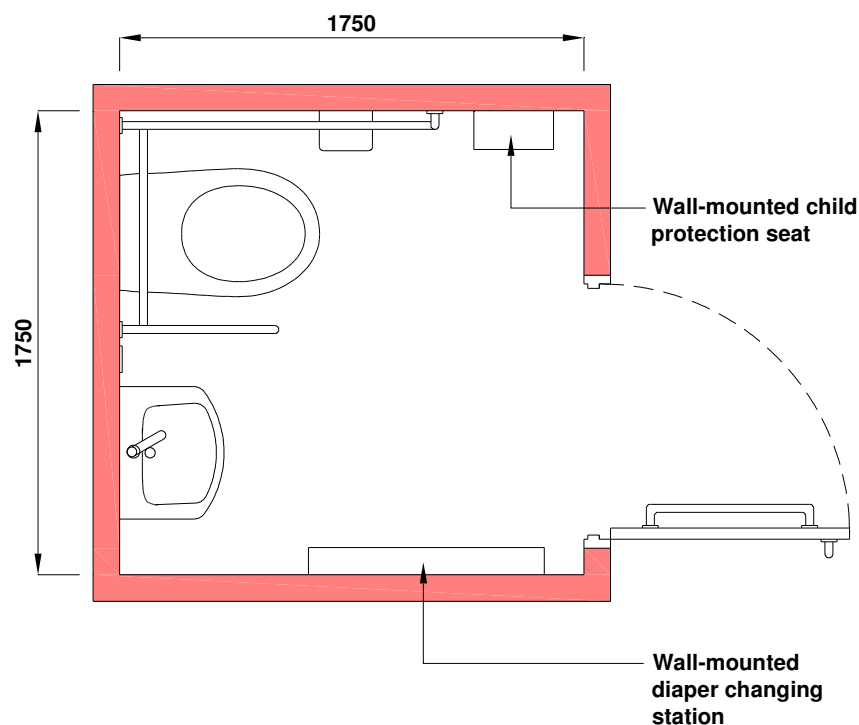


Figure G6
Child Protection Seat and Diaper Changing
Station in Individual Washroom

G.3.3 Family Room

G.3.3.1 At least one family room with breastfeeding and diaper changing facilities should be provided in shopping centres and other recreational or entertainment areas. The family room should preferably be located near toilets and equipped with the following:

- (a) a sink with liquid detergent and paper towels;
- (b) a dispenser for hot and cold water;

- (c) rest area for parents and young children;
- (d) a vending machine for beverage and diaper;
- (e) refrigerator with freezer;
- (f) notice board for messages; and
- (g) magazines for reading.

G.3.3.2 Breastfeeding area

- G.3.3.2.1 A separate breastfeeding room with door-lock is preferred and should be made available to breastfeeding mothers only.
- G.3.3.2.2 Alternatively, an area in the family room separated by curtains should be made available for breastfeeding mothers.
- G.3.3.2.3 Comfortable seating, preferably of the armchair-type, should be provided for the convenience of the mothers.

G.3.3.3 Diaper-changing station

- G.3.3.3.1 Where a family room is not provided, a diaper-changing station should be provided in both the male and female toilets or in individual washrooms for persons with disabilities so that both fathers and mothers can use the facility.
- G.3.3.3.2 The diaper changing station must be stable with safety straps and barriers length-wise to ensure the safety of the infants. If it is to be located in individual washrooms, a flap-type station is recommended to save space and to avoid causing obstruction to wheelchair users.
- G.3.3.3.3 The recommended dimensions of a diaper-changing station, in the closed position, are 889 mm in length by 508 mm in height and 102 mm in thickness as illustrated in *Figure G7*.

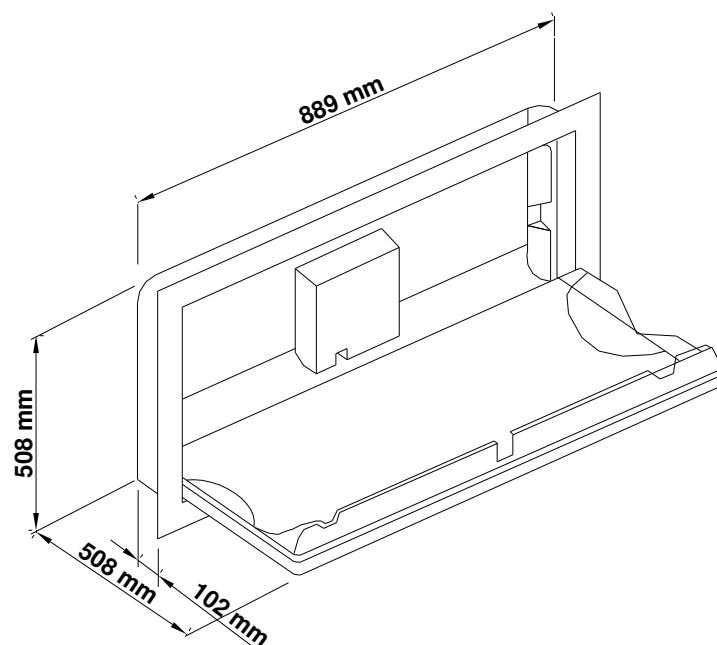


Figure G7
Flap-type Diaper Changing Station

G.3.4 Seating or Resting Area

G.3.4.1 Ample seating or resting areas should be provided in shopping centres and other recreational or entertainment areas for parents and their young children.

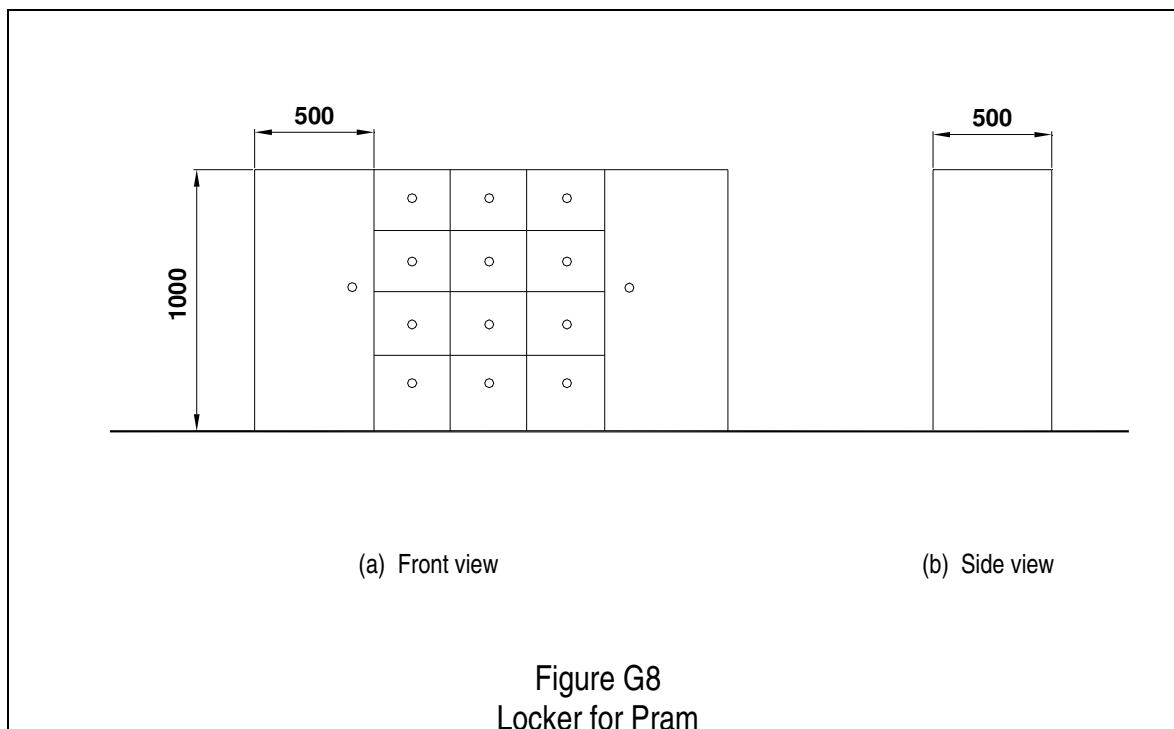
G.3.5 Children's Activity Corner or Playroom

G.3.5.1 Outdoor or indoor play equipment for children of various ages should be provided. The floor surface of the children's play area should be cushioned or shock-proofed to ensure the safety of the children.

G.3.5.2 Ample seats should also be provided near the play equipment for parents supervising their children.

G.3.6 Locker Provision for Pram and other heavy belongings

- G.3.6.1 Pram depository service or lockers big enough to accommodate prams should be provided at the main entrance of shopping centres and other recreational or entertainment areas to allow families to deposit their pram and other heavy belongings. Pram lockers should not be less than 1000 mm in height, 500 mm in width and 500 mm in depth as illustrated in *Figure G8*.



G.3.7 Pram and Wheelchair Rental Facility

- G.3.7.1 Renting of prams and child buggies and wheelchairs in shopping centres, supermarkets or other recreational or entertainment areas should be considered where applicable.

Note: *Provision of prams and child buggies in these areas would help to make it easier for families with infants and young children to move around the premises and provision of wheelchairs would help the elderly and ambulant disabled.*

G.3.8 Flexible Arrangement of Tables and Chairs

G.3.8.1 A variety of table and chair arrangements or flexible arrangement of tables and chairs should be provided in eating outlets or establishments to cater to groups of different sizes.

G.3.8.2 Where fixed seating is provided, adequate space should be provided between the seats to accommodate a baby-chair, similar to the provisions made for wheelchair users as illustrated in *Figure 54* of Chapter 7.

G.3.8.3 Baby-chairs

G.3.8.3.1 Adequate baby chairs with side and backrests, and a safety belt or T-bar should be provided in eating places.

G.3.8.3.2 The baby-chairs should be stable and preferably be portable.

Note: *Family-friendly facilities should be well maintained to ensure that they are clean and hygienic and are safe for young children's use.*

APPENDIX H

DESIGN GUIDELINES FOR PARKS AND OPEN SPACES**H.1 GENERAL**

- H.1.1 Pavements, footways and pedestrian areas should have surfaces that are stable, firm, level, slip-resistant and free from water ponding.
- H.1.2 Routes should be well lit with average 5 lux and clearly defined using texture and visual contrasts.
- H.1.3 All routes used by pedestrians should be at minimum between 1500 mm to 1800 mm. Greater width may be required where there is large pedestrian flow. Where there are obstacles on the route, the minimum width between obstacles should be 1000 mm. All routes should have minimum headroom of 2000 mm.
- H.1.4 Routes should be level. If there is a change in level, the preferred gradient for any ramp is not to exceed 1 : 20. Where the gradient is steeper than 1 : 20, it should be designed as ramped access according to clause 3.3. If steps are necessary to address steep gradient of the route, an alternative accessible ramp should be considered so that facilities could be reached either via steps or ramp depending on the needs of people of varying abilities.
- H.1.5 Where possible, drainage gratings should be located off the accessible routes. Slots in gratings should not be greater than 12 mm wide and placed at right angles to dominant direction of travel. Gaps in paving, if provided, should not exceed 10 mm.

H.2 **GRADUATED DIFFICULTY OF ACCESS**

H.2.1 A system of graduated difficulty of access should be applied in outdoor recreational areas. A wide variety of trail types, each characterized by a degree of difficulty to negotiate should be provided whenever possible. By providing a diversity of trail types (with varying surfaces, widths, slopes, cross-slopes, lengths, edges, number of rest stops, etc.), a wider spectrum of opportunity with diverse experiences can be provided that will accommodate or challenge all people regardless of their abilities.

H.2.2 A good system of signage should enable one to choose for oneself the type of experience or degree of challenge desired. In this regard, it is not necessary that all facilities be totally accessible. Some may be difficult to negotiate even for the fittest individuals. The main objective is to provide greater diversity in trail types, based on an understanding of the wide variation of ability in people. Such a system does not compromise the recreational experience for anyone, and it also has the advantage of not always segregating the able-bodied from those who are not.

H.2.3 However, the guideline that follows describe the standards that applies for the lowest difficulty.

H.2.4 Whenever possible, a park/site/project must provide at least one trail of the lowest difficulty level that traverse the entire park/site/project.

H.2.5 Railing should be mandatory for the trail and lowest difficulty level.

H.3 **OUTDOOR STEPS**

H.3.1 Where steps are provided, it should have a minimum of two steps. Three steps are preferred to ensure clear legibility of the grade change. The length of landing should be at least 1500 mm. Longer landings should be multiples of 1500 mm i.e. 1500, 3000, 4500, etc. The height between landings should be kept to a maximum of 1500 mm to allow a view of the next higher landing.

- H.3.2 The riser and its corresponding tread for outdoor steps are recommended as shown in *Table H1*:

TABLE H1

Risers and Treads

Riser (mm)	Tread (mm)
100	450
120	410
125	400
130	390
135	380
140	370
145	360
150	350

- H.3.3 However, the recommended cut-off riser height for park or open space should be 130mm and below for lowest difficulty level. Riser up to 150mm and above is considered average difficulty level.
- H.3.4 All nosing should be visible with permanent contrasting material to ensure that tread edge is clearly visible in descent.
- H.3.5 Handrails should be provided however short the flight of steps. It should be easy and comfortable to grip. Preferably, it should have a circular section of 35 mm to 45 mm in diameter. The vertical height to the top of the handrail should be between 800 mm and 900 mm measured from the pitch line. Handrails should extend 300 mm beyond the top and bottom steps to allow people especially elderly to steady themselves before ascending or descending the flight of steps.
- H.4 **PARKS FURNITURE**
- H.4.1 All parks furniture along the route when people need them such as seats, dustbins, advertising boards, artworks, etc should be carefully sited to avoid obstruction or hazard to pedestrians.
- H.4.2 Sufficient seats should be provided along pedestrian routes at designated areas. There should be space for wheelchairs or pushchairs alongside the

provided seating. Some seating should have armrests and backrest to give support to people when rising.

H.4.3 In situation where near toilet, amenities area, at end of steps and activity zones such as children playground etc, extra consideration to be exercised on furniture placement to prevent any obstruction or hazards to users.

H.4.4 All parks furniture design should integrate universal and user friendly factor. It should be in light color, ease of maintenance, comfortable and durable. All furniture should be of non-absorptive materials to promote rapid drying and lastly to prevent ponding.

H.5 **ACCESSIBLE PARKING LOT**

H.5.1 Carpark lots for the disabled should be located near to either adequately sheltered information points or pedestrian entrances which allow easy movement for people with disabilities.

H.5.2 Accessible pedestrian entrances should be physically separated from vehicles gaining access.

H.5.3 Where bollards are erected at entrance to the route, it should be provided according to clause 3.7.3.

H.6 **Amenities**

H.6.1 Public toilets should be provided and located near to the main areas of attraction, e.g. BBQ and picnic areas, playground area or other such use. At least one accessible toilet should be made available for wheelchair users.

H.6.2 BBQ and picnic areas, if provided, should be accessible by all people.

H.6.3 Shelters should be provided to protect against the weather. It should be accessible for those with mobility equipment, e.g. pushchairs, wheelchairs, and the like.

COMPOSITION OF THE CODE REVIEW COMMITTEE

The Code Review Committee comprised the following organizations:

1) GOVERNMENT AGENCIES

- a) Building and Construction Authority
- b) Housing and Development Board
- c) Land Transport Authority
- d) National Parks Board
- e) Urban Redevelopment Authority
- f) Ministry of Community Development, Youth and Sports
- g) National Council of Social Services

2) VOLUNTARY WELFARE ORGANIZATIONS

- h) Handicaps Welfare Association
- i) Singapore Association of the Visually Handicapped
- j) The Society for the Physically Disabled
- k) The Singapore Action Group of Elders
- l) Asian Women's Welfare Association

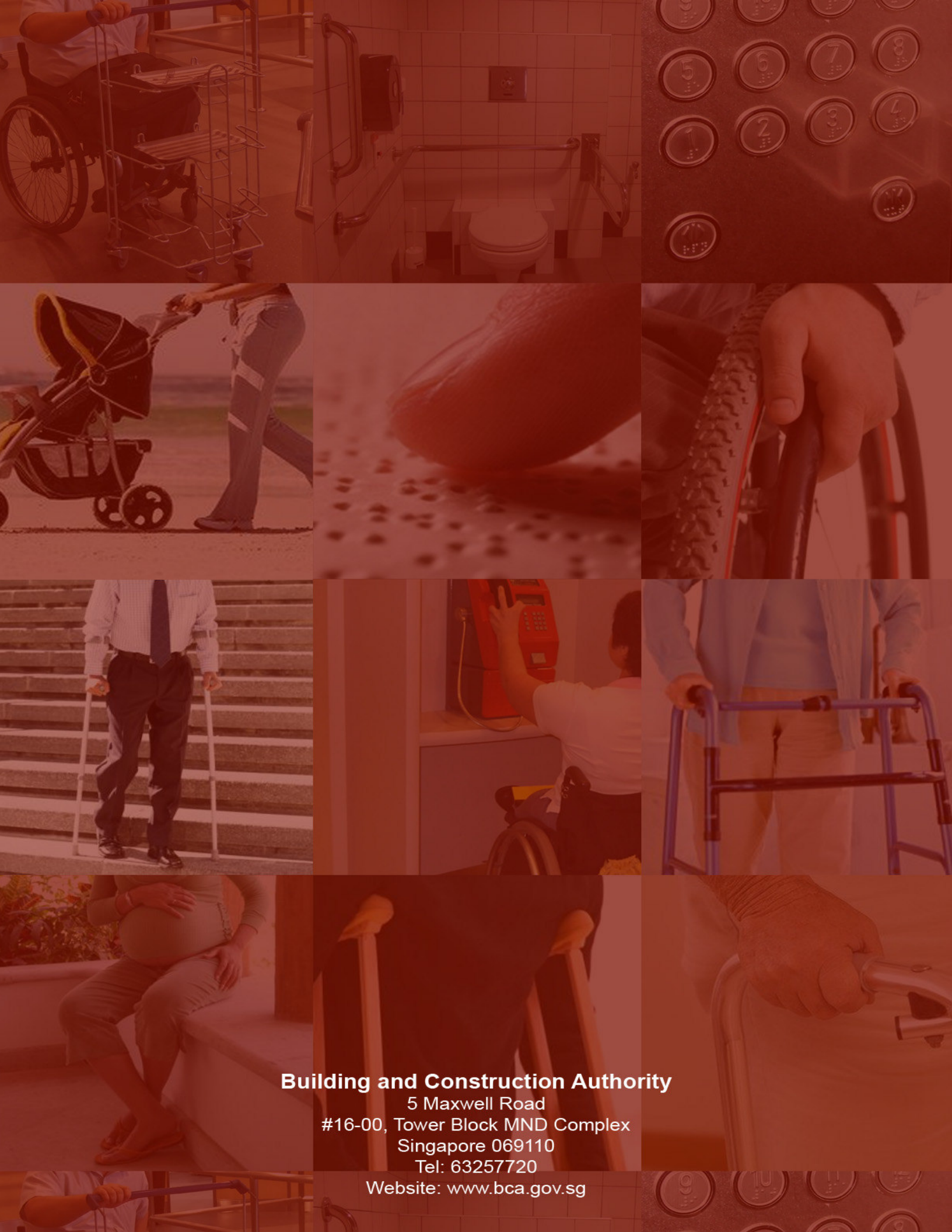
3) INDUSTRY PLAYERS

- m) Singapore Institute of Architects
- n) Singapore Institute of Landscape Architects
- o) Real Estate Developers' Association of Singapore

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- (b) Handicaps Welfare Association and of Asian Women's Welfare Association for the Design Guidelines for Children with Disabilities in Appendix E;
- (c) Singapore Association of the Visually Handicapped for the Design Guidelines for Persons with Visual Impairment in Appendix F;
- (d) Light House International for allowing the diagrams and figures to be published in Appendix F; and
- (e) Family Development Division (Work-Life Unit) of the Ministry of Community Development and Sports and RSP Architects, Planners & Engineers Pte Ltd for the Design Guidelines for Family-Friendly Facilities in Appendix G.



Building and Construction Authority

5 Maxwell Road
#16-00, Tower Block MND Complex
Singapore 069110
Tel: 63257720

Website: www.bca.gov.sg