CAN/CSA-B651-95
Barrier-Free Design

A National Standard of Canada

Please Note: Δ Refers to a formally approved revision dated June 1996

Contents

Technical Committee on Barrier-Free Design

Preface

1. Scope

2. Reference Publications

3. General Requirements
3.1 Space Allowances
3.2 Controls and Operating Mechanisms
3.2.1 Floor Space
3.2.2 Height
3.2.3 Operation
3.2.4 Illumination
3.3 Ground and Floor Surfaces
3.3.1 General
3.3.2 Changes in Level
3.3.3 Carpets
3.3.4 Gratings
3.4 Protruding Objects
3.4.1 General
3.4.2 Detectable Objects Attached to a Wall
3.4.3 Freestanding Objects
3.4.4 Clear Width Maintenance
3.4.5 Headroom

4. Circulation
4.1 Accessible Routes, Paths, or Corridors
4.1.1 Width
4.1.2 Slope
4.2 Doors
4.2.1 Clear Opening
4.2.2 Double-Leaf Doorways
4.2.3 Manoeuvering Space at Doors
4.2.4 Two Doors in Series
4.2.5 Thresholds
4.2.6 Door Hardware
4.2.7 Door-Opening Force
4.2.8 Power-Assisted Swinging Doors
4.3 Ramps
4.3.1 Running Slope and Length
4.3.2 Cross Slope
4.3.3 Width
4.3.4 Landings
4.3.5 Ramp Surfaces
4.3.6 Outdoor Conditions
4.3.7 Edge Protection

4.3.8 Ramp Handrails
4.4 Curb Ramps
4.4.1 Slope
4.4.2 Width
4.4.3 Surfaces
4.4.4 Flared Sides
4.4.5 Location at Pedestrian Crosswalks
4.4.6 Islands
4.5 Stairs
4.5.1 Treads and Risers
4.5.2 Nosings
4.5.3 Detectable Warning Surfaces
4.5.4 Stair Handrails
4.6 Handrails
4.7 Elevator Requirements
4.8 Elevating Devices
4.9 Areas of Refuge

5. Washroom Facilities
5.1 Washroom Identification
5.2 Toilet Stalls
5.2.1 General
5.2.2 Toilet Stall Doors
5.3 Toilets
5.3.1 General
5.3.2 Toilet Location
5.3.3 Toilet Flush Controls
5.3.4 Toilet Grab Bars
5.4 Lavatories
5.4.1 General
5.4.2 Faucets
5.4.3 Lavatory Clearance
5.5 Washroom Accessories
5.5.1 General
5.5.2 Mirrors
5.6 Individual Washrooms
5.6.1 General
5.6.2 Equipment
5.7 Bathtubs
5.7.1 Floor Space
5.7.2 Grab Bars
5.7.3 Controls
5.7.4 Shower Head
5.7.5 Enclosures
5.8 Shower Stalls
5.8.1 Roll-in Shower Stalls
5.8.2 Shower Stalls with Seat
5.8.3 Shower Controls
5.8.4 Shower Heads
5.8.5 Shower Enclosures

5.8.6 Shower Floors
5.9 Grab Bars
5.9.1 Size and Spacing
5.9.2 Structural Strength
5.9.3 Safety
5.10 Drinking Fountains
5.10.1 Spouts
5.10.2 Controls
5.10.3 Floor Space

6. Communications
6.1 Visual Alarms
6.2 Public Telephones
6.2.1 Protruding Parts
6.2.2 Controls
6.2.3 Cord Length
6.2.4 Illumination
6.2.5 Telephones for Persons in Wheelchairs
6.2.6 Telephones for Use by Persons Who Are Deaf or Hard of Hearing
6.2.7 Directional Signs
6.3 Assistive Listening Systems
6.4 Signage
6.4.1 Character Proportion
6.4.2 Contrast
6.4.3 Illumination
6.4.4 Tactile Characters or Symbols
6.4.5 Symbol of Access
6.5 Detectable Warning Surfaces

7. Parking Spaces and Passenger Loading Zones
7.1 Circulation Routes
7.2 Car Parking Spaces
7.3 Van Parking Spaces
7.3.1 Size
7.3.2 Height Clearance
7.4 Signs
7.4.1 Designated Stalls
7.4.2 Vertical Signs
7.4.3 Symbol of Access
7.5 Passenger Loading Zones
7.5.1 Size and Access
7.5.2 Vertical Clearance

8. Seating Spaces
8.1 Seating at Tables and Counters
8.1.1 Clear Floor Space
8.1.2 Clear Knee Space
8.2 Viewing Positions

9. Recreation Facilities
9.1 Benches
9.2 Picnic Tables

10. Residential Units
10.1 Basic Access
10.1.1 Circulation
10.1.2 Controls and Outlets
10.1.3 Windows
10.1.4 Visual Alarms
10.1.5 Bathrooms
10.1.6 Kitchens
10.1.7 Laundry Facilities
10.1.8 Outdoor Living Areas
10.2 Complete Access
10.2.1 General
10.2.2 Elevating Devices
10.2.3 Bathrooms
10.2.4 Kitchens
10.2.5 Miscellaneous Components

Appendices
A—Slip Resistance of Floor Finishes
B—Anthropometrics
C—Elevator Requirements

Index

Technical Committee on Barrier-Free Design

D. Henning	Public Works and Government Services Canada, Ottawa, Ontario	*Chair*
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J. Beattie	The Canadian Hearing Society, Toronto, Ontario	
S. Brink	Canadian Centre for Management Development, Ottawa, Ontario	
W.E. Burningham	Ontario Ministry of Housing, Toronto, Ontario	
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T. Parker	Canada Mortgage and Housing Corporation, Ottawa, Ontario	

L. Pringle	City of Etobicoke, Etobicoke, Ontario	
J. Sanders	The Canadian National Institute for the Blind, Ottawa, Ontario	
R. Thompson	British Columbia Ministry of Municipal Affairs, Victoria, British Columbia	
J. Vasa	School of Rehabilitation Therapy Kingston, Ontario	

Associate Members

E. Boyd	Canadian Paraplegic Association, Ottawa, Ontario	
B. Dion	Betty Dion Enterprises, Ottawa, Ontario	
G. Grey	Public Works and Government Services Canada, Ottawa, Ontario	
W. Hamilton	The Canadian National Institute for the Blind, Ottawa, Ontario	
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C. Stark	Gloucester, Ontario	
C. Zwierzchowski	Public Works Canada, Ottawa, Ontario	
T. Bartoffy	Canadian Standards Association, Etobicoke, Ontario	*Administrator*

Preface

Individuals with disabilities shall be assured access to fundamental elements of daily life that are generally available in the community. Wherever possible the effects of an impairment or disability on an individual's life shall not be determined by environmental factors.

(Principle 5 from the Prime Minister's Declaration on the Decade of Disabled Persons.)

This is the second edition of CSA Standard CAN/CSA-B651, *Barrier-Free Design.* The first edition was published in 1990. The Standard contains requirements for making buildings and other facilities accessible to persons with a wide range of physical and sensory disabilities. It was developed to fulfill an expressed need for a national, technical standard covering a broad range of building and environmental facilities; a standard which could be referenced in whole or in part by a variety of adopting authorities.

It must be understood by the user of this Standard that the requirements contained herein are minimum levels. This Standard does not have the force of law unless mandated by legislation or called up in the regulations of the authority having jurisdiction. The user is advised to contact the local authority having jurisdiction in this area in order to determine to what extent this Standard is referenced.

The requirements result from a consensus of the Committee members who represent a broad spectrum of interests. The members were encouraged and aided by the public comments received as a result of the wide distribution of a draft at the public comment stage.

The format allows for commentary and illustrative information to be distinctly included but clearly separate from the requirements of the Standard. The document is organized by facility type such as circulation or washroom facilities. Clause 10, Residential Units, can be used independently from the remainder of the Standard. Readers are encouraged to read the Scope section before using the document.

CSA hereby recognizes the financial assistance provided by Public Works and Government Services Canada, whose support helped make the development of this Standard possible. *The Handbook of B.C. Building Code,* Section 3.7 and the ANSI Standard A117.1 were used as base references in developing the first edition of this Standard.

This Standard was approved by the CSA Technical Committee on Barrier-Free Design under the jurisdiction of the Steering Committee on Public Safety. It has been approved as a National Standard of Canada by the Standards Council of Canada.

September 1995

Notes:

(1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*

(2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

(3) *This publication was developed by consensus, which is defined by the* CSA Regulations Governing Standardization *as "substantial agreement reached by concerned interests. Consensus includes an attempt to remove all objections and implies much more than the concept of a simple majority, but not necessarily unanimity." It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of the publication.*

(4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*

(5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, Standards Development, 178 Rexdale Boulevard, Etobicoke, Ontario M9W 1R3.*

Requests for interpretation should

(a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;

(b) provide an explanation of circumstances surrounding the actual field condition; and

(c) be phrased where possible to permit a specific "yes" or "no" answer.

Interpretations are published in CSA's periodical Info Update. *For subscription details, write to CSA Sales Promotion,* Info Update, *at the address given above.*

CAN/CSA-B651-95
Barrier-Free Design

1. Scope

1.1
This Standard specifies how to make buildings and other facilities barrier-free and therefore accessible and safely usable by persons with physical or sensory disabilities. The disabilities considered are: mobility impairments such as reliance on crutches or a wheelchair; reaching and manipulation disabilities; hearing impairments; deafness; visual impairment and blindness.

Commentary: Some people with very severe physical disabilities may have requirements beyond the level described in this Standard.

1.2
This Standard describes technical requirements which can be applied to the design and construction of new facilities or modifications to existing facilities. This Standard does not describe the application of technical requirements. The extent to which these requirements will be applied is the responsibility of others such as adopting authorities or specifiers.

1.3
The Standard contains minimum requirements based on adult dimensions. Dimensions are given in SI (metric) units (typically in millimetres) and, where converted from Imperial units, they have been rounded off with respect for critical dimensions.

Commentary: When designing for specific individuals, their particular abilities and preferences should be taken into account. For example, some people prefer to transfer to or from a wheelchair towards their preferred side when using toilet facilities.

If a facility is primarily to serve children, dimensions and other provisions should be adjusted to make them suitable for children.

1.4
Commentaries and diagrams are included for explanatory and illustrative purposes only and are not a mandatory part of the Standard. They are shown in a different colour to distinguish them from requirements. All dimensions on figures are in millimetres. Grab bar dimensions are measured to the centreline.

2. Reference Publication

2.1

CSA Standards
CAN/CSA-B44-94,
Safety Code for Elevators;

CAN/CSA-B355-94,
Lifts for Persons with Physical Disabilities;

CAN/CSA-B613-M87,
Elevating Devices for the Handicapped in Private Residences;

CAN3-T515-M85 (R1992),
Requirements for Handset Telephones Intended for Use by the Hard of Hearing;

CAN/CSA-Z323.4.2-M86,
Wheelchairs—Determination of Overall Dimensions, Mass, and Turning Space;

CAN/CSA-Z323.4.3-M89,
Wheelchairs—Determination of Static Stability;

CAN/CSA-Z323.4.4-M89,
Wheelchairs—Determination of Brake Effectiveness;

CAN/CSA-Z323.4.6-M89,
Wheelchairs—Determination of Maximum Speed, Acceleration, and Retardation of Electric Wheelchairs;

CAN/CSA-Z323.4.7-M89,
Wheelchairs—Determination of Obstacle-Climbing Ability of Electric Wheelchairs.

British Standards
BS5395 Part 1:1977,
Code of Practice for the Design of Straight Stairs.

3. General Requirements

3.1 Space Allowances

The minimum clear floor or ground area required to accommodate a single, stationary wheelchair and occupant shall be 750 x 1200 mm.

Commentary: Figure 1 illustrates the minimum clear floor area for a person in a typical wheelchair. There is a variety of wheelchair sizes, some of which may require an area larger than that shown in this document. Where possible, additional area should be provided to facilitate use by persons who rely on larger wheelchairs.

The minimum clear floor or ground area for wheelchairs may be oriented for forward or parallel approach to an object. Clear floor or ground area for wheelchairs may be part of the knee space where it is provided.

Figure 2 shows the area required for a wheelchair to turn. For additional anthropometric and wheelchair information, see Appendix B.

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Commentary: A 1200 x 1200 mm area would allow access for both forward and side approach.

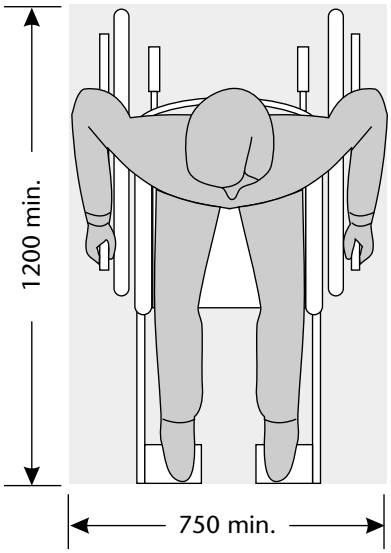

Figure 1
Minimum Clear Floor Area

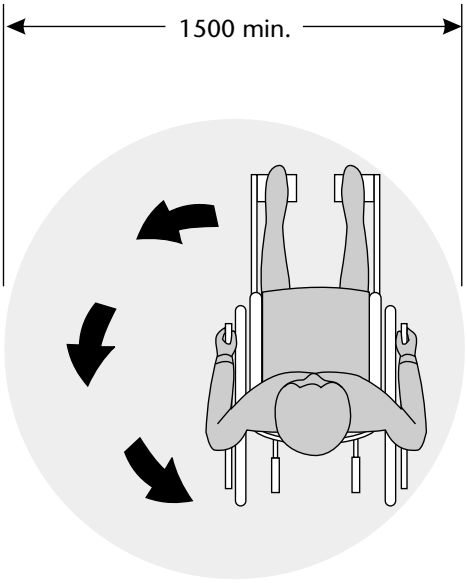

Figure 2
Minimum Clear Turning Space at Toe Level for a Wheelchair to Turn 180°

3.2 Controls and Operating Mechanisms

3.2.1 Floor Space

A clear, level floor area at least 750 x 1200 mm shall be provided at controls and operating mechanisms such as dispensers and receptacles.

3.2.2 Height
The operable parts of controls and operating mechanisms, such as dispensers and receptacles, shall be located between 400 and 1200 mm from the floor (Figure 3).

3.2.3 Operation
Controls and operating mechanisms shall be operable
(a) with one hand;
(b) without tight grasping, pinching, or twisting of the wrist; and
(c) with a force less than 22 N.

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

3.2.4 Illumination
Controls and operating mechanisms shall be capable of being illuminated to at least a level of 100 lx.

Commentary: Automatic controls such as infrared and other electronic devices would facilitate use by persons with severely limiting disabilities.

Operation with one hand is an important requirement for many persons, including amputees, persons who need one hand to steady themselves with a cane, or even persons carrying packages. The requlrement does not preclude several operations, one after the other. The kind of situation to be avoided, for example, is a door lock which must be turned with one hand while the handle is simultaneously turned with the other hand in order to open a door.

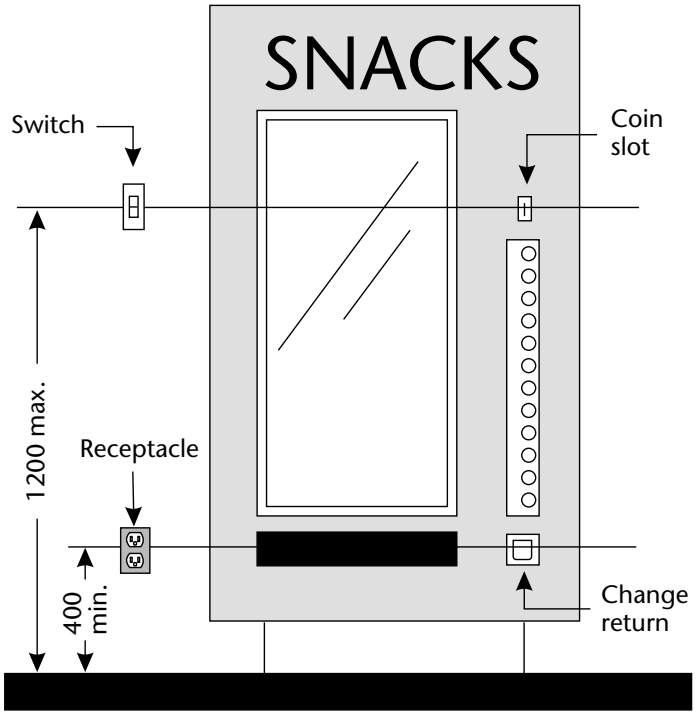

Figure 3
Height of Controls and Operating Mechanisms

3.3 Ground and Floor Surfaces

3.3.1 General

Ground and floor surfaces shall be stable, firm, and slip resistant.

Commentary: Additional information on the slip resistance of various floor surfaces is provided in Appendix A.

Exterior walkways should have a firm surface such as asphalt, concrete, pavers, well-compacted crushed stone, or lumber with the planks across the direction of travel.

Irregular surfaces such as cobblestone and large exposed aggregate paving make walking or wheeling difficult for persons with mobility impairments.

Highly reflective surfaces can result in glare, which is a problem for many persons with visual impairments.

3.3.2 Changes in Level

Changes in level, except for elevators, shall conform to Table 1. (See Clause E2.1 of Appendix C for elevator requirements.)

Table 1
Changes in Level

Vertical rise, mm	Edge treatment
0 to 6	may be vertical
6.1 to 13	bevel, maximum slope 1:2
Over 13	treat as ramp or curb ramp (see Clauses 4.3 and 4.4)

3.3.3 Carpets

Carpets or carpet tile shall

(a) be securely fixed;

(b) have a firm cushion, pad, or backing, where used;

(c) have a level loop, textured loop, level cut pile, or level cut/uncut pile texture with a maximum pad and pile height of 13 mm; and

(d) have exposed edges fastened to floor surfaces with trim conforming to Table 1.

3.3.4 Gratings

Gratings located in walking surfaces shall

(a) have spaces not greater than 13 mm wide in one direction; and

(b) be placed so that the long dimension is across the dominant direction of travel.

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

3.4 Protruding Objects

3.4.1 General

Objects protruding from walls with their leading edges between 680 and 1980 mm from the floor shall protrude not more than 100 mm into pedestrian areas such as walkways, halls, corridors, passageways, or aisles (Figure 4(a)).

Commentary: The requirement to have an area free from obstruction is primarily to aid persons with visual impairments as shown in Figures 4, 5, and 6. Examples of such obstructions are directional signs, tree branches, guy wires, public telephone enclosures, drinking fountains, and the underside of escalators or stairways.

Potentially hazardous objects are noticed only if they are within the detection range of canes. Persons with visual impairments, walking toward an object, can detect an overhang if its lowest surface is less than 680 mm from the floor, but when walking alongside projecting objects, they cannot detect overhangs. Where a person is using a wall or an edge as a guide, a protrusion of not more than 100 mm is acceptable.

3.4.2 Detectable Objects Attached to a Wall

Objects with their leading edges below 680 mm from the floor may protrude any amount (Figure 4(b)).

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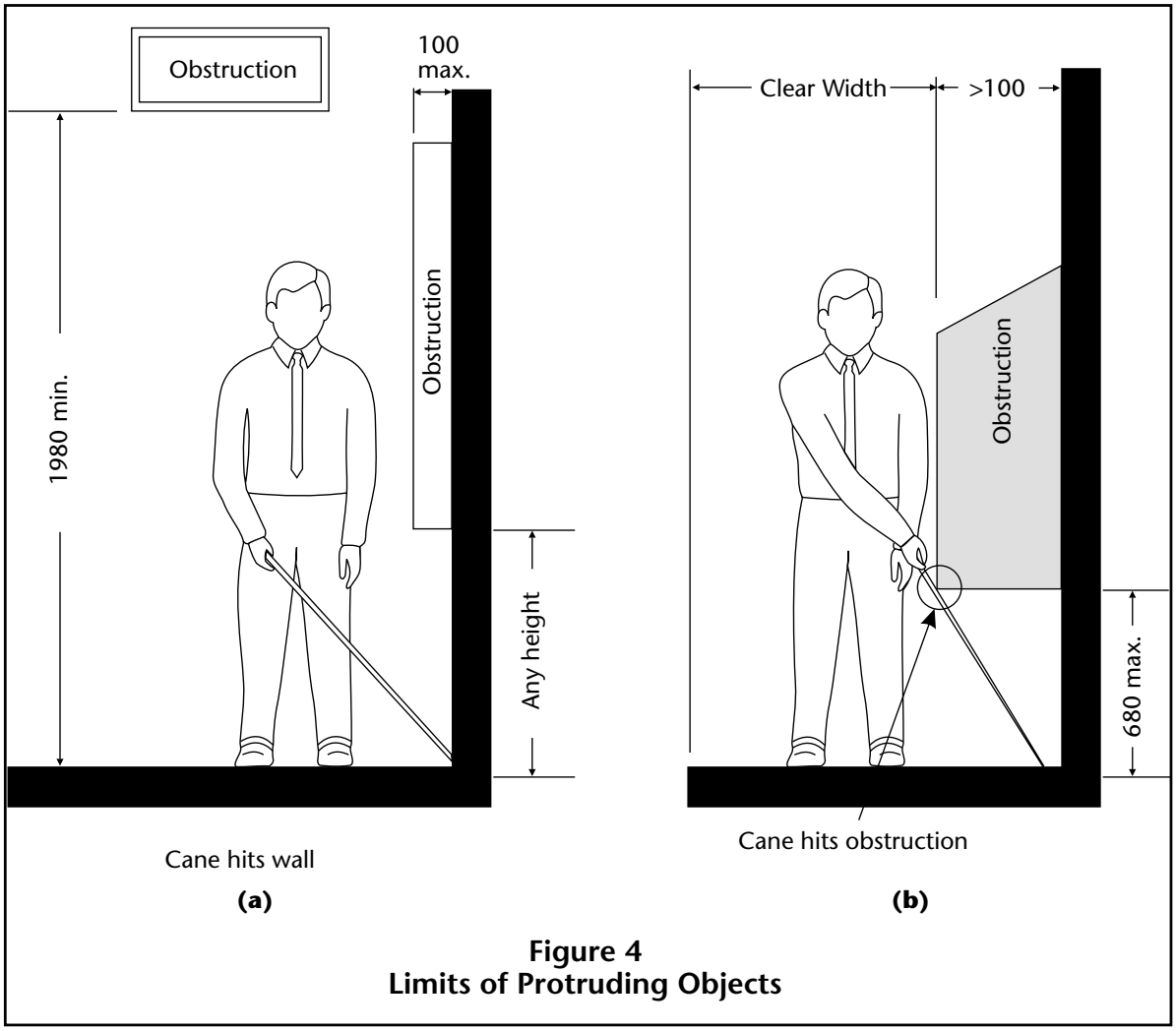


Figure 4
Limits of Protruding Objects

3.4.3 Freestanding Objects

3.4.3.1
Freestanding objects shall not have an overhang of more than 300 mm between 680 and 1980 mm from the ground or floor (Figure 5(a)).

3.4.3.2
The maximum height of the bottom edge of freestanding objects with a space of more than 300 mm between supports shall be 680 mm from the ground or floor (Figure 5(b)).

3.4.4 Clear Width Maintenance

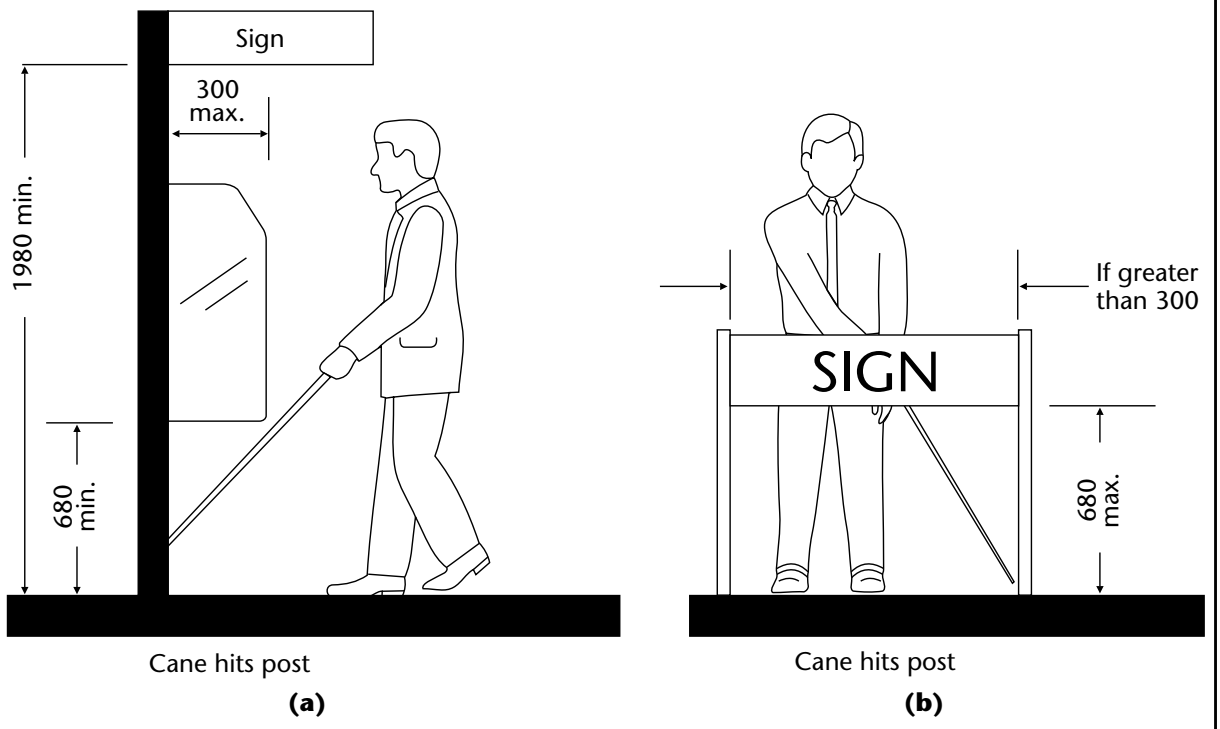


Figure 5
Freestanding Objects Mounted on Posts

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

3.4.5 Headroom

3.4.5.1 General
The minimum clear headroom in pedestrian areas such as walkways, halls, corridors, passageways, or aisles shall be 1980 mm.

3.4.5.2 Detectable Guard
A guardrail or other barrier having its leading edge at or below 680 mm from the floor shall be provided where the headroom of an area adjoining an accessible route is reduced to less than 1980 mm (Figure 6).

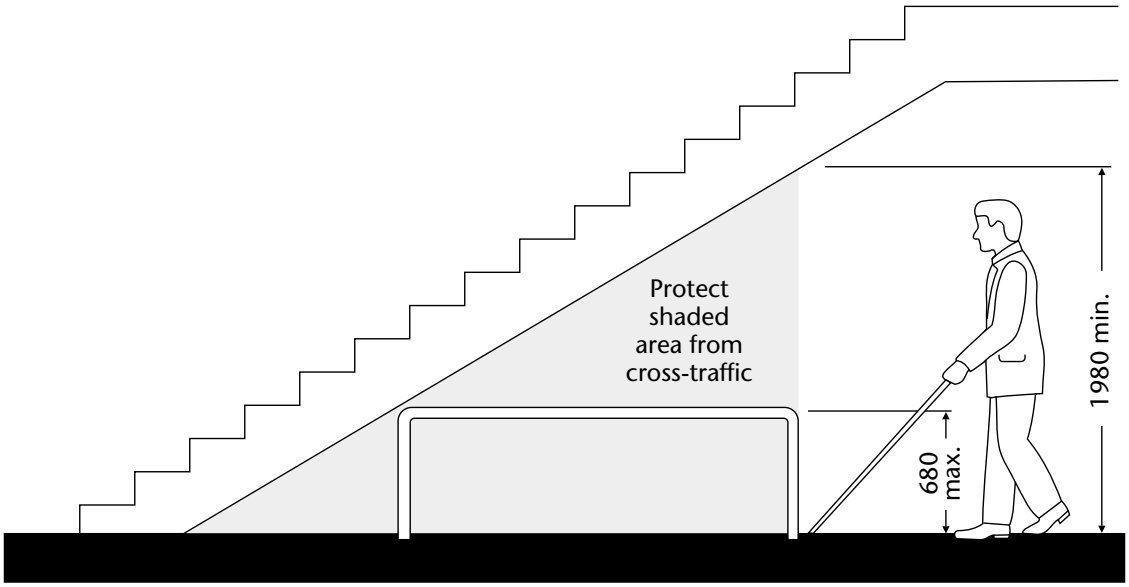


Figure 6
Overhead Hazards

4. Circulation

4.1 Accessible Routes, Paths, or Corridors

4.1.1 Width

The minimum clear width of accessible routes shall be 920 mm (Figures 7(a) and 9), except

(a) for a short indentation up to 600 mm in length, it shall be a minimum of 810 mm (Figure 7(a));
(b) at doors it shall be 810 mm;
(c) where additional manoeuvring space is required at doorways (see Clause 4.2.3);
(d) at U-turns around an obstacle less than 1200 mm wide, it shall be 1100 mm (Figure 10);
(e) for exterior routes, it shall be 1200 mm (Figure 7(b)); or
(f) where space is required for two wheelchairs to pass, it shall be 1500 mm (Figure 7(c)).

Commentary: Although the minimum acceptable width is 920 mm, wider routes allow for easier circulation. The minimum width recommended for checkout lanes is 920 mm (Figure 8).

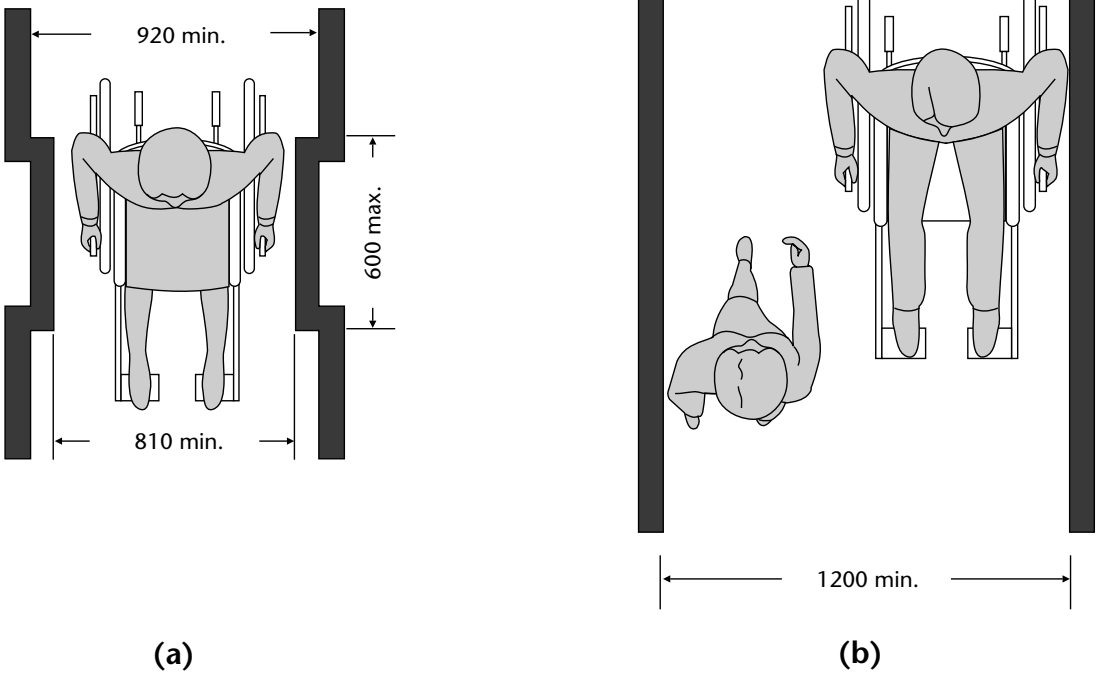
4.1.2 Slope

Accessible routes shall

(a) have a running slope not steeper than 1:20;
(b) have a cross slope not steeper than 1:50; or
(c) be designed as a ramp complying with Clause 4.3 if the slope is steeper than 1:20.

Commentary: Long paths of travel should be avoided, and resting areas should be provided at frequent intervals (approximately 30 m).

Where possible, exterior walkways should be protected from the elements.



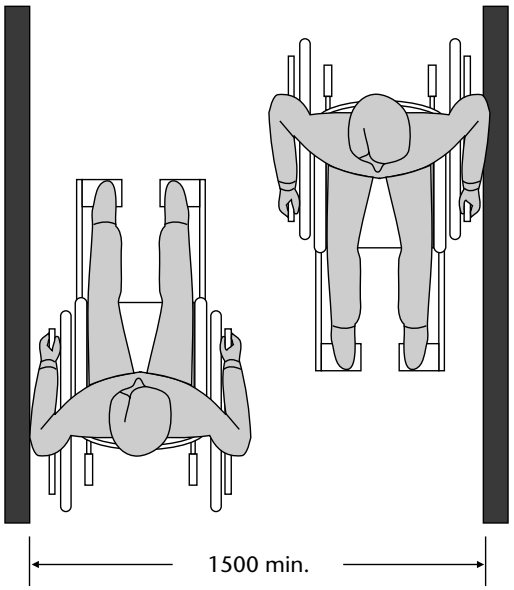


Figure 7
Width of Accessible Routes

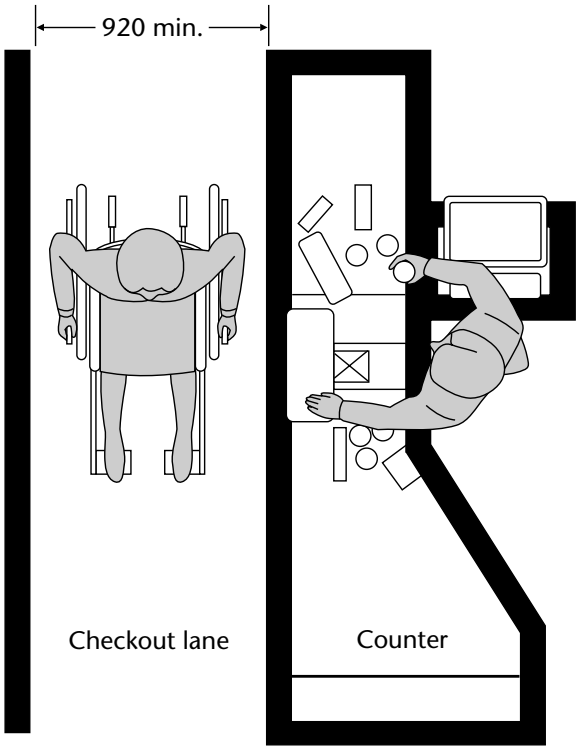


Figure 8
Width of Accessible Checkout Lanes

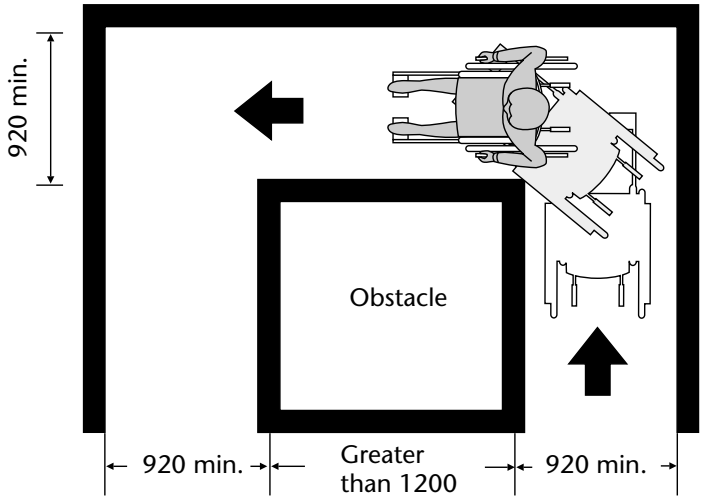


Figure 9
Width of Accessible Route for a 90° Wheelchair Turn, and a Turn Around an Obstacle

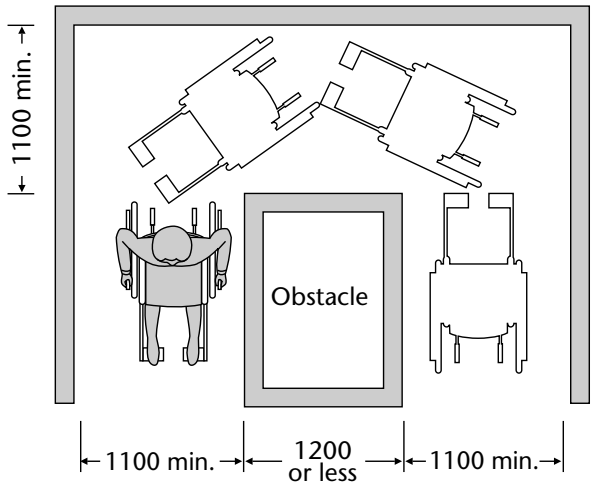


Figure 10
Width of Accessible Route for a Turn Around an Obstacle That is Less Than 1200 mm Wide

4.2 Doors

4.2.1 Clear Opening

The minimum clear opening of doorways shall be 810 mm measured between the face of the door and the stop with the door open 90° (Figure 11(a)).

Commentary: In existing buildings, swing-clear hinges can be used to increase the clear opening without changing the frame (Figure 11(b)).

Panic hardware that does not interfere with passage through a doorway is available and should be used wherever possible.

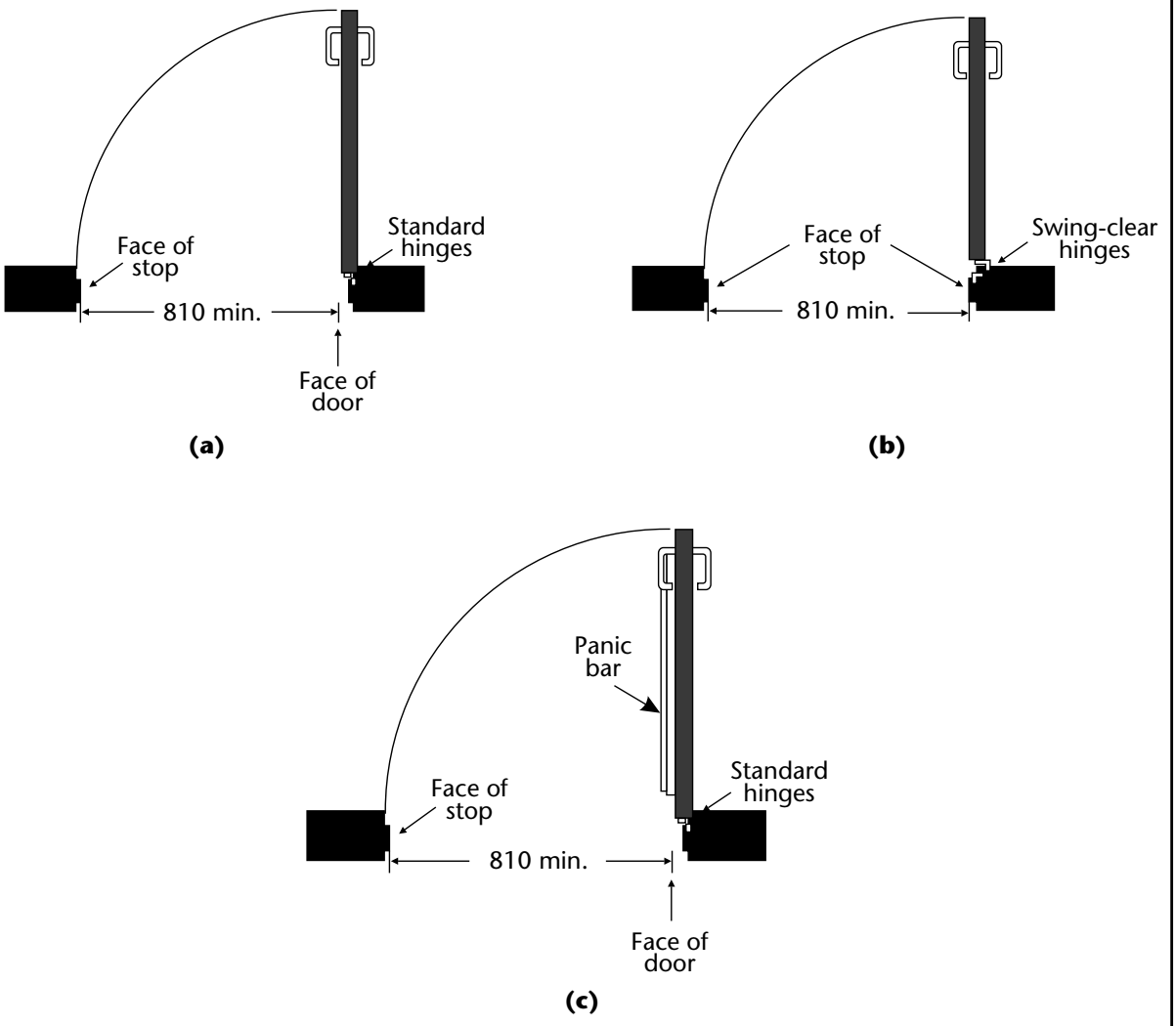


Figure 11
Clear Opening of Doorway

4.2.2 Double-Leaf Doorways

If doorways have two independently operated door leaves, at least one active leaf shall comply with Clauses 4.2.1 and 4.2.3.

4.2.3 Manoeuvring Space at Doors

Doorways shall have wheelchair manoeuvring space on both sides of the door, and a clear space beside the latch as described in Table 2, except where access is only required from one side, such as to a closet (Figure 12.)

Table 2
Manoeuvring Space at Doors, mm

Context	Floor space required		Space beside latch
	Depth	Width	
Side hinged door			
Front approach (Figure 12 (a))			
Pull side	1500	1500	600
Push side	1200	1200	300
Latch side approach (Figure 12 (b))			
Pull side	1200	1500	600
Push side	1050	1500	600
Hinge side approach (Figure 12(c))			
Pull side	1500	1500	6000
Push side	1050	1350	450
Sliding door			
Front approach	1200	900	50
Side approach	1050	1350	540

Commentary: Where a door leads to a ramp landing, additional space may be required (Clause 4.3.3).

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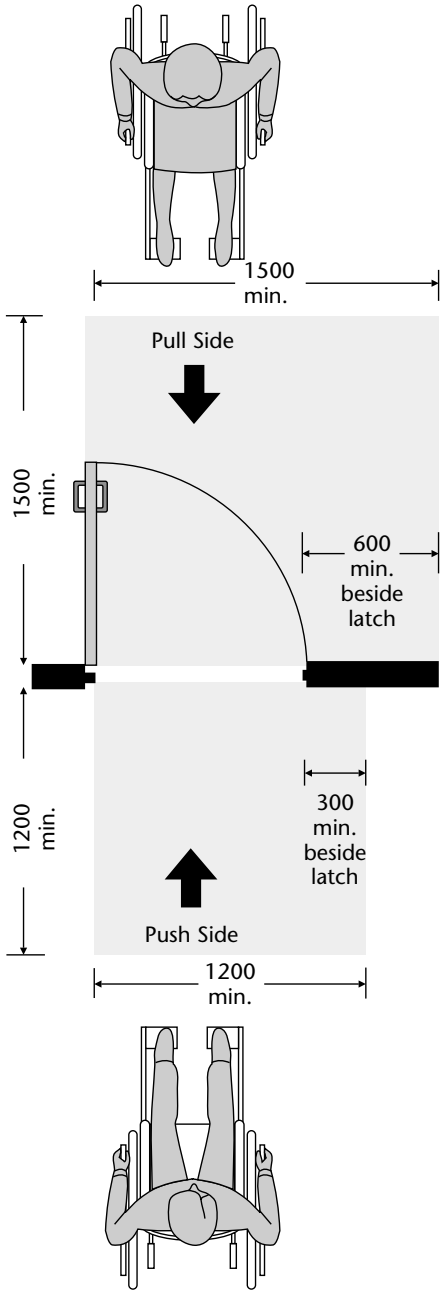

(a) Front approach at hinged door

Figure 12
Minimum Doorway Manoeuvring Space

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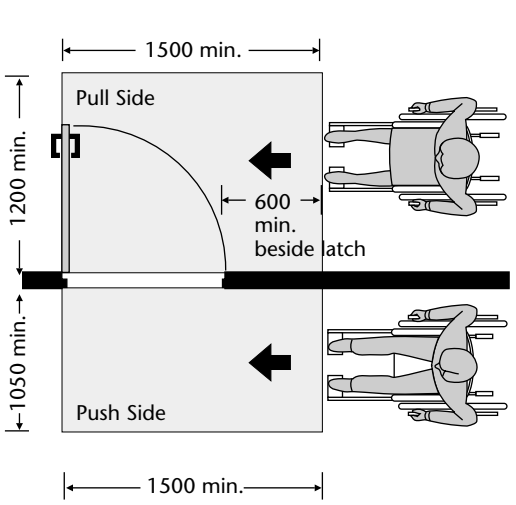
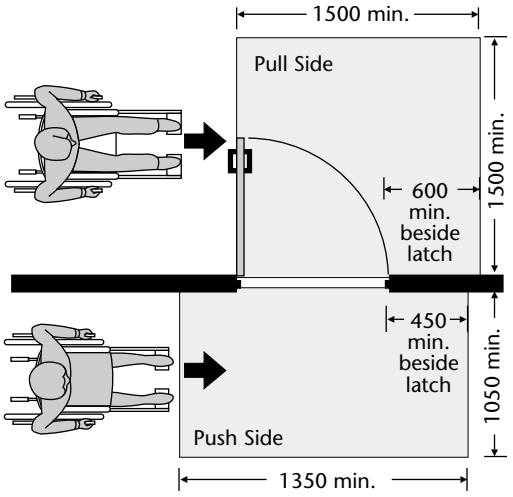
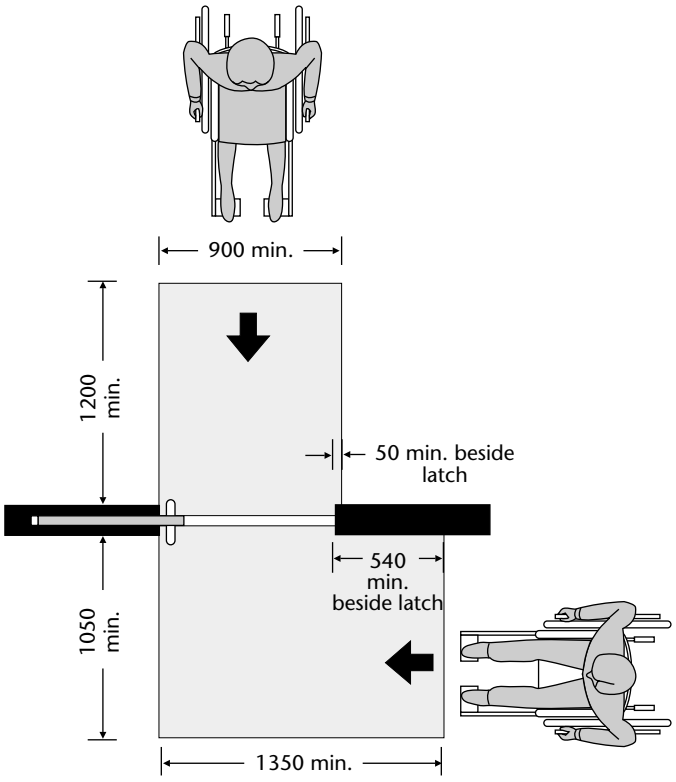


(b) Latch side approach at hinged door



(c) Hinge side approach at hinged door

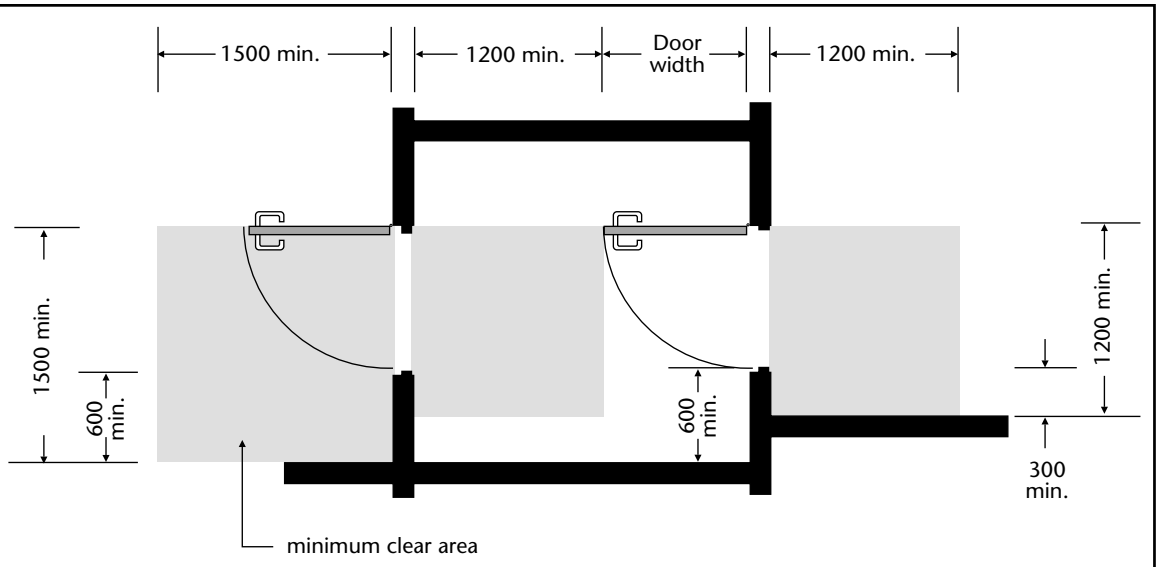


(d) Front and side approach at sliding door

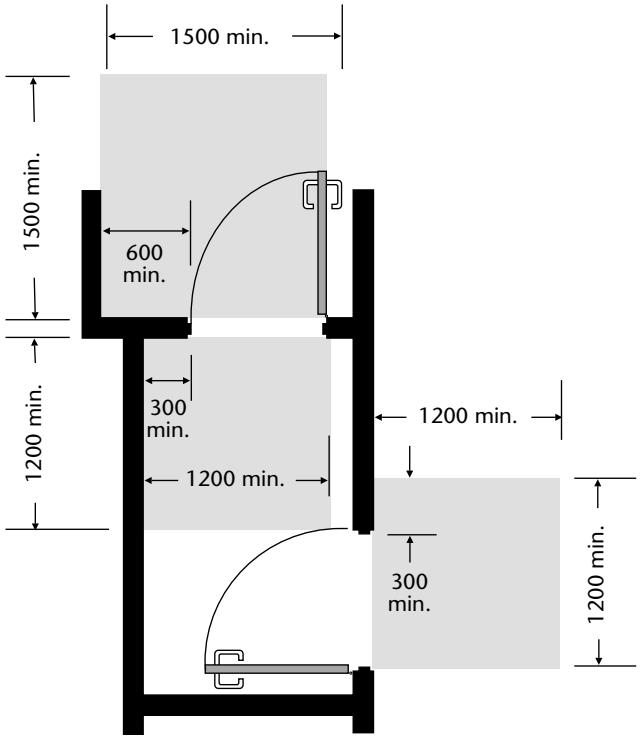
Figure 12 *(Concluded)*

4.2.4 Two Doors in Series

The minimum space between two hinged or pivoted doors in series shall be 1200 mm plus the width of any door swinging into the space (Figure 13).



(a)



(b)

Figure 13
Manoeuvring Space at Doors in Series

4.2.5 Thresholds

Thresholds shall

(a) be not more than 13 mm high;
(b) at exterior sliding doors be not more than 19 mm high; and
(c) where over 6 mm high, be bevelled at a maximum slope of 1:2.

Commentary: Where possible, thresholds should be avoided. They are a hazard to ambulant persons with disabilities and a particular inconvenience to persons in wheelchairs.

4.2.6 Door Hardware

4.2.6.1 General

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 between 400 and 1200 mm from the floor.

Commentary: Panic hardware that does not interfere with passage through a doorway is available and should be used where possible.

Knob handles do not provide for an adequate grip by persons with impaired hand functions. Lever handles should be used on latched doors. "U" shaped door handles (Figure 14) reduce the risk of catching clothing on or injury from the exposed lever end. Push-pull mechanisms which do not require grasping are also easy to use.

Kickplates 250 mm high on doors should be considered in high use areas to protect the push side of doors from damage caused by wheelchair footrests and to make it easier for persons in wheelchairs to open doors.

If transparent glazing is incorporated in a door, it should extend low enough (900 to 1000 mm above the floor) to permit a person in a wheelchair to see and be seen (Figure 15).

Door hardware should contrast with the colour of its background.

4.2.6.2 Sliding Doors

Operating hardware shall be exposed and usable from both sides when sliding doors are fully open.

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

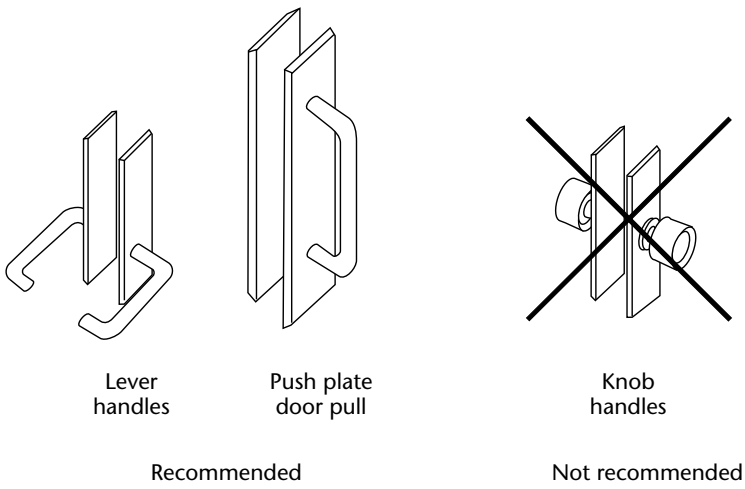


Figure 14
Handles

4.2.6.3 Door Closers

The s weep period of door closers shall be adjusted so that from an open position of 90º, the door will take not less than 3 s to move to a semiclosed position of approximately 12º.

Commentary: In some circumstances, closers with a delay feature that keeps the door open for several seconds before it begins to close might be desirable. However, closers with this feature have limited back-check, a feature of a normal door closer where resistance to opening increases as the door reaches the full arc of swing. Doors equipped with this type of closer are therefore more susceptible to damage should the door be opened with too much force or should someone try to force it closed, thinking the closer has failed to operate. Delayed action closers are not recommended for occupancies such as schools.

4.2.7 Door-Opening Force

The maximum force for pushing or pulling open a door shall be
(a) 38 N for exterior hinged doors;
(b) 22 N for interior hinged doors; and
(c) 22 N for sliding or folding doors.

Commentary: These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.

4.2.8 Power-Assisted Swinging Doors

Power-assisted swinging doors shall
(a) take not less than 3 s 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.

Commentary: At least one power-assisted or automatic door should be provided at the main entrance(s) to a building since exterior doors may not meet the force requirements of Clause 4.2.7 and still operate satisfactorily.

Where doors swing into a path of travel, it is desirable to have guardrails provided at a cane-detectable height extending at right angles to the wall containing the door (Figure 15).

Sliding automatic doors do not need guardrails for protection and are more convenient for persons in wheelchairs and visually impaired persons.

Some large revolving doors can accommodate persons using wheelchairs or crutches.

Turnstiles cannot be used by persons in wheelchairs and can be hazardous to ambulant persons who use crutches or canes. An accessible gate with a clear width of 810 mm should be provided beside a turnstile (Figure 16).

Buttons or pads to open automatic doors must be well located, visible, and easily operable. The best location is determined by ensuring that the button or pad is
(a) seen clearly before reaching the door;
(b) at a height that can be operated from a standing or seated position; and
(c) well clear of the door swing and any other fixtures. Visibility is enhanced by size, colour contrast, and lighting. Buttons or pads are easily operable when they
(i) are operated by touch on any part of its surface;
(ii) require little force to activate the door; and
(iii) do not require finger movement but can be opened by touching with a closed hand or arm.

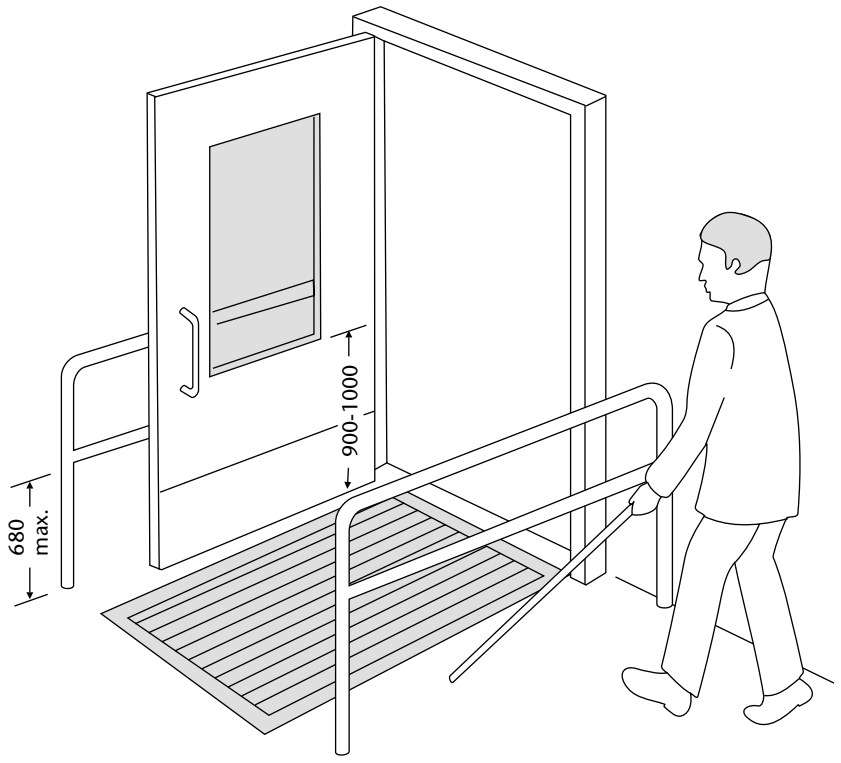


Figure 15
Guards at Out-Swinging Automatic Doors

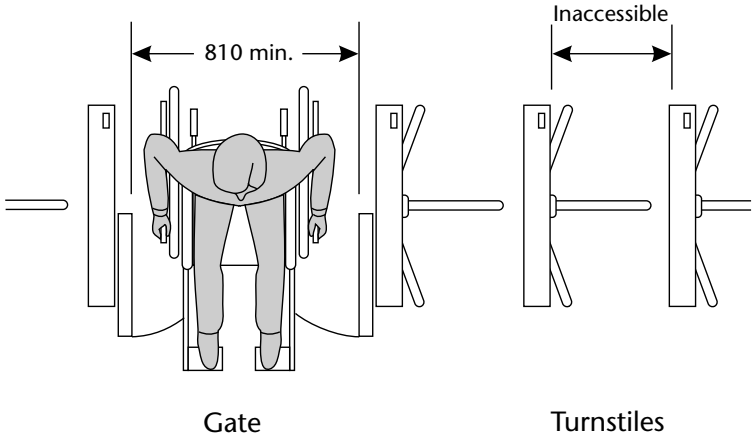


Figure 16
Access Beside Turnstiles

4.3 Ramps

4.3.1 Running Slope and Length

The slope shall not be steeper than 1:12 (8.33%) and the maximum horizontal length between landings shall not exceed 9 m.

4.3.2 Cross Slope

The maximum cross slope of ramp surfaces shall be 1:50.

Commentary: Ramps allow persons in wheelchairs to move from one level to another. However, many ambulatory persons with disabilities negotiate steps more easily and safely; thus, accessibility by both steps and ramps is preferred.

The slope should be as gentle as possible. The steeper the ramp, the more likely it is that persons in wheelchairs will require some form of assistance. Most persons can manage a slope of 1:15 to 1:20. Where there is a large change of elevation which requires multiple ramp and landing combinations, other solutions should be considered.

A walkway with a slope gentler than 1:20 is not considered a ramp and may be any length.

For curb ramps, see Clause 4.4

4.3.3 Width

The minimum width of a ramp between handrails shall be 920 mm.

4.3.4 Landings

4.3.4.1

Ramps shall have level landings at the top and bottom of each run and also where the ramp changes direction (Figure 17).

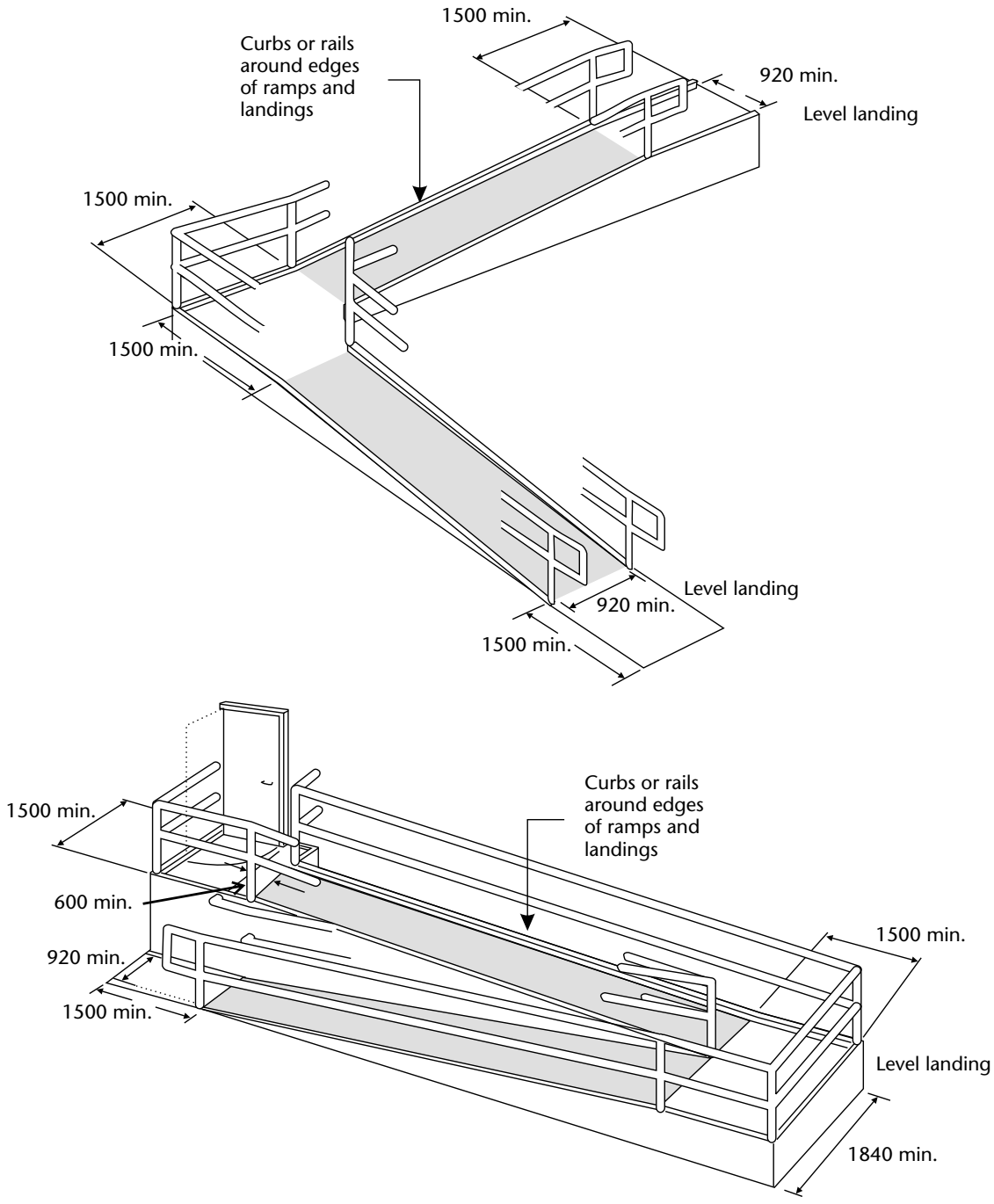


Figure 17
Ramps and Landings

4.3.4.2

The landing shall

(a) be at least as wide as the widest ramp run leading to it;
(b) have a length not less than 1500 mm; and
(c) have a minimum size not less than 1500 1500 mm if served by a doorway.

Commentary: Doorways at landings need sufficient manoeuvring space at the latch side of the door (Figure 17).

4.3.5 Ramp Surfaces

Ramp and landing surfaces shall be slip resistant. (See Appendix A for additional guidance on slip resistance.)

4.3.6 Outdoor Conditions

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

Commentary: Consideration should be given to protecting ramps from rain, snow, and ice. Handrails should be provided on both sides of the ramp.

4.3.7 Edge Protection

Ramps and landings not at grade or adjacent to a wall shall have edge protection such as a

(a) curb with a minimum height of 75 mm (Figure 18(a));

(b) raised barrier with its lower edge not more than 75 mm from the ramp or landing surface (Figure 18(b)); or

(c) rail with the bottom edge not more than 75 mm from the ramp or landing surface (Figure 18(c)).

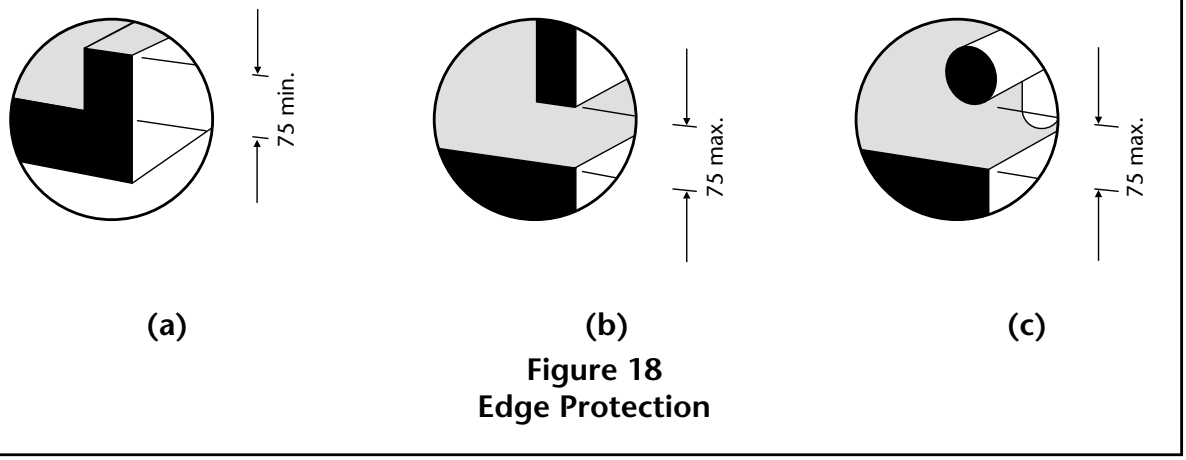


Figure 18
Edge Protection

4.3.8 Ramp Handrails

A ramp run with a rise greater than 150 mm shall have handrails which

(a) are on both sides;

(b) comply with Clause 4.6;

(c) are continuous on the inside of switchback or dogleg ramps;

(d) when not continuous, extend horizontally at least 300 mm beyond the top and bottom of the ramp and return to the wall, floor, or post (Figure 19);
(e) have their tops between 800 and 920 mm from the ramp surface; and
(f) have a distance between handrails of 920 to 1000 mm.

Commentary: Handrail extensions at the top and bottom of ramps provide tactile cues for persons with visual impairments and provide support for persons who need help to negotiate ramps.

Handrail extensions should not project into another path of travel, and handrails should return to the wall, floor, or post so as not to constitute a hazard to pedestrians.

In order to provide a means for wheelchair users to pull themselves up the ramp using both handrails, the distance between handrails needs to be limited as in Clause 4.3.8 (f).

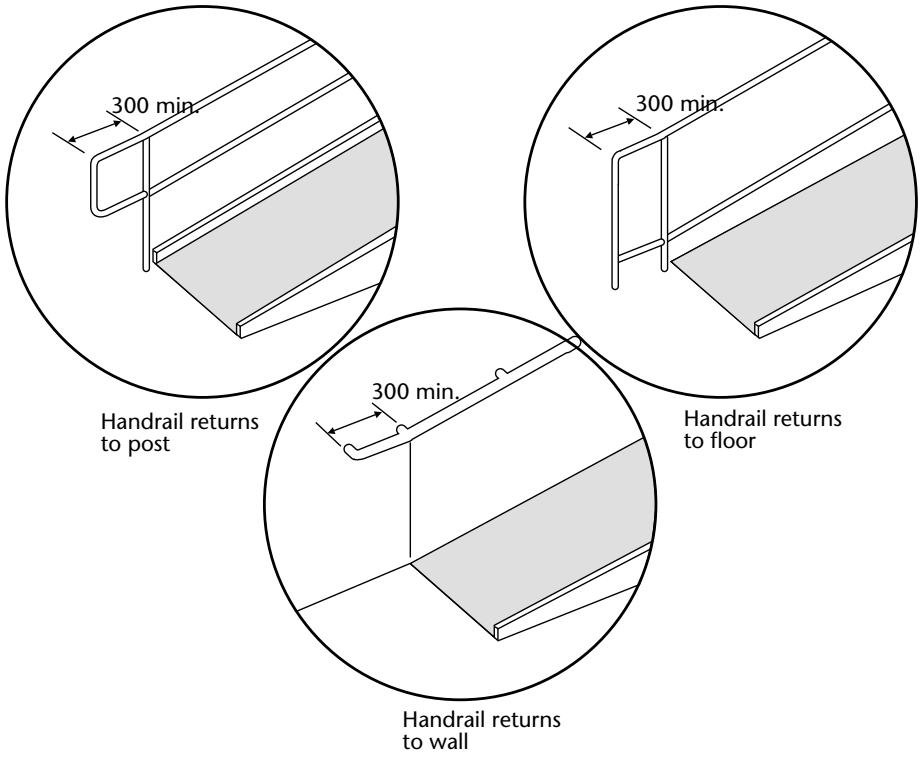


Figure 19
Handrail Extensions

4.4 Curb Ramps

4.4.1 Slope

4.4.1.1

The maximum running slope shall conform to Table 3, and the maximum horizontal length shall not exceed 2 m.

Table 3
Curb Ramp Rise and Slope

Maximum vertical rise between landings, mm	Slope
150	1:10.1 to 1:12
75	1.8 to 1:10

4.4.1.2
The maximum counterslope of gutters and road surfaces immediately adjacent to curb ramps shall be 1:20.

4.4.2 Width
The minimum width of curb ramps, exclusive of flared sides, shall be
(a) 920 mm; or
(b) 1200 mm where exposed to snow.

4.4.3 Surfaces
Surfaces of curb ramps shall
(a) be slip resistant;
(b) have a detectable warning surface that is colour- and texture-contrasted with the adjacent surfaces; and
(c) have a smooth transition from the ramp and adjacent surfaces.

4.4.4 Flared Sides

4.4.4.1
Curb ramps shall have flared sides where pedestrians are likely to walk across them.

4.4.4.2
The maximum slope of flared sides shall be 1:10 (Figure 20).

4.4.5 Location at Pedestrian Crosswalks
Curb ramps at pedestrian crosswalks shall be wholly contained within the area designated for pedestrian use (Figure 22).

Commentary: Curb ramps do not require handrails.

Curb ramps should be as gradual as possible and should not project onto a road surface unless there is little or no vehicular traffic. It is desirable to have a level walking space 920 mm wide at the top of the ramp so pedestrians can avoid the ramp (Figure 20).

Curb ramps with returned curbs are an alternative approach which can be used where pedestrians would not be expected to walk across the ramp (Figure 21). Curb ramps should be located where they will not be blocked by parked vehicles.

Built-up curb ramps projecting into the roadway are not recommended because they are dangerous to users and obstructive to vehicles.

A textured surface will assist in giving a secure foothold to ambulant persons. A detectable surface with a change in plane will assist persons with visual impairments.

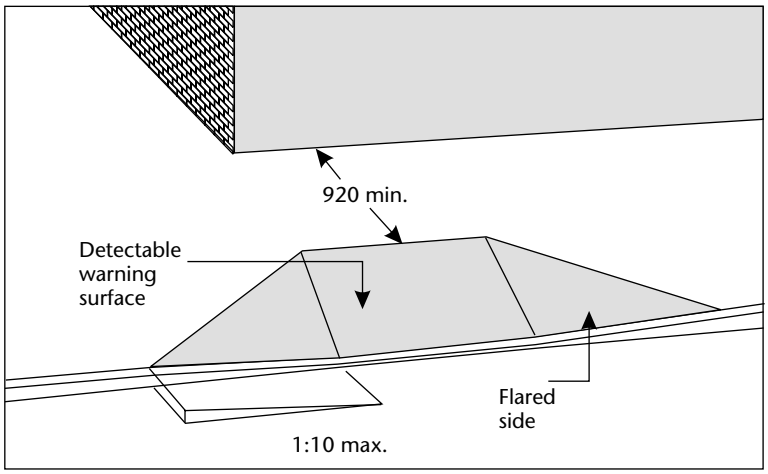


Figure 20
Curb Ramp with Flared Sided

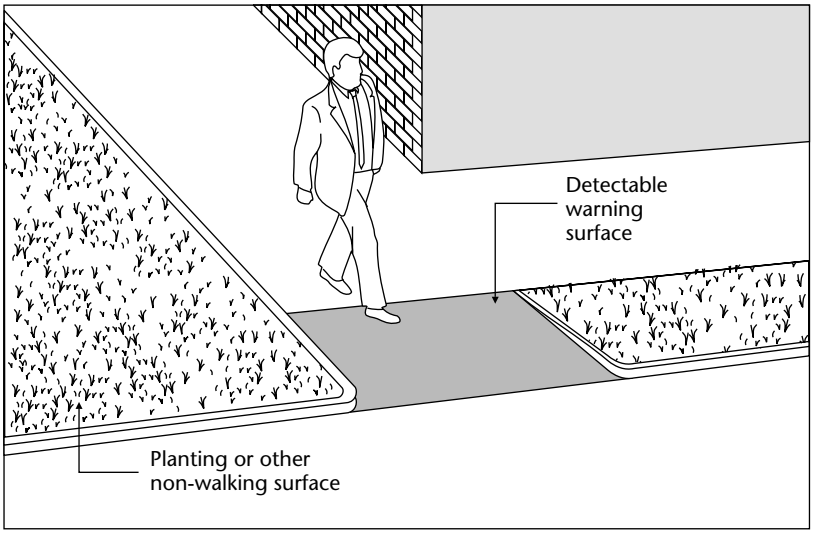


Figure 21
Curb Ramp with Returned Curb Sides

Commentary: Flared sides can be outside the pedestrian crosswalk.

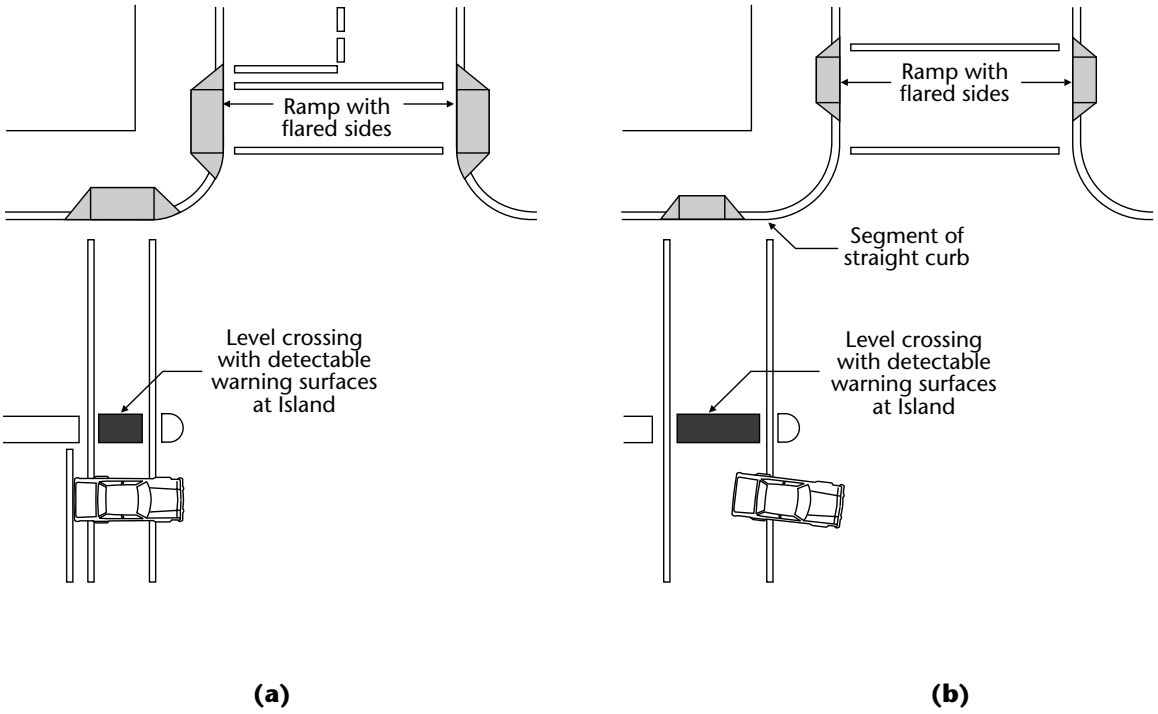


Figure 22
Location of Curb Ramps at Pedestrian Crosswalks

4.4.6 Islands

4.4.6.1
Raised islands in crossings shall
(a) be cut through level with the street (Figure 22(a)); or
(b) have curb ramps at both sides and a level area not less than 1200 mm long in the middle (Figure 22(b)).

4.4.6.2
Islands level with the street shall have within the area designated for pedestrian use detectable warning surfaces that are
(a) at least 900 mm long; and
(b) of a texture and colour that contrasts with the surrounding walking surfaces.

4.5 Stairs

4.5.1 Treads and Risers
A flight of stairs shall have
(a) uniform riser heights and tread depths;
(b) risers not more than 180 mm high;

(c) treads not less than 280 mm deep, measured from riser to riser; and
(d) no open risers (Figure 23(a)).

Commentary: Generally speaking, a longer tread is better for people with mobility impairments.

4.5.2 Nosings

Nosings shall
(a) project not more than 38 mm;
(b) have no abrupt undersides (Figure 23(b));
(c) have a radius of curvature at the leading edge of the tread not more than 13 mm;
(d) where projecting, be sloped to the riser at an angle greater than 60<F"Arial">°<F255> to the horizontal (Figure 23(c));
(d) where projecting, be sloped to the riser at an angle greater than 60° to the horizontal (Figure 23(c));
(e) be illuminated to a level of at least 100 lx;
(f) be slip resistant; and
(g) have the horizontal face in a colour contrasting with the tread.

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

4.5.3 Detectable Warning Surfaces

Detectable warning surfaces shall
(a) be provided at the top of the stairs and at landings;
(b) extend the full width of the stair for a depth of at least 900 mm commencing one tread depth back from the stair (Figure 23(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.

Commentary: Stairs with open risers are hazardous to persons who need a solid riser to guide the foot up the riser to the next step, or who place canes or crutches against the riser of the next step.

Where projecting nosings are used, they must not have sharp or abrupt angles that prevent the foot from sliding up the riser.

It is important for stairs and ramps to have good illumination so that they can be easily seen. Strongly patterned carpets should not be used on stairs since they cause perceptual problems and obscure the definition of the tread edges.

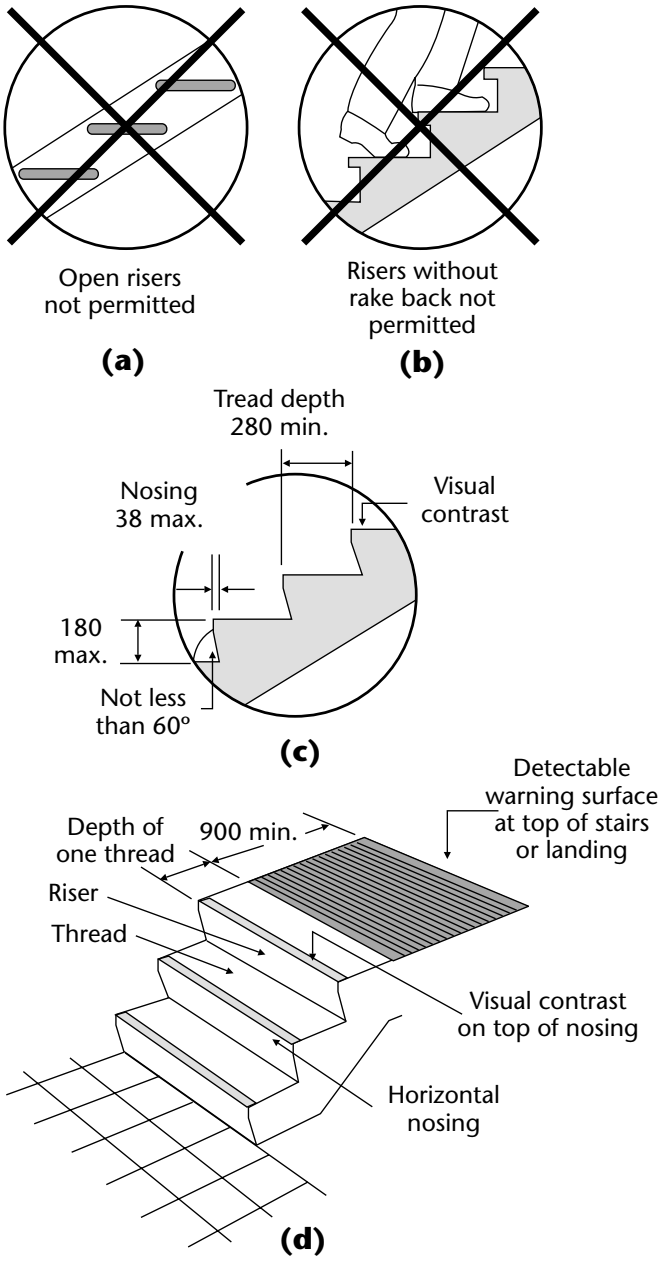


Figure 23
Stair Detail

4.5.4 Stair Handrails

Handrails for stairs shall

(a) comply with Clause 4.6;
(b) be installed on both sides (Figure 24);
(c) be of uniform height, ranging between 800 and 920 mm from the stair nosing;
(d) have a continuous inside handrail on switchback or dogleg stairs (Figure 25); and
(e) where not continuous:
    (i) extend at the top of the stairs parallel with the floor surface not less than 300 mm;
    (ii) continue at the bottom of the stairs to slope for a distance equal to the depth of the tread and then extend parallel to the floor surface not less than 300 mm; and
    (iii) return to the wall, floor, or post (Figures 25, 26, 27).

Commentary: Many persons with disabilities rely upon handrails to maintain balance and prevent serious falls. Handrail extensions at the top and bottom of stairs provide tactile cues for persons with visual impairments, and a continuous handrail will assist them in negotiating stairs at changes in direction (Figure 24).

Handrail extensions should not project into another path of travel, and handrails should return to the wall, floor, or post so as not to constitute a hazard (Figure 19).

The extended handrail is useful for persons with physical limitations to steady themselves before climbing or descending the stairs. The "one-tread depth" extension at the bottom is to ensure that the horizontal handrail extension is at the same height as the handrail on the stair (Figures 25, 26, and 27).

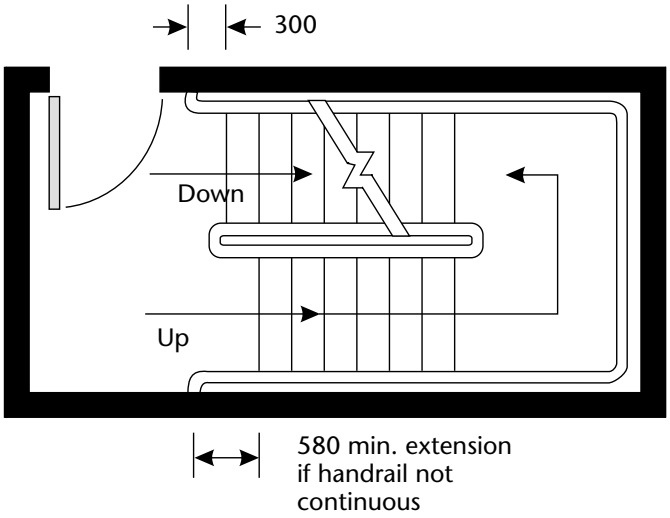


Figure 24
Handrail in Stairway

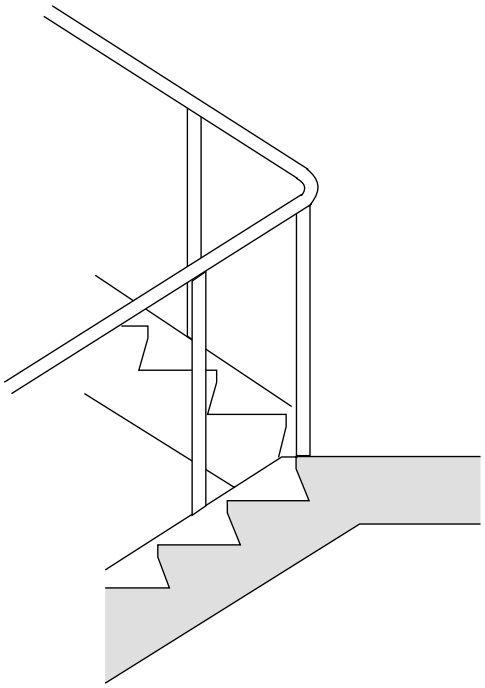


Figure 25
Continuous Handrail at Centre of Stair

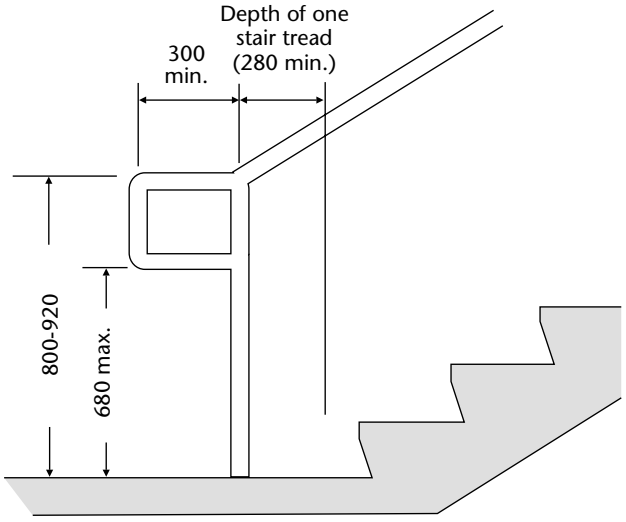


Figure 26
Handrail Extension at Bottom of Stair

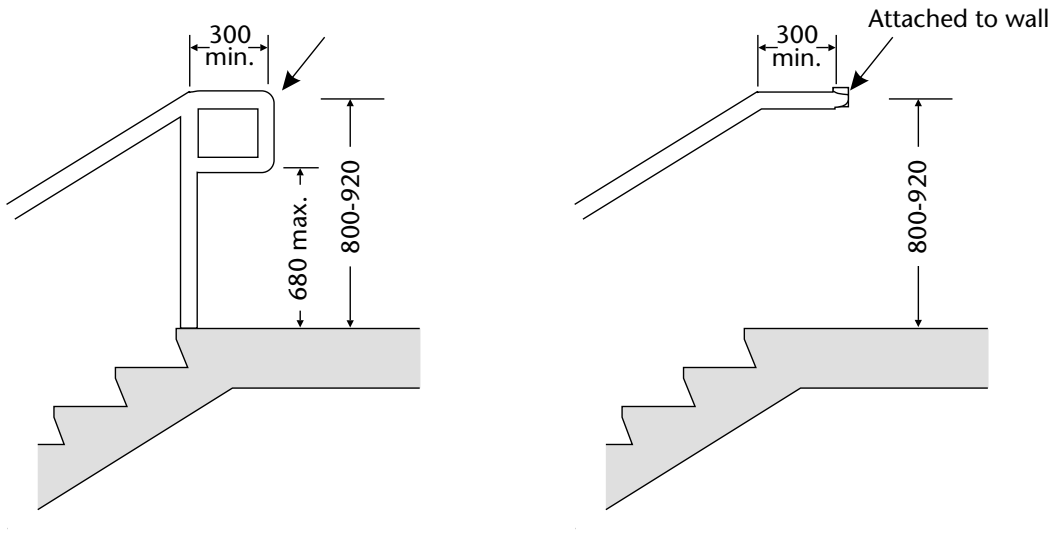


Figure 27
Handrail Extension at Top of Stair

4.6 Handrails

4.6.1

Handrails shall

(a) have a circular section 30–40 mm in diameter or an alternative shape providing the same gripping surface;

(b) be free of any sharp or abrasive elements;

(c) have continuous gripping surfaces, without interruption by newel posts, other construction elements, or obstructions that can break a hand hold; and

(d) have a clear space between the handrail and the wall of

(i) 35–45 mm; or

(ii) at least 60 mm where the wall has a rough surface (Figure 28).

4.6.2

A recess containing a handrail shall extend at least 450 mm above the top of the rail (Figure 29).

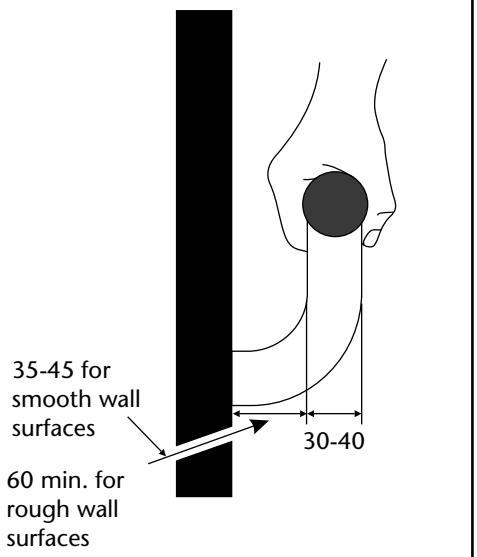


Figure 28
Handrails

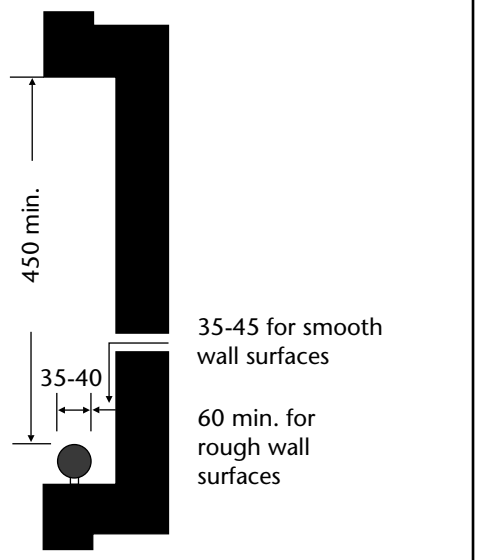


Figure 29
Handrails in Recess

Commentary: Handrails are extremely important features and must be designed to be easy to grasp and to provide a firm and comfortable grip so the hand can slide along the rail without obstruction.

A circular section with a diameter not more than 40 mm is the preferred shape so that the thumb and fingers can lock around the handrail. Wide or deep handrails which allow only a pinched grip are undesirable unless a proper hand-size grasping area is provided (Figure 30). Standard pipe sizes designated by the industry as 32 to 38 mm meet the requirements of Clause 4.6.1(a).

The maximum clearance allowed is to provide for adequate gripping room and prevent injuries from arms slipping through the opening.

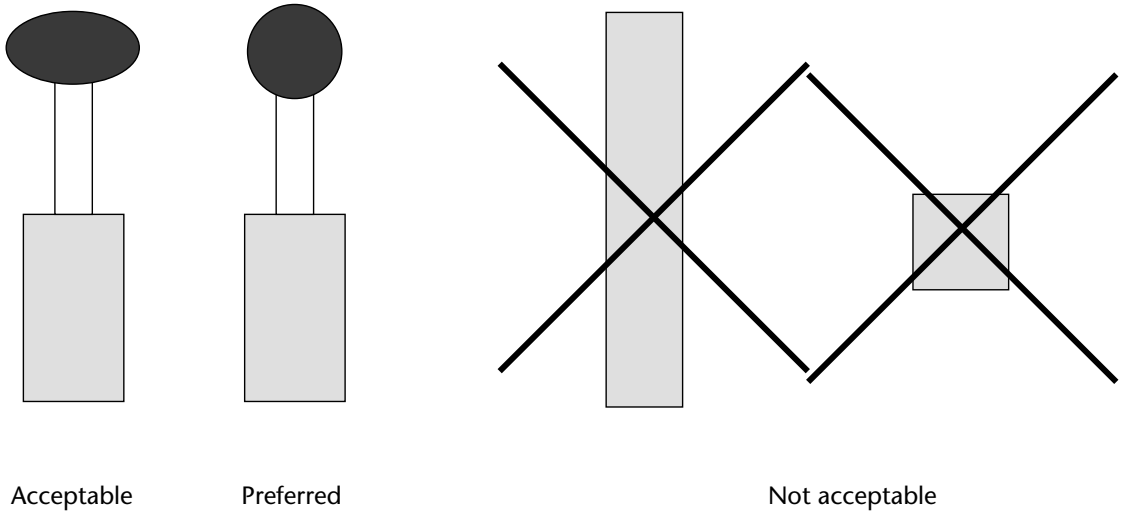


Figure 30
Handrail Shapes

4.7 Elevator Requirements

4.7.1

Elevators shall comply with Appendix E of CSA Standard CAN/CSA-B44.

Commentary: These requirements are reproduced in Appendix C of this Standard, along with additional recommendations. Where the depth of an elevator makes it difficult for a wheelchair user to turn around, provide a mirror on the rear wall to allow the user to see the floor indicators.

4.8 Elevating Devices

4.8.1
Elevating devices such as platform lifts shall comply with CSA Standard CAN/CSA-B355.

Commentary: Escalators are not considered a safe means of barrier-free travel.

4.9 Areas of Refuge

4.9.1
Areas of refuge shall be
(a) of a size that allows a minimum floor space of 850 x 1200 mm per nonambulatory occupant with no fewer than 2 such spaces;
(b) separated from the floor area by a fire separation having a fire-resistance rating at least equal to that required for an exit;
(c) served by an exit or a firefighters' elevator;
(d) designated as an area of refuge for persons with disabilities on the building plans and in the building; and
(e) smoke protected in buildings of more than three storeys.

Commentary: An area of refuge is a space that facilitates a safe delay of egress, is protected from fire conditions developing in the floor area, and provides direct access to an exit or a firefighters' elevator. It provides a known place for firefighters to come get to persons unable to use stairs.

A firefighters' elevator, referred to above, is an elevator system designed for use by firefighters and others with firefighter supervision.

An exit through a fire wall may be considered equivalent to an area of refuge.

Since areas of refuge provide temporary safety, it is important for the building management to have operating procedures in place which complement the building design features.

The term "smoke protected" describes spaces that will contain not more than 1% by volume of contaminated air from the fire floor, during a 2 h period after the start of a fire, assuming an outdoor air temperature equal to the January design temperature on a 2½% basis.

Signs along the normal path of egress should indicate the direction to the area of refuge.

Nonambulatory occupants in areas of refuge should not obstruct egress. The door should not encroach on the space for wheelchairs.

An area of refuge could be an enlarged landing in an exit stair (Figure 31).

According to the National Building Code, Clause 3.3.1.7, a sprinklered building does not require areas of refuge.

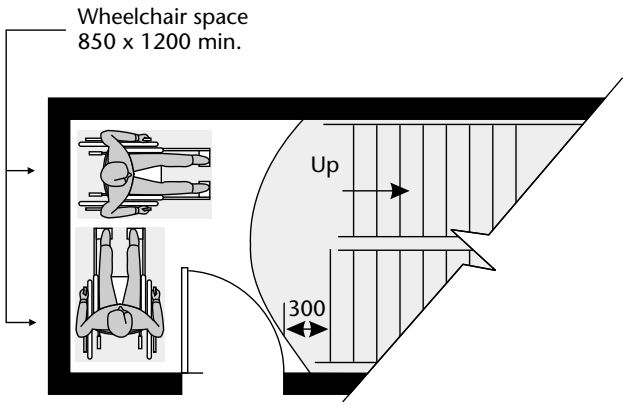


Figure 31
Example of Refuge Area

5. Washroom Facilities

Commentary: When entering and leaving washrooms, people using wheelchairs frequently encounter problems. Door arrangements and spacing must comply with Clause 4.2.

Within the washroom, sufficient space is required to allow persons in wheelchairs to move freely to and from the various fixtures (Figure 32). For detailed dimensions for reaching/grasping refer to Appendix B.

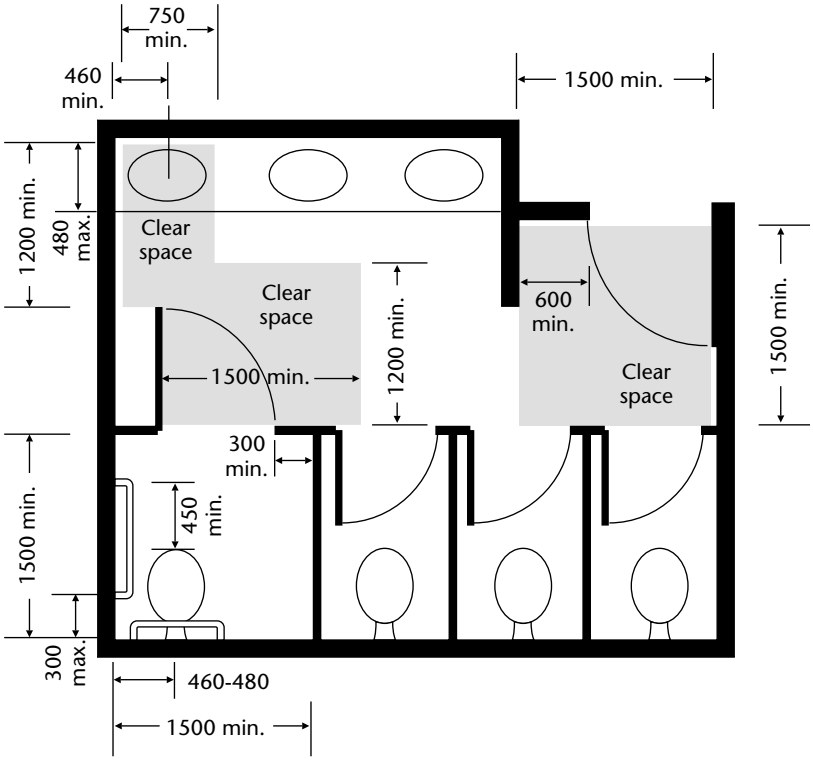


Figure 32
Example of a Washroom Layout

5.1 Washroom Identification

Signs at washroom entrances shall comply with Clause 6.4.4.

5.2 Toilet Stalls

5.2.1 General

Toilet stalls shall

(a) have internal dimensions at least 1500 x 1500 mm (Figure 33);

(b) have a toilet complying with Clause 5.3; and

(c) be equipped with a coat hook mounted not more than 1400 mm from the floor on a side wall and projecting not more than 40 mm from the wall.

Commentary: The requirements do not preclude the addition of vertical grab bars. Flip-up grab bars can be used on the transfer side of the toilet.

The toilet paper dispenser should be located so as not to interfere with the grab bar; under the grab bar, and in front of the toilet, is a convenient location.

5.2.2 Toilet Stall Doors

Toilet stall doors shall

(a) be capable of being locked from the inside by a device that is operable with one hand; does not require fine finger control, tight grasping, pinching, or twisting of the wrist; and requires a force not more than 22 N to activate (eg, sliding bolt or lever);

(b) provide a clear opening of at least 810 mm with the door in the open position;

(c) swing outward, unless additional space is provided within the stall for the door swing;

(d) be provided with a "D" type door pull, at least 140 mm long, on the inside of an outswinging door, located so that the centreline is between 200 and 300 mm from the hinged side of the door, at outside door-handle height (Figure 33); and

(e) be provided with a "D" type door pull at least 140 mm long, on the outside, near the latch side of the door.

5.3 Toilets

5.3.1 General

Toilet fixtures shall have

(a) the top of the seat between 400 and 460 mm from the floor (Figure 34);

(b) no spring-activated seat;

(c) a back support where there is no seat lid or tank; and

(d) the tank top securely attached.

Commentary: A toilet seat lid is an inexpensive means of providing a back support.

5.3.2 Toilet Location

Toilets shall be located between 460 and 480 mm from the centreline to the adjacent wall.
be electronically controlled (Figure 36).

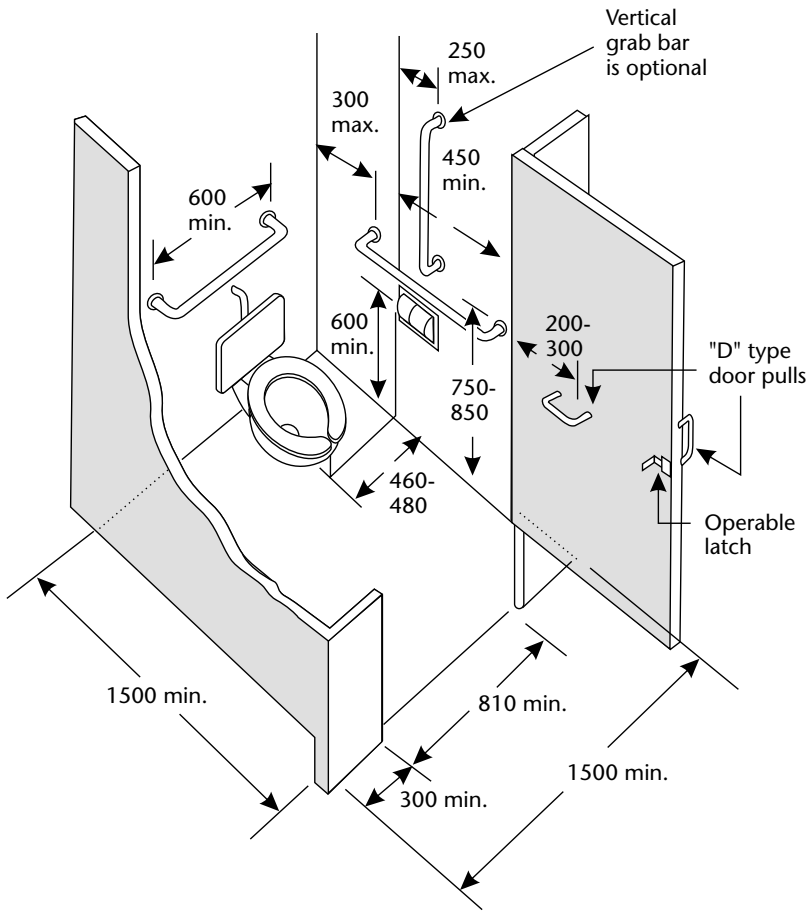


Figure 33
Toilet Stall

5.3.3 Toilet Flush Controls

Flush controls shall be

(a) hand operated on the transfer side of the toilet; or

(b) be electronically automatically controlled.

5.3.4 Toilet Grab Bars

Toilets shall be served by two horizontal grab bars which shall

(a) comply with Clause 5.9;

(b) be mounted at a height between 750 and 850 mm from the floor level;

(c) be mounted on the side wall closest to the toilet extending from a point not more than 300 mm from the rear wall to at least 450 mm in front of the toilet seat for one of the bars (Figure 33); and

(d) for the other, be mounted on the wall behind the toilet and be at least 600 mm long (Figure 33).

Commentary: Wall-hung toilets are preferred because they provide additional space at toe level. Preferences for toilet seat heights vary considerably. Higher seats may be an advantage to some ambulatory persons with disabilities but a disadvantage to persons in wheelchairs. Toilet seats 400 to 460 mm high offer a reasonable compromise. Thick seats and filler rings are available to adapt standard fixtures to these requirements.

A back support reduces the chance of imbalance or injury caused by leaning against exposed valves or pipes. Flush valves and related plumbing can be located behind walls, beside the toilet, or behind the toilet seat. Flush controls for tank-type toilets have a standard mounting location on the left side of the tank (facing the tank). Tanks with controls mounted on the right side are often available by special order.

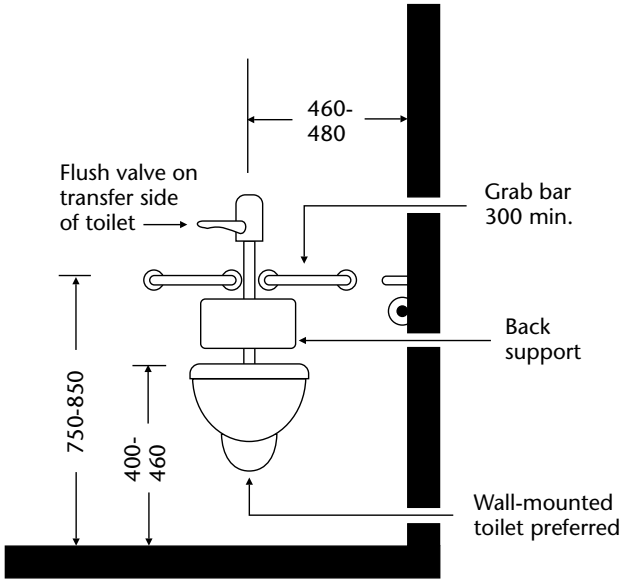


Figure 34
Toilet Configuration

5.4 Lavatories

5.4.1 General

Lavatories shall

(a) be mounted so that the minimum distance between the centreline of the fixture and the side wall is 460 mm;

(b) have the top located between 820 and 860 mm from the floor;

(c) have a knee space at least 750 mm wide, 200 mm deep, and 680 mm high with an additional toe space at least 750 mm wide, 230 mm deep, and 230 mm high;

(d) have a minimum clear floor space 750 mm wide and 1200 mm deep of which a maximum of 480 mm in depth may be under the lavatory; and

(e) have hot water and drain pipes insulated if they abut the clearances noted above (Figure 35).

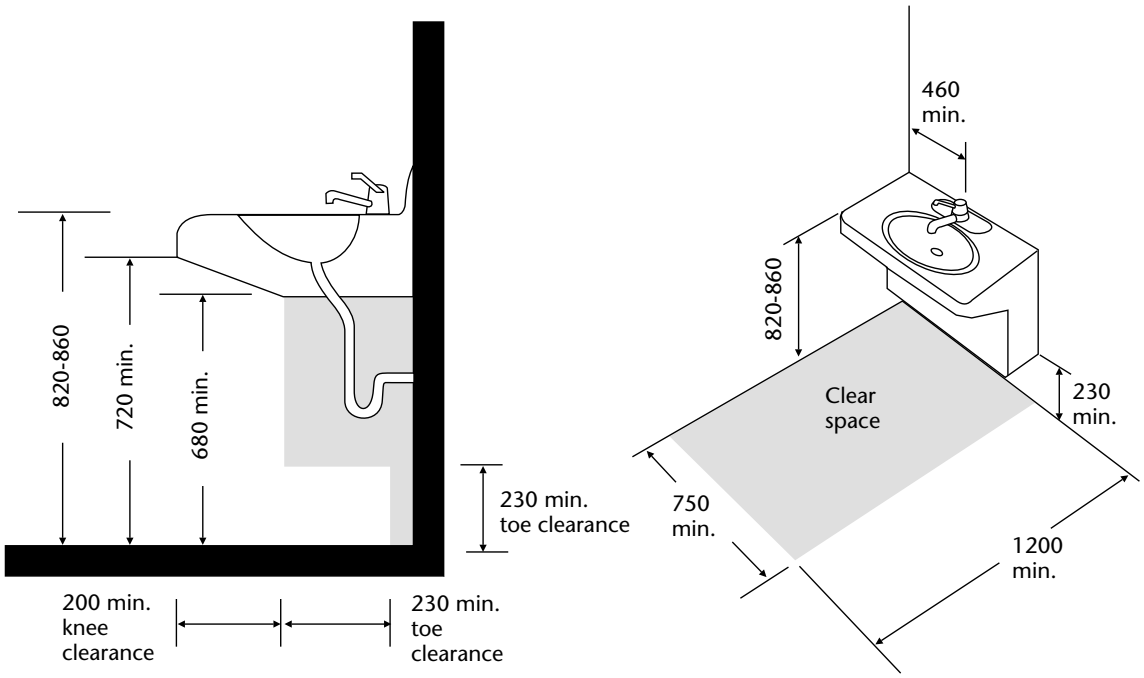


Figure 35
Lavatory Clearances

5.4.2 Faucets

Faucets and other controls shall

(a) have handles of the lever type (not self-closing) operable with a closed fist; or

(b) be electronically controlled (Figure 36).

5.4.3 Lavatory Clearance

The front apron of a vanity shall have a minimum clearance 750 mm wide and 720 mm high (Figure 35).

Commentary: Clearance under a lavatory is required for wheelchair access. The trap should be offset to the rear to ensure that the knee-space is clear of obstructions. If this is not possible, the trap should be insulated to prevent heat injuries to the legs.

Lavatories on pedestals are not recommended.

It is desirable that lavatories be located in a vanity counter. However, if that is not possible, a shelf should be provided at counter level.

Faucets with lever handles allow use with a minimum of pressure. Short levered handles are not recommended (Figure 36).

Water temperatures at lavatories should be controlled to avoid the possibility of scalding.

Faucets for lavatories, tubs, and showers should be colour-coded (red and blue) where possible.

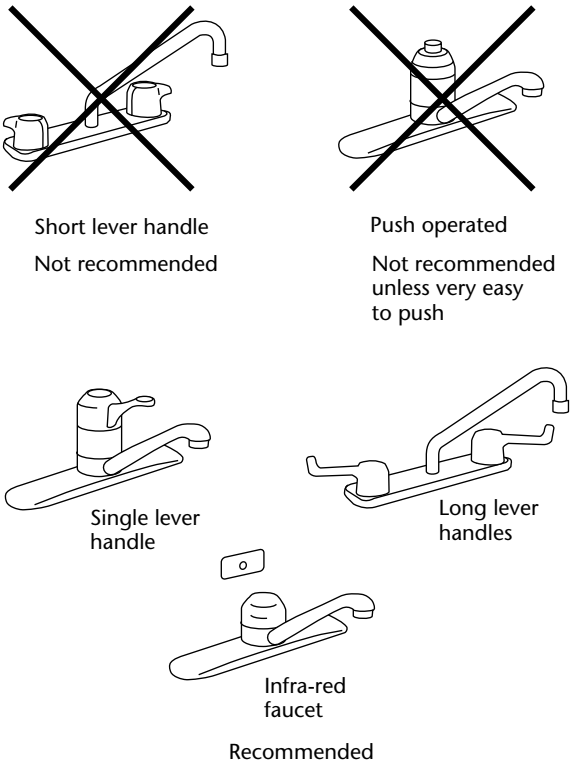


Figure 36
Faucets

5.5 Washroom Accessories

5.5.1 General

At least one of each type of the washroom accessory provided shall have operable parts and controls less than 1200 mm from the floor (Figure 37).

5.5.2 Mirrors

Where mirrors are provided, at least one shall be mounted with its bottom edge not more than 1000 mm from the floor (Figure 37).

Commentary: Accessories such as towel dispensers and waste receptacles should not protrude into the path of travel but should be placed close to the accessible lavatory, to avoid having a person wheeling a chair with wet hands.

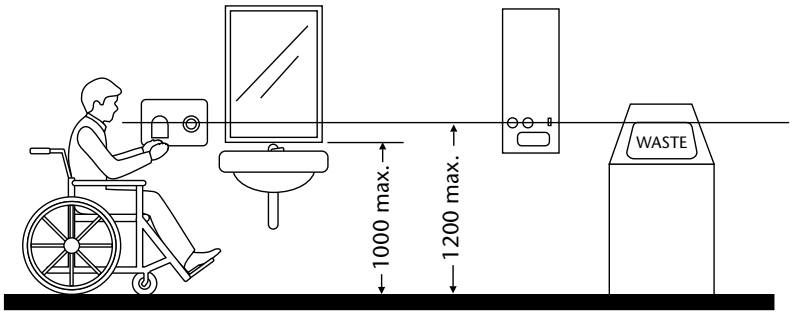


Figure 37
Washroom Accessories

5.6 Individual Washrooms

5.6.1 General

Where a washroom containing one toilet and one lavatory (sometimes referred to as unisex, special, or unit washroom) is provided, it shall

(a) have a floor area not less than 3.5 m^2 with no dimension between opposite walls less than 1700 mm;

(b) have a clear space of at least 900 mm wide adjacent to the toilet (Figure 38);

(c) have a toilet complying with Clause 5.3; and

(d) have a lavatory complying with the requirements of Clause 5.4.

5.6.2 Equipment

Washrooms described in Clause 5.6.1 shall comply with the requirements of Clause 5.5 and shall be equipped with a

(a) shelf or counter at least 200 x 400 mm;

(b) coat hook mounted not more than 1400 mm from the floor on a side wall and projecting not more than 40 mm from the wall; and

(c) door which shall

(i) comply with Clause 5.2.2;

(ii) be provided with spring-type or gravity hinges so that the door closes automatically; and

(iii) be operable from the outside under emergency conditions.

Commentary: An individual washroom is used by a variety of persons, including a person with disabilities with an attendant or a parent with a child.

It may be desirable to equip this type of washroom with an emergency call switch.

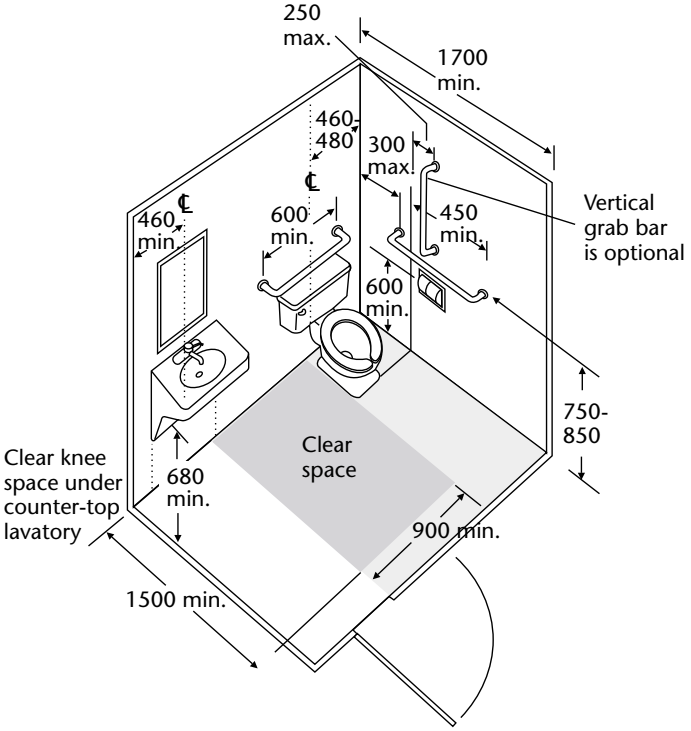


Figure 38
Example Layout for an Individual Washroom

5.7 Bathtubs

5.7.1 Floor Space

A clear floor space at least 750 mm wide shall be provided along the side of the bathtub, and the lavatory can encroach a maximum of 300 mm into this space providing there is clear knee and toe space under the lavatory (Figure 39).

Commentary: It is desirable to have a seat 400 mm deep across the width of the bathtub located at the end of the bathtub to allow easier access.

5.7.2 Grab Bars

Grab bars shall

(a) comply with Clause 5.9;

(b) be at least 1200 mm long, located horizontally along the length of the bathtub, 180–280 mm above the bathtub rim; and

(c) be at least 1200 mm long, located vertically at the foot end of the bathtub adjacent to the clear floor space with the lower end 180–280 mm above the bathtub rim (Figure 39).

Commentary: Care should be taken to ensure that the vertical grab bar does not interfere with the shower curtain. Grab bar dimensions given should be measured to the centreline.

5.7.3 Controls

Faucets and other controls shall

(a) comply with Clause 5.8.3;

(b) be located at the foot end of the bathtub between the centreline of the bathtub and the clear floor space; and

(c) be not more than 450 mm above the bathtub rim.

5.7.4 Shower Head

A shower head complying with Clause 5.8.4 shall be provided.

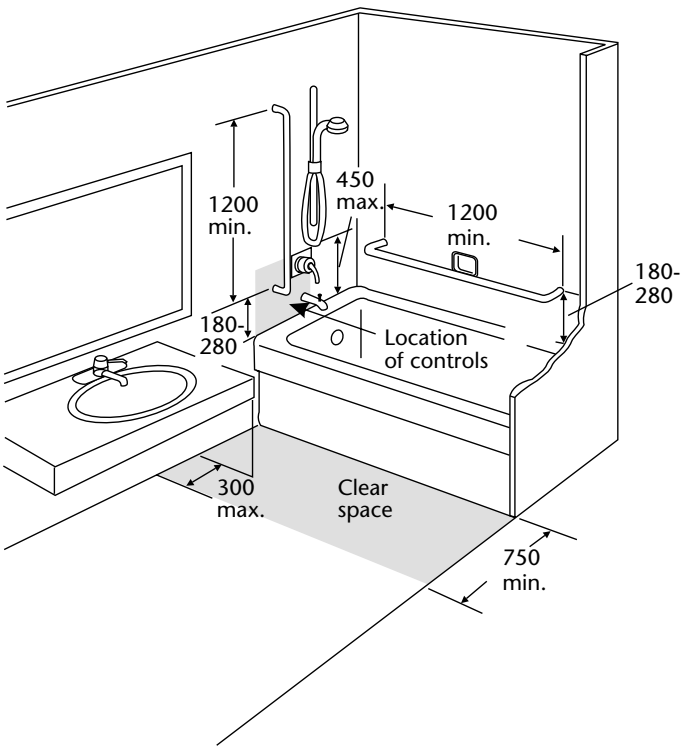


Figure 39
Bathtubs

5.7.5 Enclosures

Enclosures for bathtubs shall not

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

5.8 Shower Stalls

Commentary: Roll-in shower stalls accommodate persons who prefer to remain in a wheelchair while taking a shower. Shower stalls with a seat accommodate persons who prefer to transfer from a wheelchair to a fixed seat in the shower stall or persons who need to be seated while showering.

5.8.1 Roll-in Shower Stalls

5.8.1.1

Roll-in shower stalls shall have interior dimensions of at least 750 x 1500 mm.

Commentary: It is desirable to have a stall wider than 750 mm where possible.

5.8.1.2

The minimum clear floor space in front of the shower entrance shall be 900 x 1200 mm with the 1200 mm dimension parallel to the shower entrance (Figure 40).

5.8.1.3

Grab bars for roll-in shower stalls shall

(a) comply with the requirements of Clause 5.9;
(b) be one L-shaped bar or two grab bars in L-shaped configuration; and
(c) be at least 750 x 900 mm with the 900 mm arm set horizontally between 700 and 800 mm from the shower floor (Figure 40).

5.8.1.4

Controls for roll-in shower stalls shall be mounted on the long wall above the grab bar, not more than 1200 mm from the floor.

5.8.1.5

Curbs for roll-in shower stalls shall be 6–13 mm high, bevelled at a slope of 1:2.

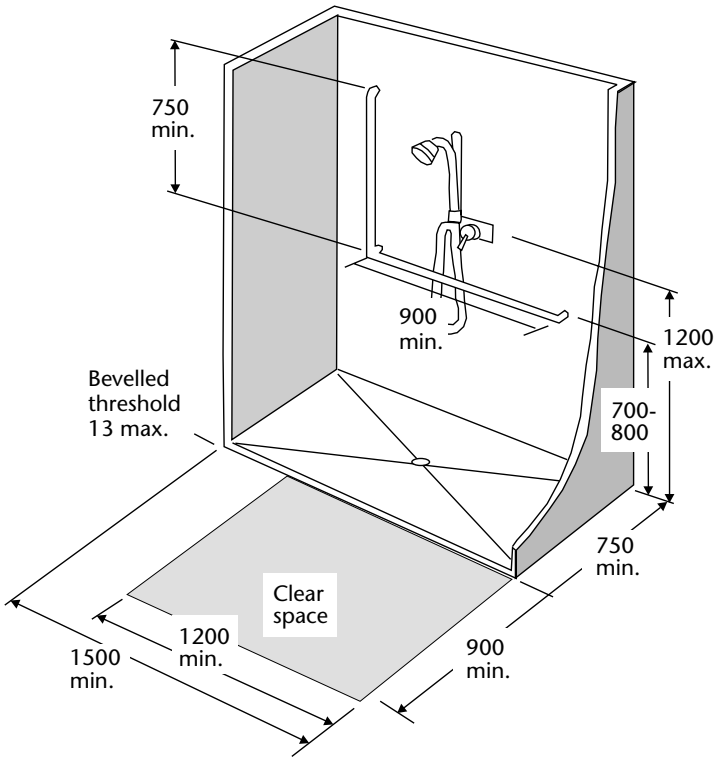


Figure 40
Example of a Roll-In Shower Stall

5.8.2 Shower Stalls with Seat

Commentary: A seat which folds to a vertical position when not in use will allow persons to use the shower in a seated or standing position. A seat of a colour that contrasts with surrounding surfaces improves safety for visually impaired persons.

5.8.2.1
Shower stalls with a seat shall have interior dimensions at least 900 x 900 mm.

5.8.2.2
In shower stalls with a seat, the seat shall
(a) be on the wall opposite the controls;
(b) be a minimum of 400 mm wide extending the full depth of the stall, less a space allowed for shower curtain; and
(c) have its top 430–480 mm from the floor.

5.8.2.3
The minimum clear floor space in front of the shower entrance shall be 900 x 1200 mm with the 1200 mm dimension parallel to the shower entrance, starting from the stall wall opposite the seat, where a seat is provided (Figure 41).

5.8.2.4

Grab bars in shower stalls with a seat shall

(a) comply with the requirements of Clause 5.9;

(b) have one grab bar at least 750 mm long installed horizontally on the back wall between 700 and 800 mm from the shower floor (Figure 41); and

(c) have another grab bar at least 750 mm long installed vertically 80–120 mm from the front edge starting between 700 and 800 mm from the floor (Figure 41).

5.8.2.5

For shower stalls with a seat, all controls, faucets, and the shower unit shall be

(a) mounted on the wall opposite the seat not more than 1200 mm from the floor; and

(b) accessible from outside the stall.

5.8.2.6

Curbs in shower stalls with a seat shall be not higher than 100 mm.

Commentary: Curb colour should contrast with the flooring colour to reduce the possibility of dangerous tripping.

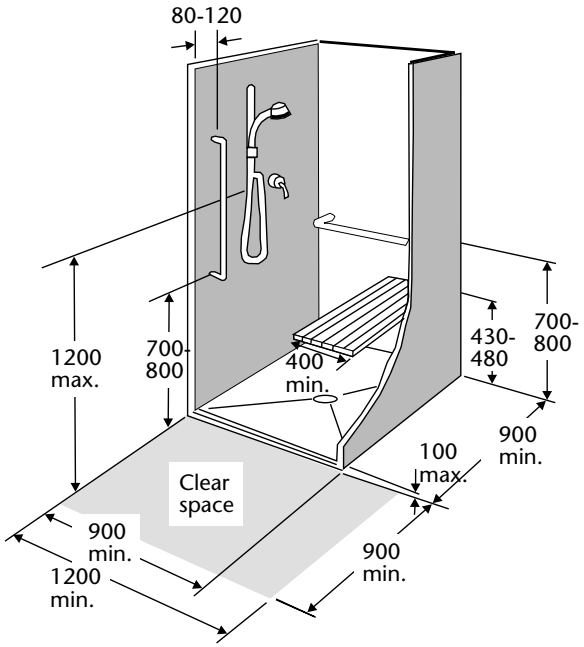


Figure 41
Example of Shower Stall with Seat

5.8.3 Shower Controls

5.8.3.1
Faucets and other controls shall be hand operated or electronically controlled.

5.8.3.2
Hand-operated controls shall
(a) be operable with one hand;
(b) require no tight grasping, pinching, or twisting of the wrist; and
(c) require a force less than 22 N to activate.

5.8.3.3
Temperature of the water supplied to the shower shall be controlled by a pressure-equalizing valve or by an automatic thermostatically controlled valve.

5.8.4 Shower Heads

5.8.4.1
A shower head 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 fixed position.

5.8.4.2
Where the shower head is mounted on a vertical bar, the bar shall be installed so as not to obstruct the use of grab bars.

5.8.5 Shower Enclosures
Enclosures for shower stalls shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

5.8.6 Shower Floors
The floor of the shower shall be slip resistant. (See Appendix A for additional guidance on slip resistance.)

5.9 Grab Bars

5.9.1 Size and Spacing
Grab bars shall
(a) be slip resistant;
(b) have a diameter 30–40 mm, or a shape that provides an equivalent gripping surface; and
(c) have a space of 35–45 mm between the wall and the grab bar where mounted adjacent to a wall.

5.9.2 Structural Strength
Grab bars shall be installed to resist a force at least 1.3 kN applied vertically or horizontally.

5.9.3 Safety
A grab bar and adjacent surfaces shall be free of any sharp or abrasive elements.

5.10 Drinking Fountains

5.10.1 Spouts
Spouts shall
(a) have an opening located between 750 and 900 mm from the floor or ground surface (Figure 42);
(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.

5.10.2 Controls

5.10.2.1
Controls shall be hand operated or electronically controlled.

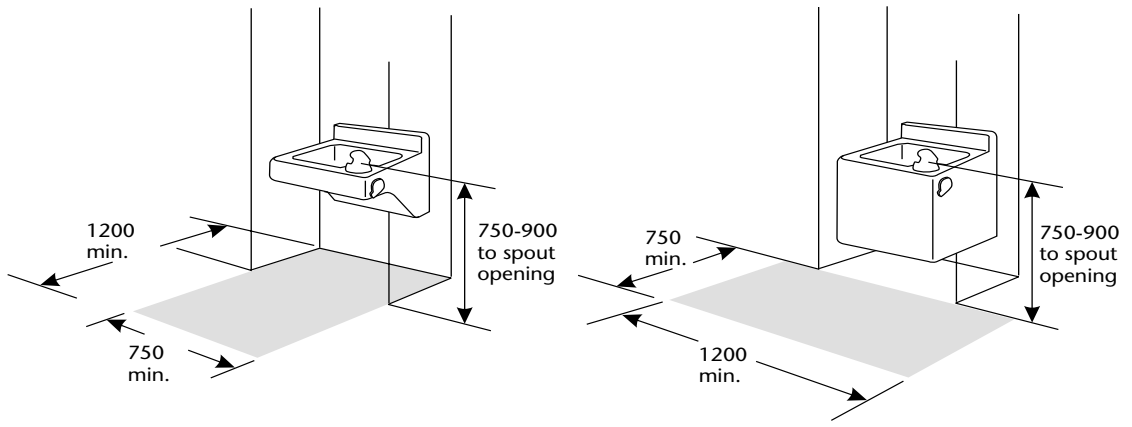
5.10.2.2
Hand-operated controls shall
(a) be at or near the front of the fountain;
(b) be operable with one hand
(c) require no tight grasping, pinching, or twisting of the wrist; and
(d) require a force less than 22 N to activate.

5.10.3 Floor Space

5.10.3.1
Cantilevered drinking fountains shall
(a) have a clear floor space of at least 750 x 1200 mm;
(b) have a clear knee space between the bottom of the apron and the floor or ground at least 750 mm wide, 200 mm deep, and 680 mm high (Figure 43);
(c) have a toe space not less than 750 mm wide, 230 mm deep, and 230 mm high; and
(d) be recessed or otherwise located out of the circulation route (Figure 42).

5.10.3.2
Freestanding or built-in drinking fountains not having a knee space shall have a clear floor space at least 1200 mm wide by 750 mm deep in front of the unit (Figure 42(b)).

Commentary: A wall-mounted drinking fountain located in an alcove is preferred because it does not create a hazard for persons who are visually impaired. 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, people in wheelchairs, and children. A 100 mm high water flow will allow the insertion of a cup or glass.



(a) Frontal approach (b) Parallel approach

Figure 42
Built-In Drinking Fountain

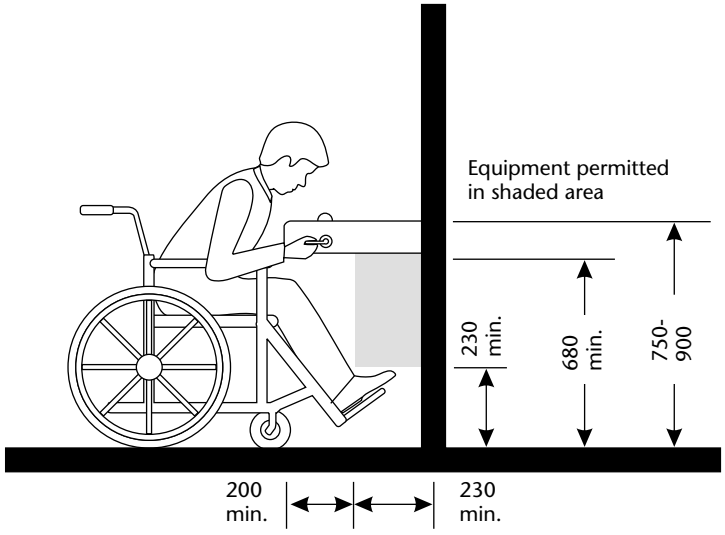


Figure 43
Spout Height and Knee Clearances at Drinking Fountain

6. Communications

6.1 Visual Alarms

Visual alarms shall be lights that flash at a frequency of approximately 1 Hz in conjunction with the audible emergency alarms.

Commentary: Visual alarms require strategic placement so that they can be readily seen. They should be significantly brighter than the ambient light. Other systems may be substituted if equivalent protection is provided for persons who are deaf or hard of hearing.

6.2 Public Telephones

6.2.1 Protruding Parts
Telephones, enclosures, and related equipment shall comply with Clause 3.4.

6.2.2 Controls
A telephone shall have push-button controls where service for such equipment is available. The characters on these push-buttons shall contrast with their background.

6.2.3 Cord Length
The minimum handset cord length shall be 1000 mm.

6.2.4 Illumination
The minimum illumination level at operating mechanisms, the directory, and shelf shall be 200 lx.

6.2.5 Telephones for Persons in Wheelchairs

6.2.5.1
The maximum height of operable parts of the telephone, including the coin slot, shall be 1370 mm from the floor.

6.2.5.2
A clear floor space not less than 750 mm wide x 1200 mm deep shall be provided in front of the telephone and this space may extend a maximum of 480 mm underneath the telephone if a clear height of 720 mm is provided for knee space (Figure 44).

6.2.5.3
A flat telephone directory shelf at least 500 mm wide and 350 mm deep shall be provided.

6.2.5.4
Telephones for use by persons in wheelchairs shall be identified by the international symbol of access (Figure 46).

Commentary: Consideration should be given to a fold-down seat, provided that when it is folded up it does not interfere with access for a person in a wheelchair.

The preferred coin slot height is 1200 mm, but this height may not be achievable with some public telephone units.

6.2.6 Telephones for Use by Persons Who are Deaf or Hard of Hearing

6.2.6.1
A telephone shall comply with CSA Standard T515.

6.2.6.2
A shelf at least 250 mm wide x 350 mm deep, with at least a 250 mm clear space above the shelf, shall be provided to accommodate the use of a Teletype Device for the Deaf (TTY or TDD) (Figure 44).

Commentary: Many persons who are deaf or hard of hearing use a Telecommunication Device for the Deaf (TDD) or Teletypewriter (TTY) with the standard telephone for communicating visually via the telephone system.

Persons using TTYs or TDDs may carry their own unit and require shelf space for it beside or beneath the telephone.

Pay telephones equipped with TDD/TTY are available and should be considered for public areas.

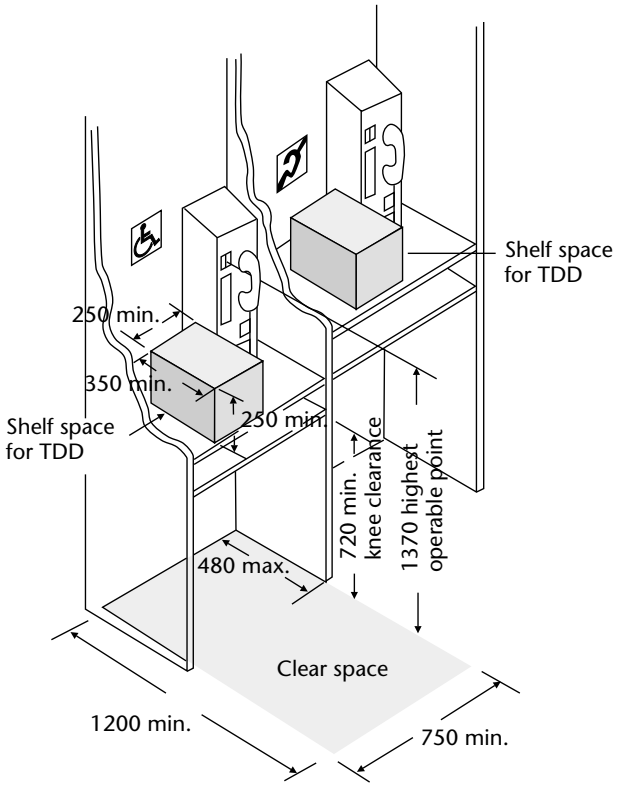


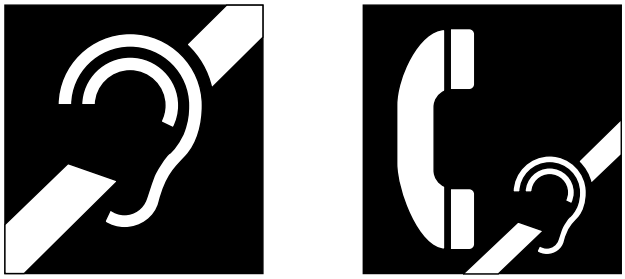
Figure 44
Height of Telephone and Shelf for TTD

6.2.6.3
Telephones for use by persons who are deaf or hard of hearing shall be identified by the symbol of accessibility for persons who are deaf or hard of hearing (Figure 45(a)).

6.2.7 Directional Signs

When directional signs for telephones are installed, they shall include the appropriate access symbol (Figure 45(b)).

Commentary: If more than one type of telephone is provided at a particular location, then at least one of each type (eg, card, coin, internal, taxi call) should be accessible to both persons who use wheelchairs and those who are hard of hearing.



(a) (b)

Figure 45
Symbols of Accessibility for Persons Who Are Deaf or Hard of Hearing

6.3 Assistive Listening Systems

Induction loops, infrared systems, and FM radio frequency systems shall be considered acceptable types of assistive listening systems for persons who are hard of hearing.

Commentary: These types of assistive listening systems can be used by persons who are hard of hearing with or without hearing aids with T-switches or audio input capability and will not interfere with the listening enjoyment of people with normal hearing. All three systems transmit a signal which can be picked up by special-purpose receivers provided to those requiring them. Receivers for such systems can be equipped to be compatible with hearing aids with T-switches or audio input capability. Hard-wired systems will not meet this requirement unless adequate provisions are made to accommodate persons with hearing aids. The choice and size (power) of the system will depend on the type of application and the size of the room. The accessibility symbol for persons who are deaf or hard of hearing (Figure 45(a)) can be useful in indicating the existence of such a facility.

6.4 Signage

6.4.1 Character Proportion

Letters and numbers on signs shall
(a) be sans serif;
(b) have Arabic numbers;
(c) have a width-to-height ratio between 3:5 and 1:1; and
(d) have a stroke-width-to-height ratio between 1:5 and 1:10

Commentary: An upper-case "X" should be used for character measurement. All signs should be consistently placed and of uniform design so as to be readily seen. The size and intended viewing distance should comply with Table 4.

Table 4
Character Height Dimensions for Viewing Distances

Minimum character height, mm	Maximum viewing distance, mm
200	6000
150	4600
100	2500
75	2300
50	1500
25	750

6.4.2 Contrast
Characters and symbols shall be glare free and contrast with their background; either light characters on a dark background or dark characters on a light background shall be used (Figure 48).

6.4.3 Illumination
The minimum level of illumination on signs shall be 200 lx.

6.4.4 Tactile Characters or Symbols
Characters, symbols, or pictographs on tactile signs shall
(a) be raised at least 0.8 mm;
(b) be between 16 and 50 mm high;
(c) if letters or numbers, be sans serif; and
(d) if wall mounted, have the centreline at a height of 1500 ± 25 mm (Figure 49).

6.4.5 Symbol of Access
If accessible facilities are identified, then the international symbol of access shall be used (Figures 45, 46, and 47).

Commentary: Tactile maps or prerecorded instructions can help visually impaired persons find their way independently in complex buildings or a group of buildings.

Orientation cues help visually impaired persons distinguish pathways and locations. These cues include changes in illumination levels, bright colours, unique patterns, location of special equipment, or other architectural features.

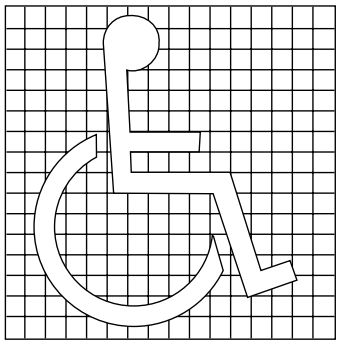
Persons with disabilities may have limitations in the movement of their head, or a reduction in peripheral vision. Signs positioned perpendicular to the path of travel are easiest for them to notice. Persons can generally distinguish signs within an angle of 30° to either side of the centreline of their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

Legibility of characters is a function of the viewing distance, the character height, the ratio of the stroke width to the character height, the contrast of colour between character and background, and the print font (Figure 48). Vertical wording should be avoided. The size of the characters should be based on the intended viewing distance. Severely nearsighted persons may have to be much closer to read a sign than persons with normal visual acuity. Signs at eye level allow persons to get closer to the sign.

Raised characters or symbols of identification greatly assist persons with visual impairments (Figure 49). Such identification should be located beside doors and openings to rooms within a building, and placed at a uniform height and distance from the door. Consistent location, such as at the door handle side, also makes identification easier. Raised characters are easier to feel than indented characters and are not susceptible to maintenance problems such as filling up with dirt or cleaning compounds.

Raised borders around raised characters can make the characters difficult to read unless the border is set far from the characters.

Braille characters may be used in addition to the standard alphabet, placed to the left of the raised characters.



Background squares for reference only

Figure 46
International Symbol of Access

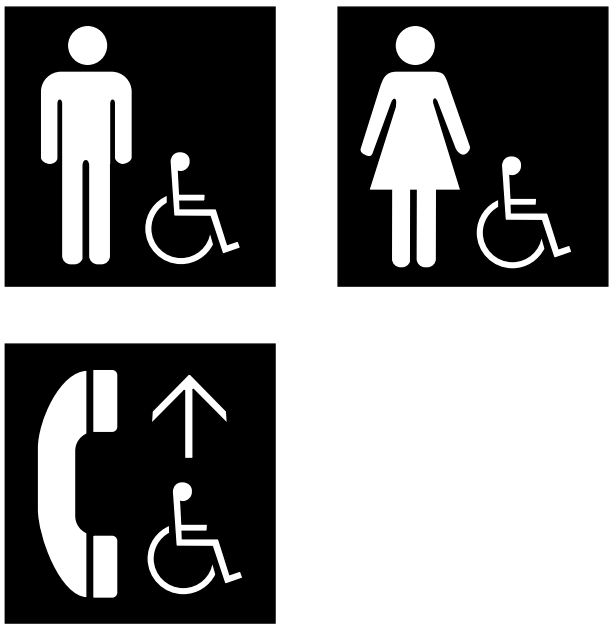


Figure 47
Example of Service Identification Signs Incorporating the International Symbol of Access

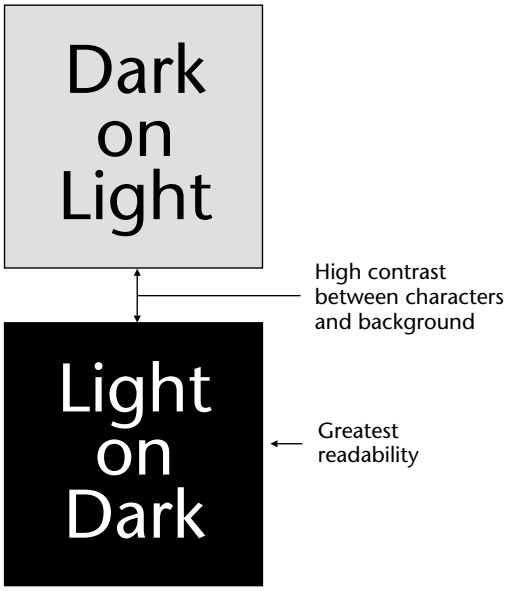


Figure 48
Readability of Printed Characters

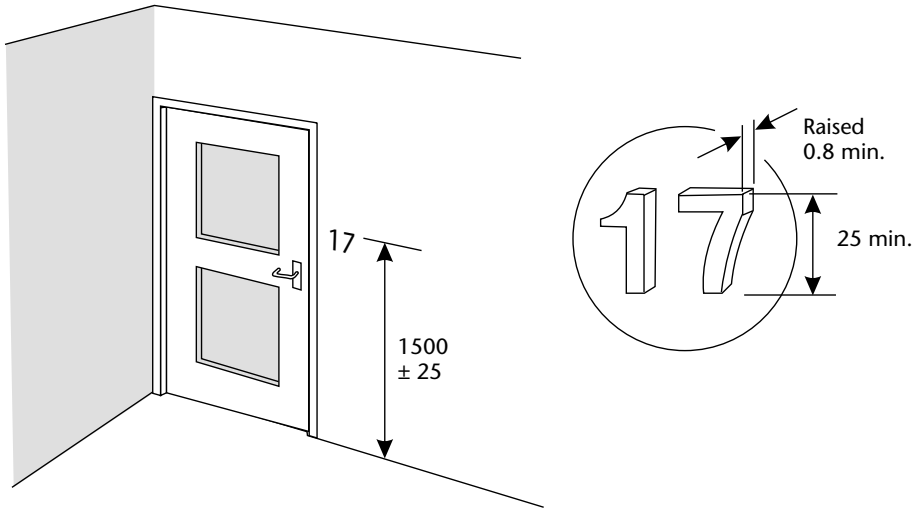


Figure 49
Raised Characters of Symbols on Identification Signs

6.5 Detectable Warning Surface

Detectable warnings on walking surfaces shall be

(a) at least 900 mm long; and
(b) of a texture and colour that contrasts with the surrounding walking surfaces.

Commentary: The minimum length of the detectable warning is established to ensure that persons will detect it regardless of stride length.

7. Parking Spaces and Passenger Loading Zones

7.1 Circulation Routes

Circulation routes adjacent to parking spaces shall be part of the accessible route to the building or facility entrance and shall be accessible by a person in a wheelchair in accordance with Clause 4.1.

7.2 Car Parking Spaces

Car parking spaces shall

(a) be at least 2400 mm wide;
(b) have an adjacent access aisle at least 1500 mm wide;
(c) have a firm, slip-resistant, level surface; and
(d) where surfaces are paved, have access aisles clearly indicated by markings (Figures 50, 51, and 52).

Commentary: Parking spaces designated for persons with disabilities and accessible passenger loading zones that serve a particular building should be located on the shortest possible circulation route to an accessible entrance. In separate parking structures or lots that do not serve a particular building, accessible parking spaces should be located on the shortest possible circulation route to an accessible pedestrian entrance of the parking facility.

The accessible route should not oblige persons in wheelchairs to pass behind vehicles which may be backing out.

Two accessible parking spaces may share a common access aisle.

The location of accessible parking spaces should be identified for drivers entering a parking lot or structure.

Parked vehicle overhangs should not reduce the clear width of an accessible circulation route.

All markings should be of a slip resistant type. It is not recommended to paint the entire surface of the accessible parking space if the paint will make the surface slippery when wet.

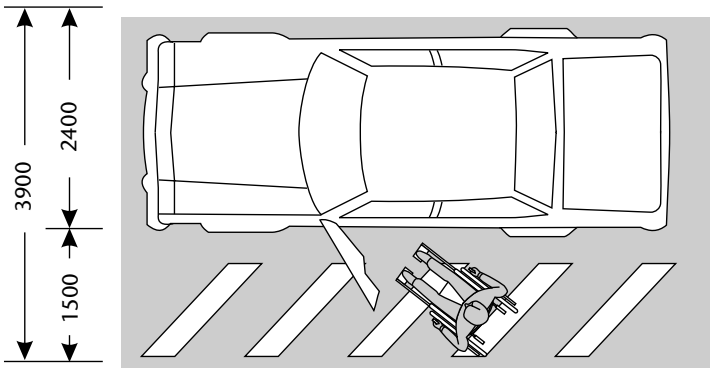


Figure 50
Parking Stall

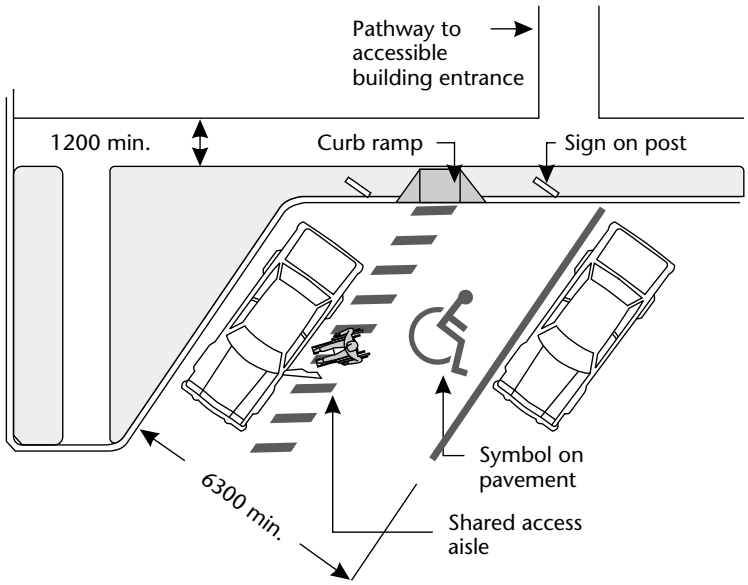


Figure 51
Parking Stall, Diagonal to Curb

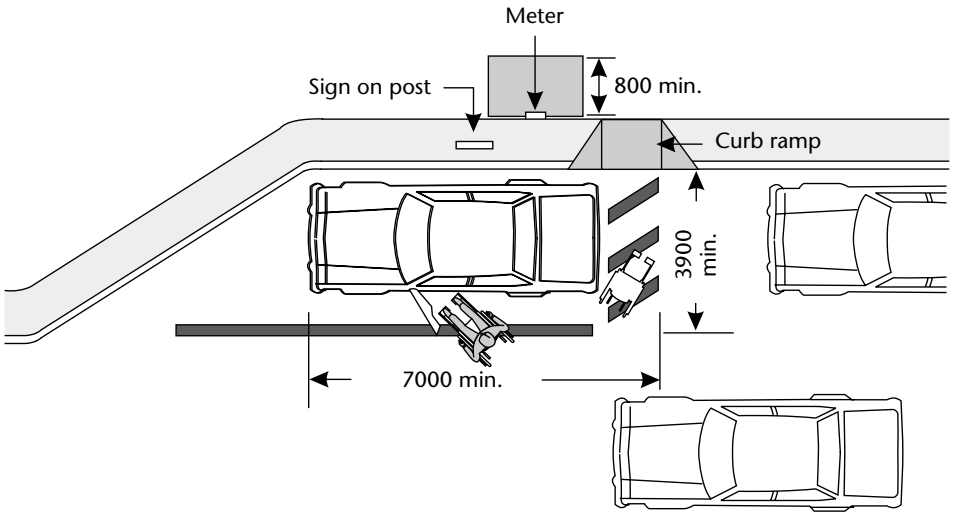


Figure 52
Parallel Parking Stalls

7.3 Van Parking Spaces

7.3.1 Size

Van parking spaces shall be at least 4600 mm wide, except for parallel parking spaces, which shall be at least 2600 mm wide by 7400 mm long (Figures 53 and 54).

7.3.2 Height Clearance

Van parking spaces shall have a height clearance of at least 2750 mm at the parking space and along the vehicle access and egress routes.

Commentary: Vans require a wider parking stall because wheelchair entry into the van is often via a side door with a mechanical platform lift which extends outside the van. Additional manoeuvring space is required beyond the platform.

For parallel van parking, space is required behind the stall because some vans have the wheelchair entry and mechanical platform lift at the back of the vehicle.

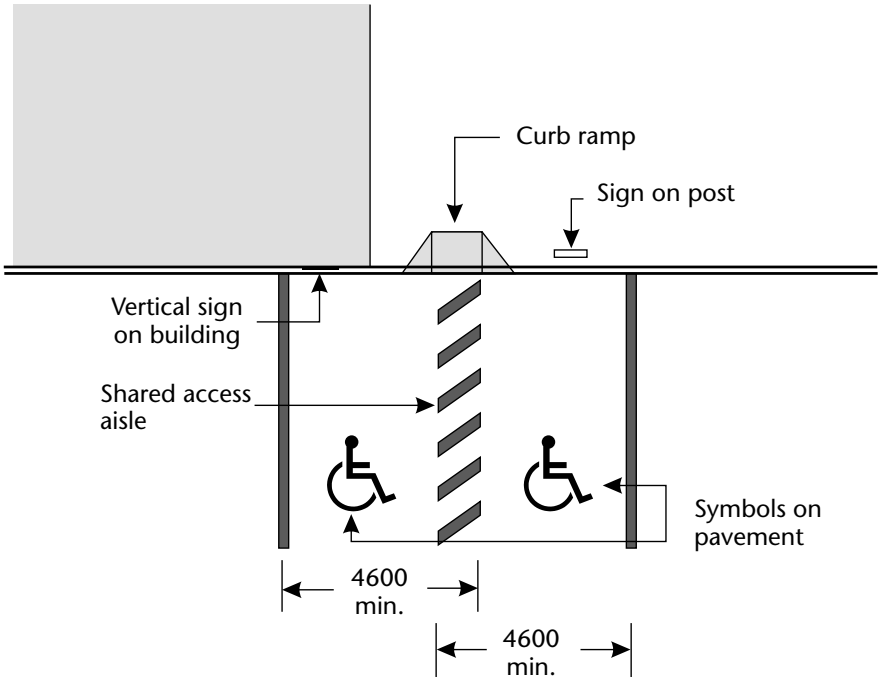


Figure 53
Van Parking Stall

Commentary: Widening the sidewalk at the unloading area may be necessary to give wheelchair users adequate room to turn after using a vehicle side-lift.

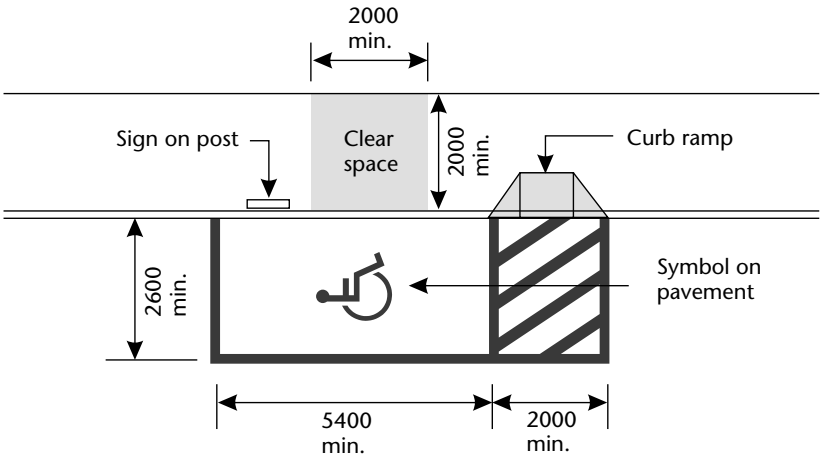


Figure 54
Parallel Van Parking Stall

7.4 Signs

7.4.1 Designated Stalls

Accessible parking stalls shall be designated as reserved for use by persons with disabilities by the
(a) Uniform Traffic Control Sign, mounted vertically (Figure 55); and
(b) international symbol of access on the pavement of the stall (Figure 46).

Δ

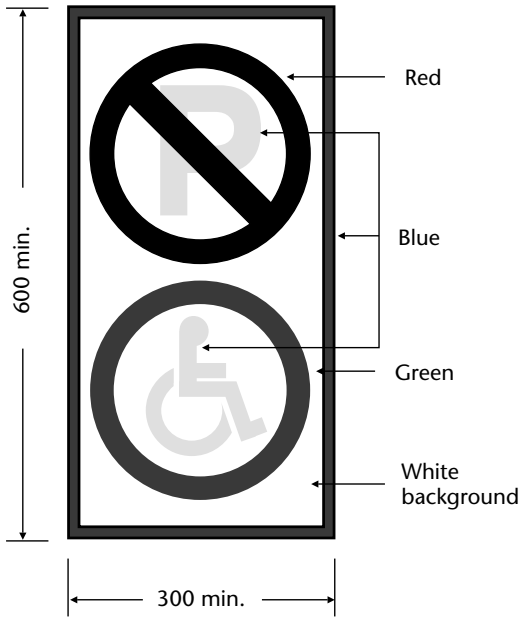


Figure 55
Uniform Traffic Control Sign Identifying
Parking Spaces Reserved for Persons with Disabilities

7.4.2 Vertical Signs

Vertical signs shall be

(a) at least 300 x 450 mm; and

(b) installed at a height between 1500 mm and 2500 mm from the ground or floor surface to the centre of the sign.

7.4.3 Symbol of Access

Symbols on the pavement shall be

(a) at least 1000 mm long;

(b) located in the centre of the stall; and

(c) in a colour strongly contrasting with the background pavement.

Commentary: The vertical sign should be located to make it readily visible by a driver of a vehicle approaching the stall.

Where the location of designated parking areas for persons with disabilities is not obvious or is distant from the approach viewpoints, directional signs should be placed along the route leading to the designated parking stalls (Figure 56).

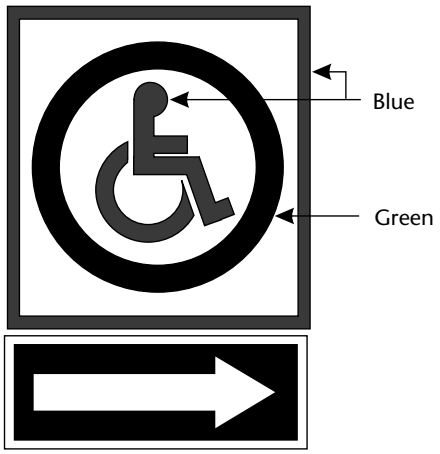


Figure 56
Sign Pointing to Designated Parking Spaces for Persons with Disabilities

7.5 Passenger Loading Zones

7.5.1 Size and Access

Passenger loading zones shall

(a) provide an access aisle at least 1500 mm wide and 6000 mm long adjacent and parallel to the vehicle pull-up space (Figure 57); and

(b) have a curb ramp complying with Clause 4.4 where there are curbs between the access aisle and the vehicle pull-up space.

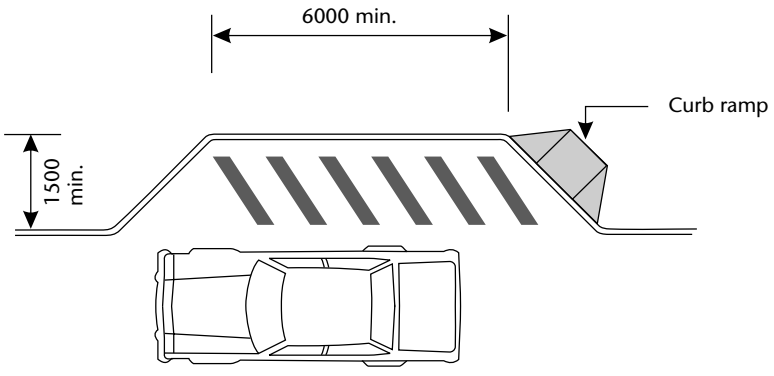


Figure 57
Access Aisle at Passenger Loading Zone

7.5.2 Vertical Clearance

A minimum vertical clearance of 2750 mm shall be provided at accessible passenger loading zones and along vehicle access routes to such areas from site entrances (Figure 58).(b)

Commentary: Where possible, covered passenger loading zones are desirable.

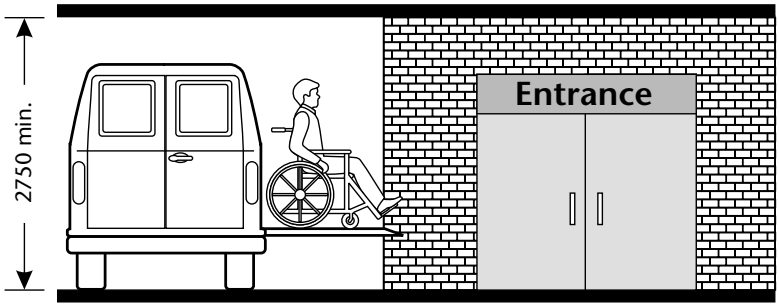


Figure 58
Vertical Clearance at Passenger Loading Zone

8. Seating Spaces

8.1 Seating at Tables and Counters

8.1.1 Clear Floor Space

Seating spaces, such as that provided at counters, tables, or work surfaces for persons in wheelchairs, shall have a clear floor space not less than 750 x 1200 mm.

8.1.2 Clear Knee Space

Where a forward approach is used, a clear knee space at least 750 mm wide, 480 mm deep, and 680 mm high shall be provided which may overlap the clear floor space by a maximum of 480 mm (Figure 59).

Commentary: Height and knee clearances at specialized work surfaces may have different requirements.

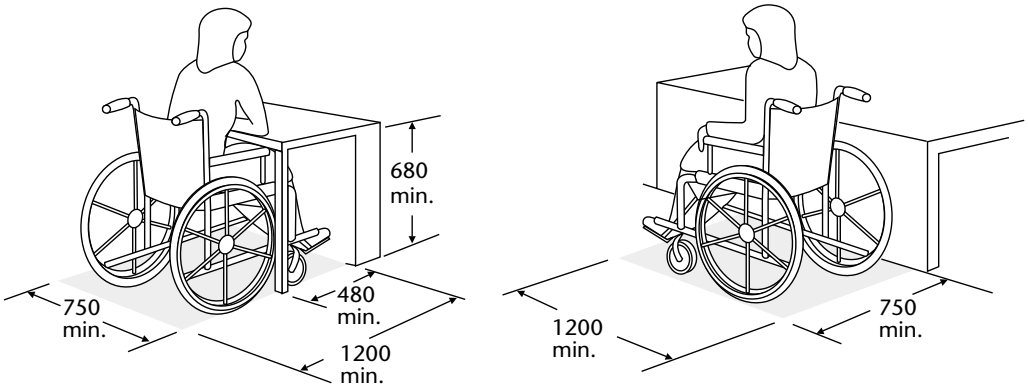


Figure 59
Forward and Side Approach to Table or Counter

8.2 Viewing Positions

Each wheelchair viewing position shall be a clear, level ground or floor area of at least 850 × 120mm.

Commentary: Wheelchair spaces in theatres and other assembly areas should be an integral part of any seating plan. They should be dispersed throughout the seating area and may be created through the use of removable seating. Wheelchair seating areas should adjoin the accessible route and be adjacent to the means of egress in case of emergency. Viewing areas should be located to provide lines of sight comparable to those for all viewing areas. Two wheelchair spaces should be provided side-by-side in any one location with adjacent seating provided for ambulatory companions (Figures 60 and 61).

Persons in wheelchairs usually sit higher than persons in standard seating and care should be taken that viewing positions for persons in wheelchairs are arranged so as not to obstruct the view of persons who may be seated behind (Figure 61).

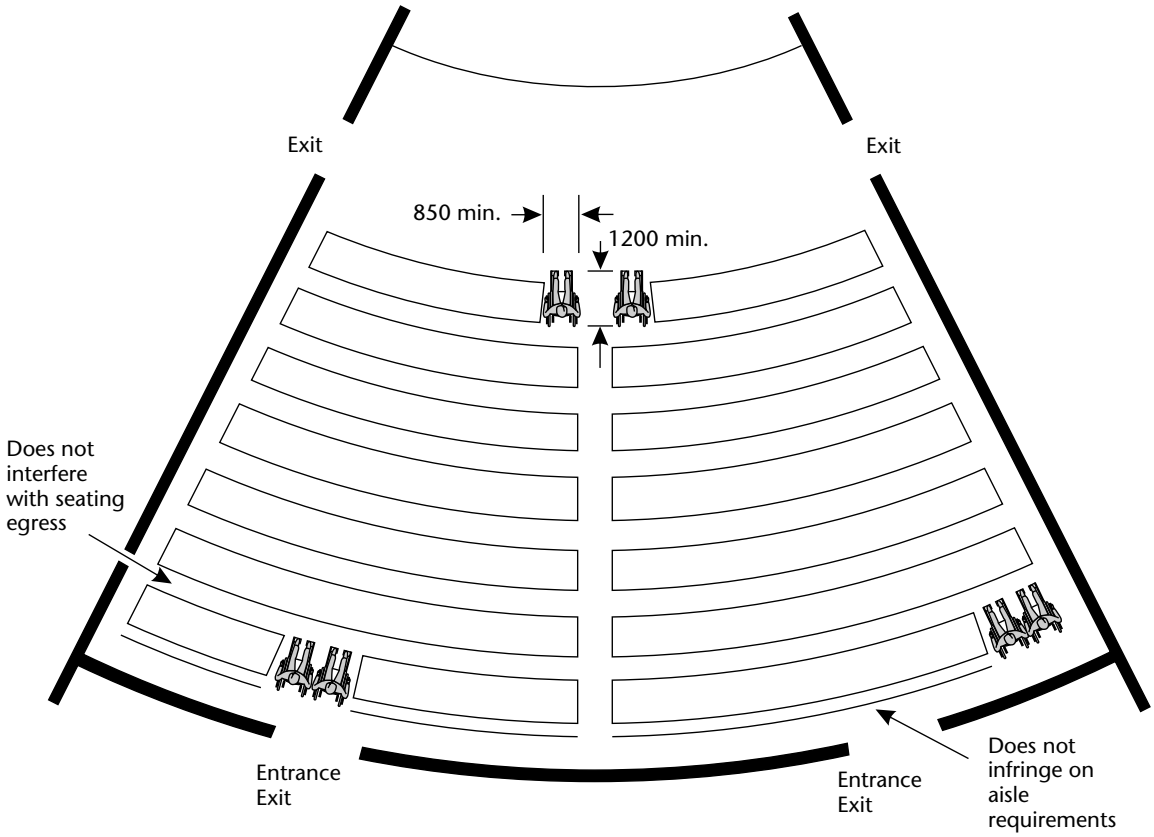


Figure 60
Theatre Viewing Positions

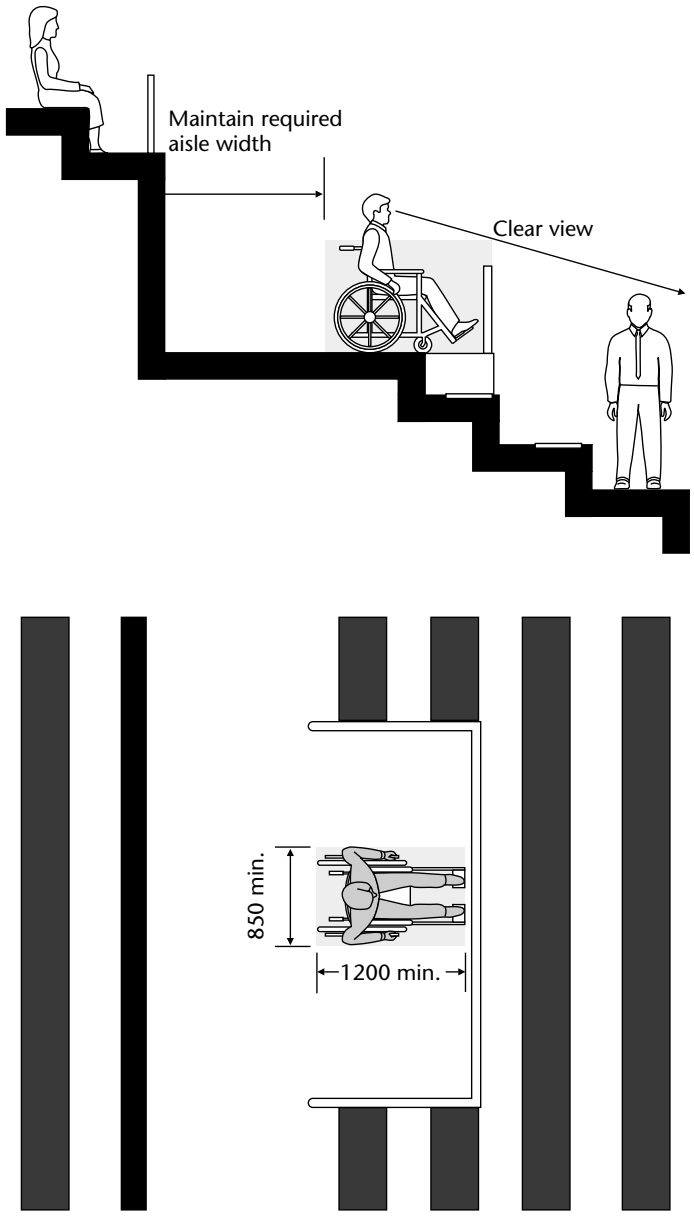


Figure 61
Stadium or Arena Viewing Positions

9. Recreation Facilities

9.1 Benches

Benches shall

(a) be adjacent to an accessible route;
(b) be stable;
(c) have the seat height between 450 and 500 mm from the ground;
(d) have arm and back rests; and
(e) have an adjacent level, firm ground surface at least 850 x 1200 mm.

Commentary: Benches should be set back from the walkway, on the same level as the walkway. If the seat slopes towards the back, it should slope only slightly to allow persons with disabilities to raise themselves easily when getting off the bench.

The space adjacent to the seat is provided to accommodate a person in a wheelchair (Figure 62).

A contrasting walking surface helps visually impaired persons to locate the facility.

If the space adjacent to the seat backs onto a downward slope, then provide a 75 mm high curb to retain the wheelchair.

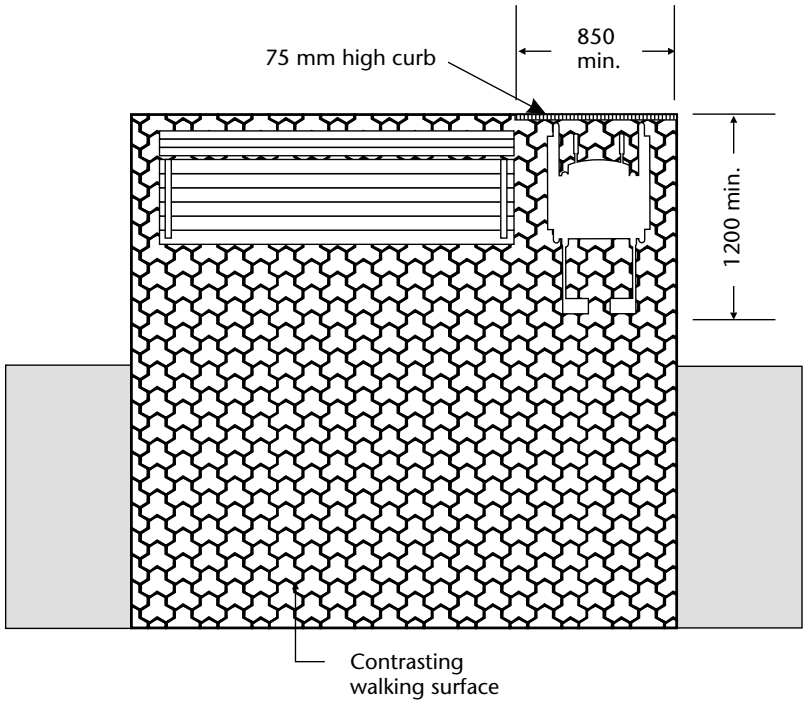


Figure 62
Bench

9.2 Picnic Tables

Picnic tables shall

(a) be adjacent to an accessible route:

(b) have knee space under the table at least 750 mm wide by 480 mm deep and 680 mm high; and

(c) have a level, firm ground surface extending at least 2000 mm on all sides of the table (Figure 63).

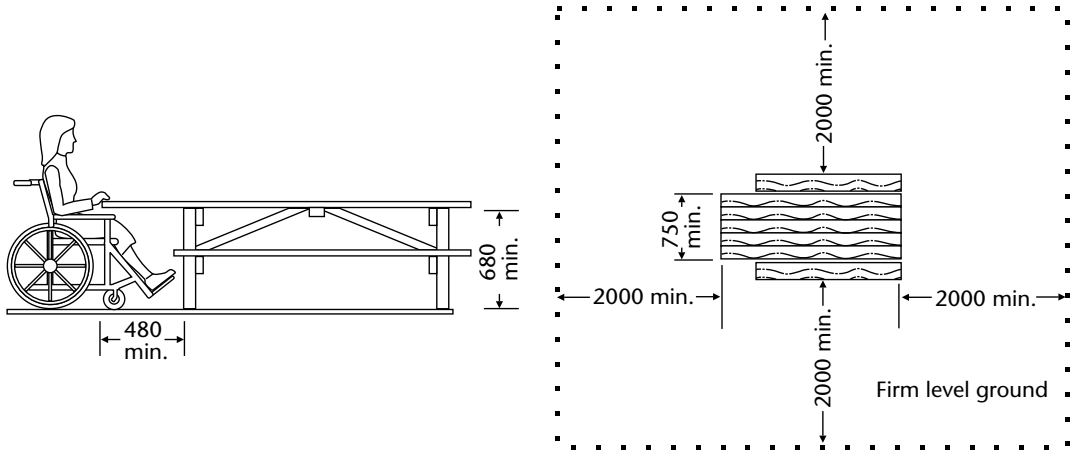


Figure 63
Picnic Table

10. Residential Units

Commentary: This section describes two levels of accessibility: Basic Access and Complete Access. Requirements specified in the Basic Access section ensure a reasonable level of access that can accommodate visitors in wheelchairs as well as temporarily disabled residents and elderly persons. While a person in a wheelchair would be able to manoeuvre independently throughout the unit, the use of the kitchen, bathroom, or other functional areas may still be somewhat restricted. Basic Access describes requirements for dwelling units sometimes referred to as "mobility", "universally accessible", or "adaptable" units.

The Complete Access section specifies requirements additional to those in Clause 10.1 in order to ensure usability for residents in wheelchairs.

10.1 Basic Access

10.1.1 Circulation

10.1.1.1 Corridor and Path Widths

Corridor and path widths shall be at least

(a) 920 mm wide for interior routes; and

(b) 1200 mm wide for exterior routes.

Commentary: Corridor widths should allow for manoeuvring space at doorways (Figure 65).

10.1.1.2 Doors

10.1.1.2.1
The minimum clear opening of doorways shall be 810 mm with the door open 90°, measured between the face of the door and the stop (Figure 64(a)).

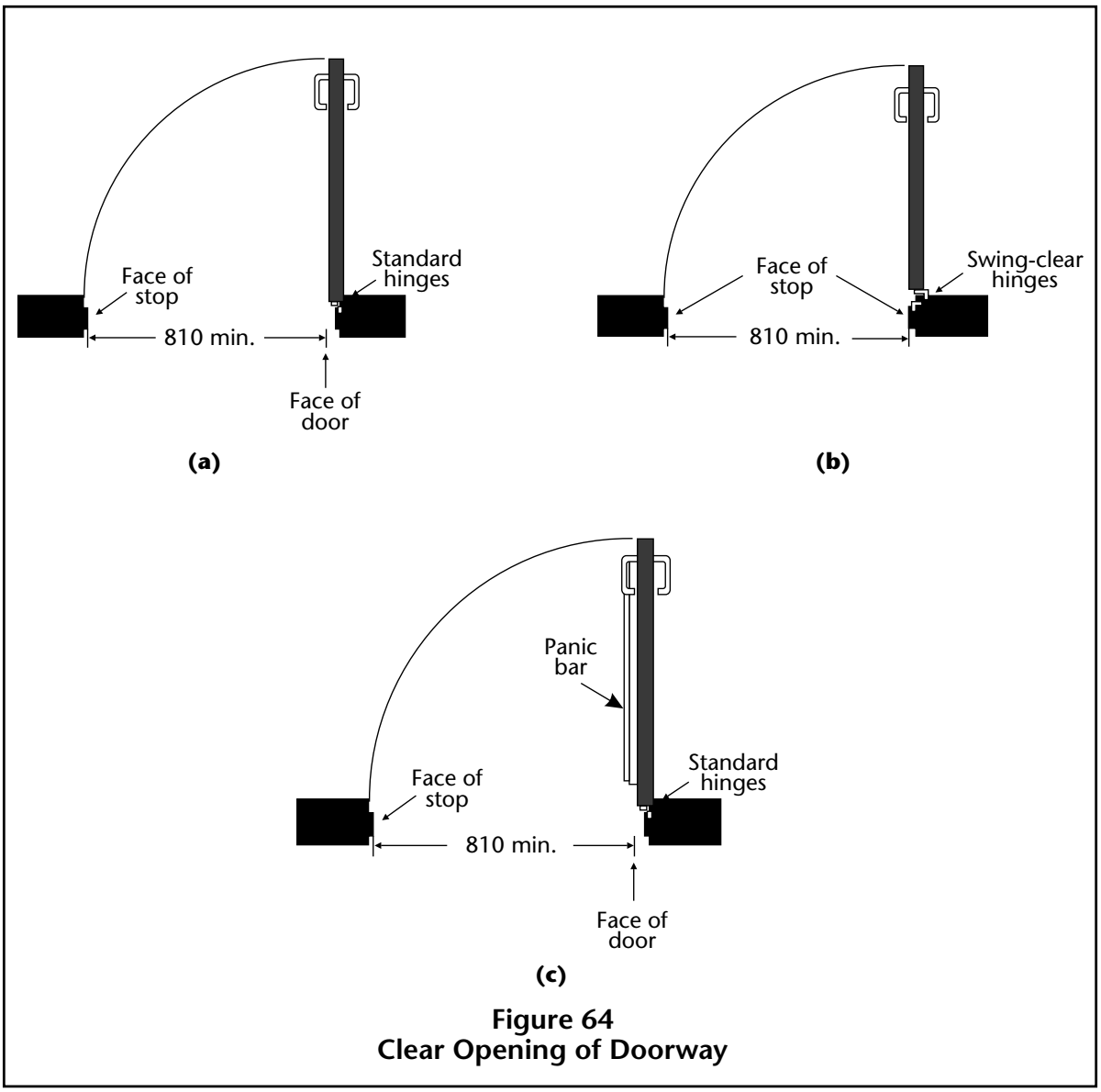


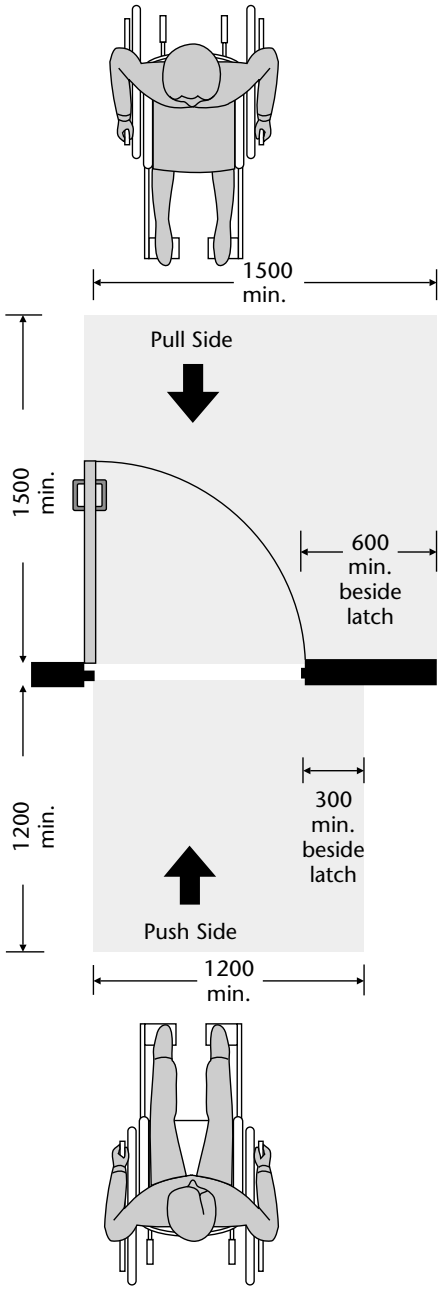
Figure 64
Clear Opening of Doorway

10.1.1.2.2
Doorways shall have wheelchair manoeuvring space on both sides of the door and a clear space beside the latch as described in Table 5, except where access is only required from one side, such as to a closet (Figure 65).

Table 5
Manoeuvring Space at Doors, mm

Context	Floor space required		Space beside latch
	Depth	Width	
Side-hinged door			
Front approach (Figure 65(a))			
Pull side	1500	1500	600
Push side	1200	1200	300
Latch side approach (Figure 65(b))			
Pull side	1200	1500	600
Push side	1050	1500	600
Hinge side approach (Figure 65(c))			
Pull side	1500	1500	600
Push side	1050	1350	450
Sliding door (Figure 65(d))			
Front approach	1250	900	50
Side approach	1050	1350	540

Commentary: Bathroom doors should swing out so that a person inside the bathroom does not fall against the door and block it. Consideration should be given to sliding and bi-fold doors which can be easier to operate and which require less wheelchair manoeuvring space.

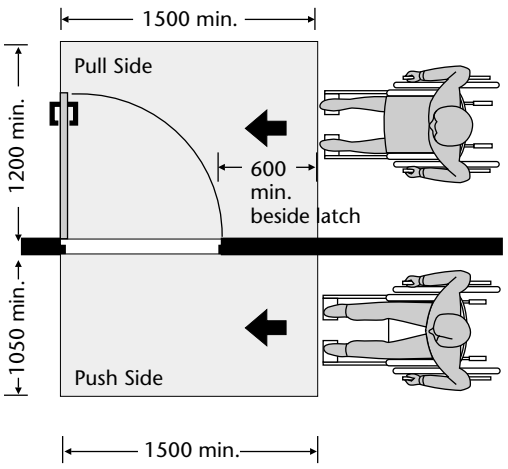


(a) Front approach at hinged door

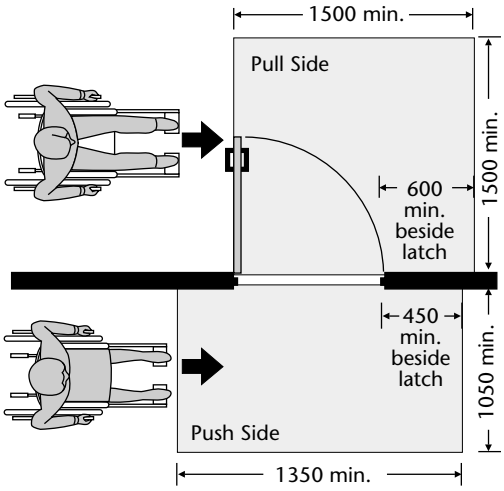
Figure 65
Minimum Doorway Manoeuvring Space

(Continued)

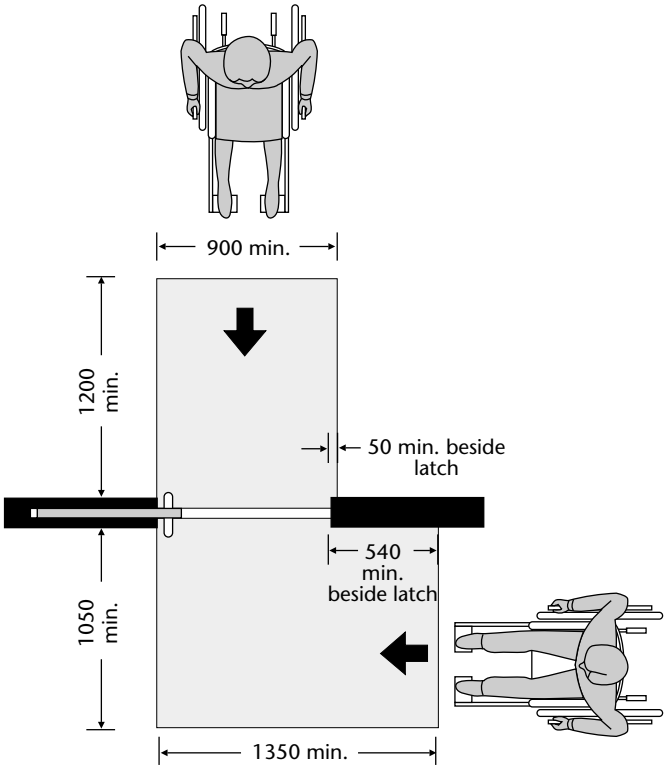
Δ



(b) Latch side approach at hinged door



(c) Hinge side approach at hinged door



(d) Front and side approach at sliding door

Figure 65 *(Concluded)*

10.1.1.2.3

Thresholds shall

(a) be not more than 13 mm high;
(b) at exterior sliding doors, be not more than 19 mm high; and
(c) where over 6 mm high, be bevelled with a slope not more than 1:2.

Commentary: Wherever possible, thresholds should be avoided.

10.1.1.2.4

The maximum force for pushing or pulling open a door shall be

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

Commentary: These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.

10.1.1.2.5

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 between 400 and 1200 mm from the floor.

Commentary: Lever handles are preferred on latched doors. Care should be taken with sliding doors to ensure that the operating mechanisms conform with this requirement.

There are exterior residential doors that require two hands; one hand to hold the lock open while the other hand is used simultaneously to turn the handle. These are not considered accessible.

10.1.1.2.6

Where door viewers are provided, one shall be located at a height between 1100 and 1200 mm from the floor and the other shall be located at the normal height for a standing adult.

10.1.1.3 Floor Surfaces

Floor surfaces shall

(a) be firm and slip resistant (see Appendix A);
(b) have no abrupt changes in level except as described in Clause 10.1.1.2.3; and
(c) if carpets or carpet tiles are used,
    (i) be securely fixed;
    (ii) have a firm cushion, pad, or backing, where used;

(iii) have a level loop, textured loop, level cut pile, or level cut/uncut pile texture with a maximum pad and pile height of 13 mm; and

(iv) have exposed edges of carpet fastened to floor surfaces and trim along the entire length of the exposed edge complying with Clause 10.1.1.2.3.

10.1.2 Controls and Outlets

The operable part of controls, such as thermostats, electrical switches, circuit breakers, locks and intercom buttons, microphones, and electrical and communication wall outlets shall be

(a) located adjacent to a clear floor space which has a width of 750 mm;
(b) located at a height between 400 and 1200 mm from the floor;
(c) operable with one hand;
(d) of a type which does not re
uire tight grasping, pinching, or twisting of the wrist;
(e) operable with a force less than 22 N; and
(f) capable of being illuminated to a level of at least 100 lx.

10.1.3 Windows

Opening and locking mechanisms shall comply with the re
uirements of Clause 10.1.2.

10.1.4 Visual Alarms

Visual alarms shall be lights that flash at a fre
uency of approximately 1 Hz in conjunction with the audible emergency alarms.

Commentary: Specialized systems using advanced technology may be substituted if equivalent protection is provided for residents who are deaf or hard of hearing.

10.1.5 Bathrooms

Bathrooms shall have

(a) a space at least 1500 x 1500 mm for access to the toilet and the fixture itself and this access space may overlap access space for other fixtures;
(b) the distance between the centreline of the toilet fixture and the adjacent wall between 460 and 480 mm; and
(c) beside the toilet, shower, and bathtub walls, structural support to allow the installation of grab bars capable of resisting a force of at least 1.3 kN applied vertically or horizontally (Figure 66).

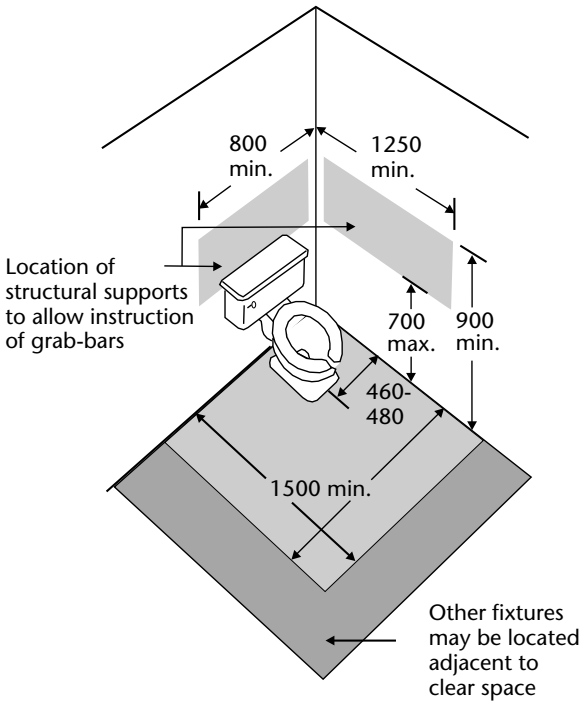


Figure 66
Bathroom

10.1.6 Kitchens

The minimum clearance between counters and all opposing base cabinets, countertops, appliances, or walls in kitchens shall be 1200 mm, except in U-shaped kitchens, where the minimum clearance shall be 1500 mm.

10.1.7 Laundry Facilities

A clear floor space at least 750 x 1200 mm shall be provided in front of clothes washing and drying equipment (Figure 67).

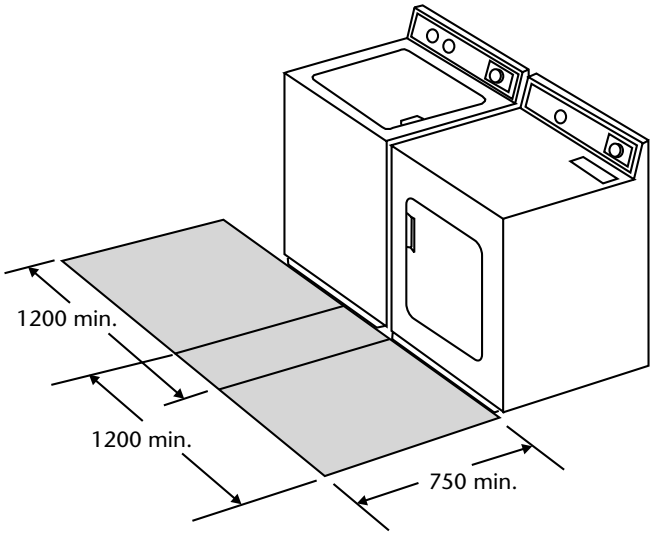


Figure 67
Laundry Facilities

10.1.8 Outdoor Living Areas

Outdoor living areas such as patios, balconies, or decks shall be

(a) at least 1500 x 1500 mm;
(b) adjacent to an accessible route; and
(c) capable of being illuminated to a level of at least 100 lx at the floor level.

10.2 Complete Access

10.2.1 General

For those units which are to be completely accessible, the requirements of Clause 10.2 in addition to the requirements of Clause 10.1 shall apply.

10.2.2 Elevating Devices

Elevating devices for persons with disabilities in private residences shall comply with CSA Standards CAN/CSA-B613, CAN/CSA-B355 and CAN/CSA-B44 as applicable.

10.2.3 Bathrooms

10.2.3.1 Toilets

Toilets shall comply with Clause 10.1.5.

Commentary: Where individuals require higher toilet seats, seat height adapters are available.

10.2.3.1.1

Toilets shall be equipped with horizontal grab bars which shall

(a) comply with Clause 10.2.3.7;

(b) be mounted on the side wall closest to the toilet extending from a point not more than 300 mm from the rear wall to at least 450 mm in front of the toilet seat;

(c) be at least 600 mm long and be mounted on the wall behind the toilet; and

(d) be mounted between 750 and 850 mm from the floor level (Figure 68).

Commentary: Where a vertical grab bar is installed, it should be located 250 mm in front of the toilet. Grab bar dimensions should be measured to the centreline. Flip-down grab bars may be used.

10.2.3.1.2

Toilet paper dispensers shall be located below the grab bar in line with the front of the toilet seat not less than 600 mm from the floor (Figure 68).

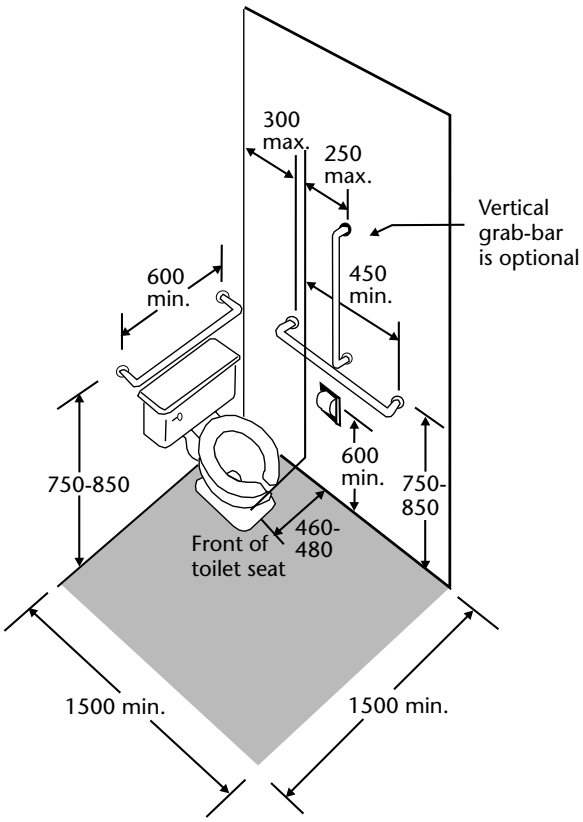


Figure 68
Grab Bars

10.2.3.2 Lavatory

10.2.3.2.1

Lavatories shall

(a) be mounted so that the minimum distance between the centreline of the fixture and the side wall is 460 mm (Figure 69);

(b) have the top located between 820 and 860 mm from the floor (Figure 69);

(c) have a knee space at least 750 mm wide, 200 mm deep, and 680 mm high with an additional toe space at least 750 mm wide, 230 mm deep, and 230 mm high (Figure 69);

(d) have a minimum clear floor space 750 mm wide and 1200 mm deep of which a maximum of 480 mm in depth may be under the lavatory (Figure 69); and

(e) have hot water and drain pipes insulated if they abut the clearances noted above.

10.2.3.2.2

Faucets and other controls shall

(a) have handles of the lever type (not self-closing) which are operable with a closed fist; or

(b) be electronically controlled.

10.2.3.3 Bathroom Accessories

Where bathroom shelving such as a medicine cabinet or towel storage is provided it shall contain at least one shelf located not more than 1200 mm from the floor.

10.2.3.4 Mirrors

At least one mirror with its bottom edge less than 1000 mm from the floor shall be provided (Figure 69(b)).

10.2.3.5 Bathtubs

10.2.3.5.1 Floor Space

A clear floor space at least 750 mm wide shall be provided in front of a bathtub. The lavatory can encroach a maximum of 300 mm into this floor space, providing there is clear knee and toe space under the lavatory (Figure 69).

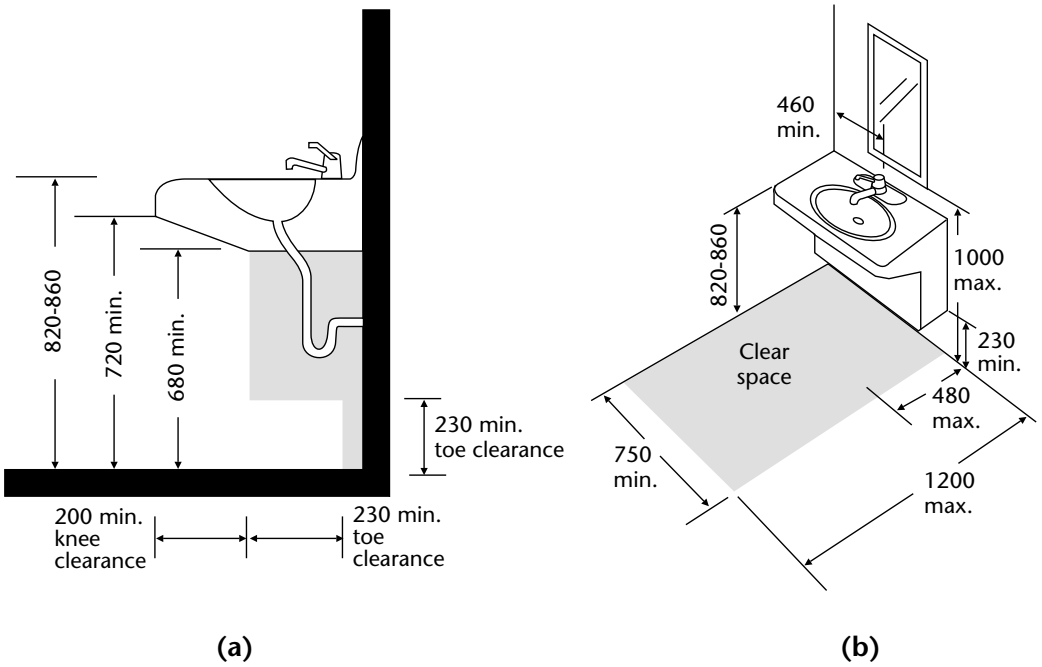


Figure 69
Lavatory Clearances

10.2.3.5.2 Bathtub Grab Bars

Grab bars shall

(a) comply with Clause 10.2.3.7;

(b) be at least 1200 mm long, located horizontally along the length of the bathtub, 180–280 mm above the bathtub rim; and

(c) be at least 1200 mm long, located vertically at the foot end of the bathtub adjacent to the clear floor space, with the lower end between 180 and 280 mm above the bathtub rim (Figure 70).

Commentary: Care should be taken to ensure that the vertical grab bar does not interfere with the shower curtain.

10.2.3.5.3 Bathtub Controls

Faucets and other controls shall

(a) comply with Clause 10.2.3.6.4;

(b) be located at the foot end of the bathtub between the centreline of the bathtub and the clear floor space; and

(c) be not more than 450 mm from the bathtub rim.

Commentary: It is desirable to have a seat 400 mm deep across the width of the bathtub located at the end of the bathtub to allow easier access.

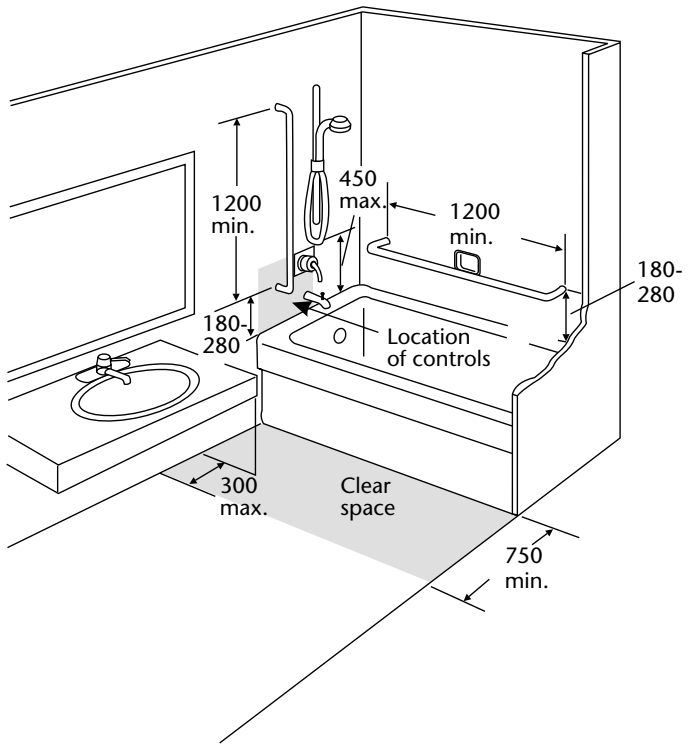


Figure 70
Bathtubs

10.2.3.5.4 Shower Head

A shower head complying with Clause 10.2.3.6.4 shall be provided.

10.2.3.5.5 Bathtub Enclosures

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.

10.2.3.6 Shower Stalls

Commentary: Roll-in shower stalls accommodate persons who prefer to remain in a wheelchair while taking a shower. Shower stalls with a seat accommodate persons who prefer to transfer from a wheelchair to a fixed seat in the shower stall or persons who need to be seated while showering.

10.2.3.6.1 Roll-in Shower Stalls

10.2.3.6.1.1
Roll-in shower stalls shall have interior dimensions of at least 750 x 1500 mm.

10.2.3.6.1.2
The minimum clear floor space in front of the shower entrance shall be 900 x 1200 mm with the 1200 mm dimension parallel to the shower entrance (Figure 71).

10.2.3.6.1.3
Grab bars for roll-in shower stalls shall
(a) comply with the requirements of Clause 10.2.3.7;
(b) be one L-shaped bar or two grab bars in L-shaped configuration; and
(c) be at least 750 x 900 mm with the 900 mm arm set horizontally between 700 and 800 mm from the shower floor (Figure 71).

10.2.3.6.1.4
Controls for roll-in shower stalls shall be mounted on the long wall above the grab bar, not more than 1200 mm from the floor.

10.2.3.6.1.5
Curbs for roll-in shower stalls shall be 6–13 mm high, bevelled at a slope of 1:2.

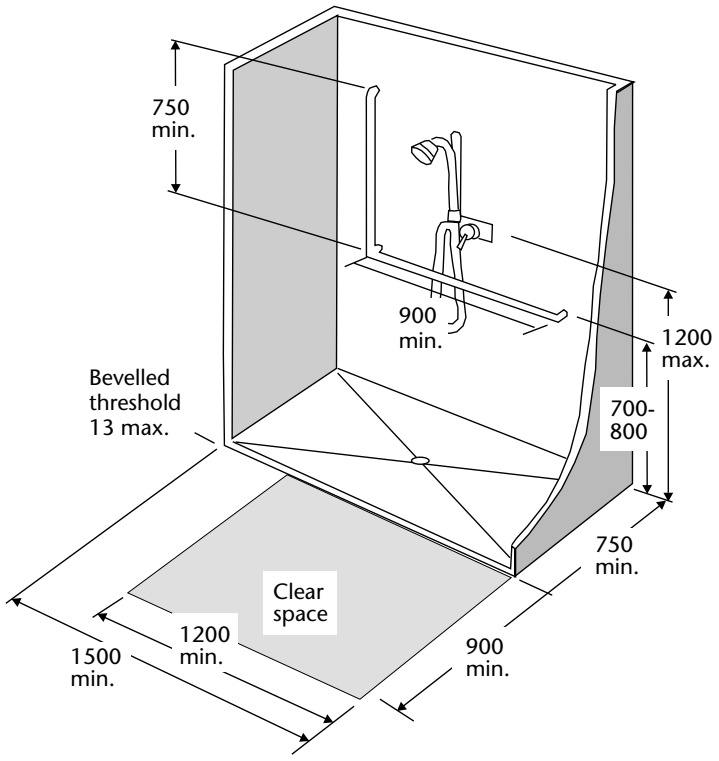


Figure 71
Example of a Roll-In Shower Stall

10.2.3.6.2 Shower Stalls with Seat

Commentary: A seat which folds to a vertical position when not in use will allow persons to use the shower in a seated or standing position. A seat of a colour that contrasts with surrounding surfaces improves safety for visually impaired persons.

10.2.3.6.2.1
Shower stalls with a seat shall have interior dimensions of at least 900 x 900 mm.

10.2.3.6.2.2
In shower stalls with a seat, the seat shall
(a) be on the wall opposite the controls;
(b) be a minimum of 400 mm wide extending the full depth of the stall, less a space allowed for a shower curtain; and
(c) have its top 430–480 mm from the floor.

10.2.3.6.2.3
The minimum clear floor space in front of the shower entrance shall be 900 x 1200 mm with the 1200 mm dimension parallel to the shower entrance, starting from the stall wall opposite the seat, where a seat is provided (Figure 72).

10.2.3.6.2.4
Grab bars in shower stalls with a seat shall
(a) comply with the requirements of Clause 10.2.3.7;
(b) have one grab bar at least 750 mm long installed horizontally on the back wall between 700 and 800 mm from the shower floor (Figure 72); and
(c) have another grab bar at least 750 mm long installed vertically 80–120 mm from the front edge starting between 700 and 800 mm from the floor (Figure 72).

10.2.3.6.2.5
For shower stalls with a seat, all controls, faucets, and the shower unit shall be
(a) mounted on the wall opposite the seat not more than 1200 mm from the floor; and
(b) accessible from outside the stall.

10.2.3.6.2.6
Curbs in shower stalls with a seat shall be not higher than 100 mm.

Commentary: Curb colour should contrast with the flooring colour to reduce the possibility of dangerous tripping.

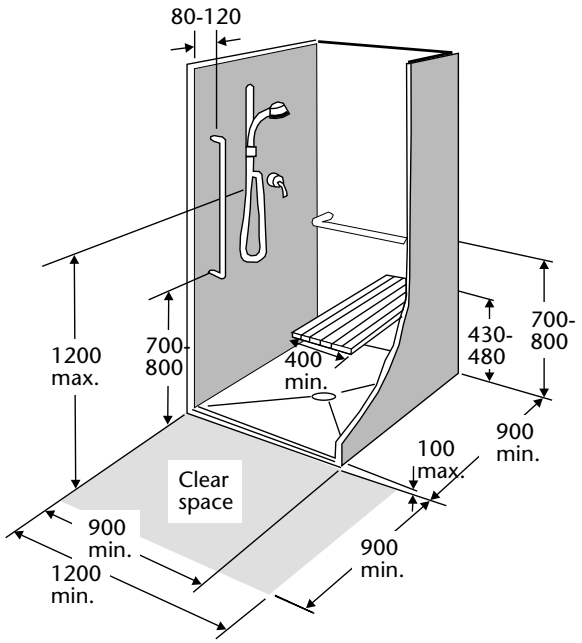


Figure 72
Example of Shower Stall with Seat

10.2.3.6.3 Shower Controls

10.2.3.6.3.1
Faucets and other controls shall be hand operated or electronically controlled.

10.2.3.6.3.2
Hand-operated controls shall
(a) be operable with one hand;
(b) require no tight grasping, pinching, or twisting of the wrist; and
(c) require a force less than 22 N to activate.

10.2.3.6.3.3
Temperature of the water supplied to the shower shall be controlled by a pressure-equalizing valve or by an automatic thermostatically controlled valve.

10.2.3.6.4 Shower Heads

10.2.3.6.4.1
A shower head 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 fixed position.

10.2.3.6.4.2
Where the shower head is mounted on a vertical bar, the bar shall be installed so as not to obstruct the use of grab bars.

10.2.3.6.5 Shower Enclosures
Enclosures for shower stalls shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

10.2.3.6.6 Shower Floors
The floor of the shower shall be slip resistant. (See Appendix A for additional guidance on slip resistance.)

10.2.3.7 Grab Bars

10.2.3.7.1 Size and Spacing
Grab bars shall
(a) be slip resistant;
(b) have a diameter 30–40 mm, or a shape that provides an equivalent gripping surface; and
(c) have a space of 35–45 mm between the wall and the grab bar where mounted adjacent to a wall.

10.2.3.7.2 Structural Strength
Grab bars shall be installed to resist a force at least 1.3 kN applied vertically or horizontally.

10.2.3.7.3 Safety
A grab bar and any wall or other surface adjacent to it shall be free of any sharp or abrasive elements.

10.2.4 Kitchens

10.2.4.1 Clearance Between Counters
Clearances shall comply with Clause 10.1.6 (Figure 73).

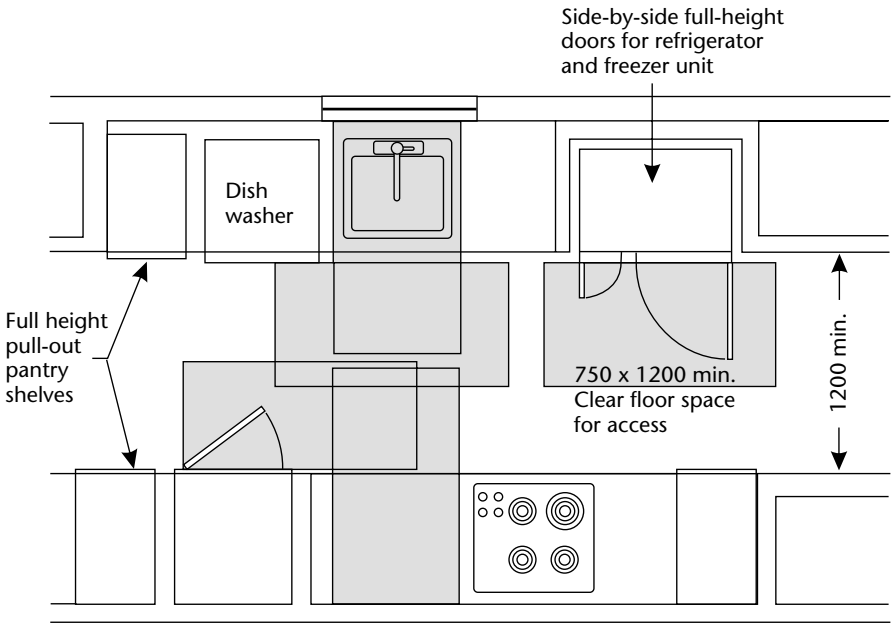


Figure 73
Plan of Parallel Kitchen

10.2.4.2 Clear Floor Space

A clear floor space of at least 750 x 1200 mm shall be provided for side approach at all appliances in the kitchen, including the range or cooktop, oven, refrigerator/freezer, dishwasher, and trash compactor.

10.2.4.3 Controls

All controls in kitchens shall comply with Clause 10.1.2.

10.2.4.4 Work Surfaces

At least one work surface shall

(a) be at least 750 mm wide x 600 mm deep;

(b) be at a height between 810 and 860 mm;

(c) have a clear floor space of at least 750 mm x 1200 mm which may extend up to 480 mm underneath the work surface;

(d) have knee space at least 750 mm wide, 480 mm deep, and 680 mm high (Figures 74 and 75);

(e) have no sharp or abrasive surfaces under it; and

(f) have accessible electrical outlets at the side or the front of it.

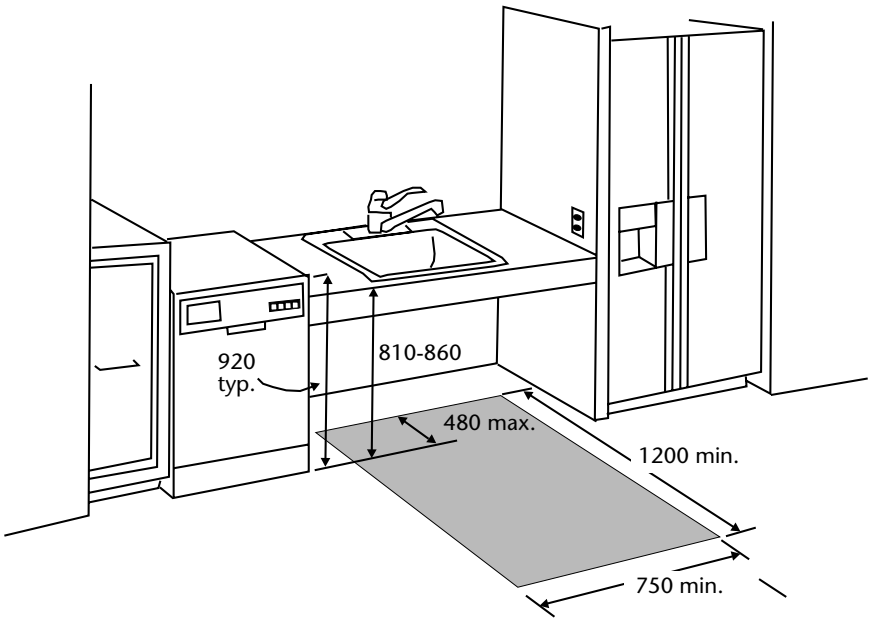
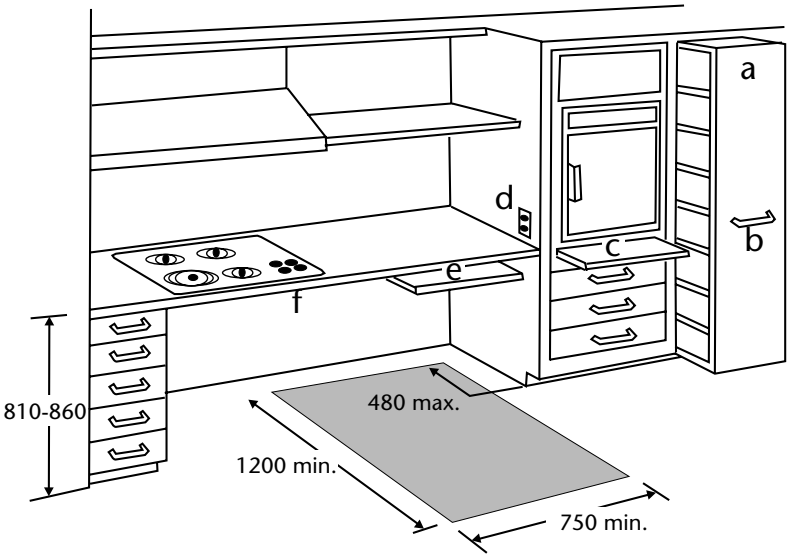


Figure 74
Work Surface and Sink

Commentary: A pull-out workboard below the standard countertop level is desirable.



a Full height pull-out pantry shelves
b "D" type pulls on cupboards and drawers
c Pull-out shelf under wall oven
d Electric outlets accessible from seated position
e Pull-out workboards for easy access and use
f Knee space under countertop cooking unit

Figure 75
Cooking Unit, Oven, and Pantry Storage

10.2.4.5 Base Cabinets

Base cabinets shall have a toe space at least 150 mm deep and 230 mm high.

10.2.4.6 Sinks

Sinks shall

(a) be mounted with the rim height between 810 and 860 mm from the floor;

(b) have a knee space at least 750 mm wide ’ 250 mm deep ’ 680 mm high plus a toe space at least 750 mm wide ’ 230 mm deep ’ 230 mm high;

(c) have a clear floor space at least 750 ’ 1200 mm in front of it; up to 480 mm of this space may extend under it;

(d) have faucets with handles of the lever type that are operable with a closed fist or have faucets that are electronically controlled;

(e) have no sharp or abrasive surfaces under it; and

(f) have hot water, drain pipes, and its underside insulated if they abut the clearances noted above (Figure 74).

10.2.4.7 Cooktops

Ranges and cooktops shall have

(a) controls which do not require reaching across the burners to operate;

(b) insulation or other protection on the underside where knee space is provided; and

(c) a clear floor space at least 750 ’ 1200 mm which may overlap a knee space by up to 480 mm (Figure 75).

10.2.4.8 Ovens

Ovens shall have

(a) controls located on the front panel; and

(b) for side-opening oven doors, the latch next to a horizontal surface, or a pull-out shelf under it which shall

- (i) extend the full width of the oven; and
- (ii) pull out not less than 250 mm (Figure 75).

Commentary: It is recommended that ovens be self-cleaning. Side-opening doors are preferred over bottom-hinged doors to avoid burns. Microwave ovens are also very convenient.

10.2.4.9 Refrigerators/Freezers

Refrigerators/freezers shall be self-defrosting and of the

(a) vertical side-by-side type (Figure 74); or

(b) over-and-under type with

- (i) at least 50% of the freezer space below 1370 mm from the floor; and
- (ii) 100% of the refrigerator space and controls below 1370 mm from the floor.

10.2.4.10 Dishwashers

Where dishwashers are installed, they shall be front-loading.

10.2.4.11 Kitchen Storage

Cabinets, drawers, and shelf storage areas shall have

(a) at least one shelf not more than 1200 mm from the floor where it is above a work counter;
(b) door pulls or handles mounted close to the
    (i) bottom of upper cabinet doors; and
    (ii) top of base cabinet doors; and
(c) a toe space at least 150 mm deep and 230 mm high provided in base cabinets.

Commentary: Full-height storage cabinets provide a good range of accessible storage. This is particularly desirable because, in accessible kitchens, the amount of base storage is reduced by the knee space provisions. "D" type pulls can be used easily by persons with hand disabilities. A good basic rule for kitchen storage is to provide shelving above counter height and drawers below.

10.2.4.12 Clothes Storage

Clothes storage shall have

(a) a clothes rail not higher than 1400 mm;
(b) at least three shelves between 400 and 1200 mm from the floor; and

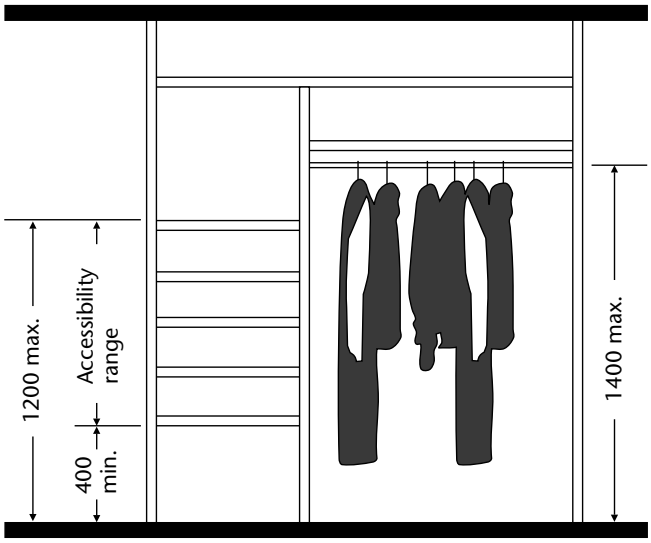


Figure 76
Clothes Storage

(c) a clear floor space at least 750 x 1200 mm in front of the storage area (Figure 76).

10.2.5 Miscellaneous Components

Components such as garbage disposal units, hose bibs, and post boxes shall have

(a) a clear floor area at least 750 x 1200 mm in front of the component; and
(b) controls and operating parts which comply with Clause 10.1.2.

Appendix A
Slip Resistance of Floor Finishes

Note: *This Appendix is not a mandatory part of this Standard.*

Table A1
Slip Resistance of Typical Flooring Surfaces

Source: British Standard 5395 Part 1:1977, *Code of Practice for the Design of Straight Stairs*.

	Slip resistance*		
Material	**Dry and unpolished**	**Wet**	**Remark**
Clay tiles (Carborundum finish)	very god	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	good	
PVC with nonslip 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	
Vinyl asbestos tiles	good	fair	
Linoleum	good	poor to fair	Edges of sheets may cause tripping if not securely fixed to base.
Concrete	good	poor to fair	If a textured finish or a nonslip aggregate is used, slip resistance value when wet may be increased to good.

(Continued)

Table A1 (Concluded)

Material	Slip resistance*		Remark
	Dry and unpolished	Wet	
Concrete (abrasive grain finish)	very good	very good	Both these finishes should provide service levels equal to clay tiles with Carborum or textures finishes. A light broom finish is commonly used for slip resistance on municipal sidewalks where they have given many years of service.
Concrete (broom textured)	very good	very 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	Nonslip nosing necessary on stairs. Slip resistance when polished or if polish is transferred by shoes from adjacent surfaces very poor.

*Very good *means surface suitable for areas where special care is required, approximates to coefficifent of friction (cof) > 0.75.*
Good *means surface satisfactory for normal use, approximates to cof 0.4 < 0.75.*
Poor to fair *means surface below acceptable safety limits, approximates to cof 0.2 < 0.4.*
Very poor *means surface unsafe, approximates to cof < 0.2.*
Note: *Care should be taken with polishes and cleaners so that the slip resistance is not reduced.*

Appendix B
Anthropometrics

Note: *This Appendix is not a mandatory part of this Standard.*

B1. Scope

B1.1
This Appendix contains dimensions which can be used for guidance when designing facilities and equipment to be used by persons with disabilities.

B2. Reach Ranges for a Person in a Wheelchair

B2.1 Forward Reach

B2.1.1. Without Obstruction
The maximum forward reach is 1200 mm from the floor and the minimum forward reach is 380 mm from the floor (Figure B1).

B2.1.2 Over Obstruction
The maximum forward reach over an obstruction 600 mm deep for touch reach and 500 mm deep for grasp reach is 1100 mm from the floor (Figure B2).

B2.2 Side Reach

B2.2.1 Without Obstruction
The maximum side reach is 1400 mm from the floor and the minimum side reach is 230 mm from the floor (Figure B3).

B2.2.2 Over Obstruction
The maximum side reach over an obstruction 860 mm high and 600 mm deep for touch reach and 500 mm deep for grasp reach is 1200 mm from the floor (Figure B4).

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

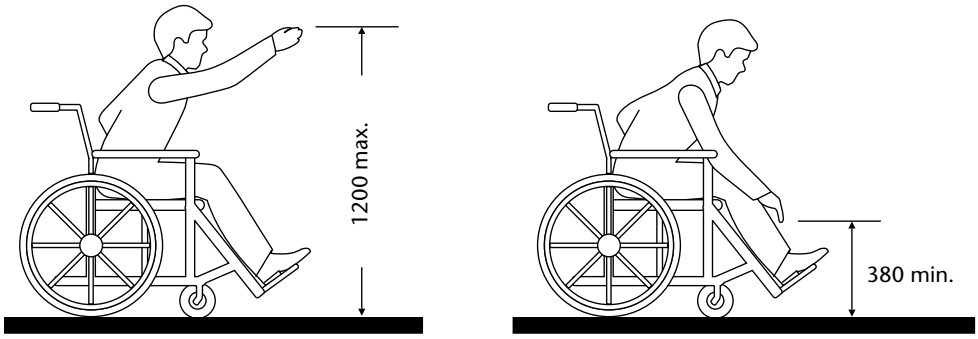


Figure B1
Forward Rearch Without Obstruction

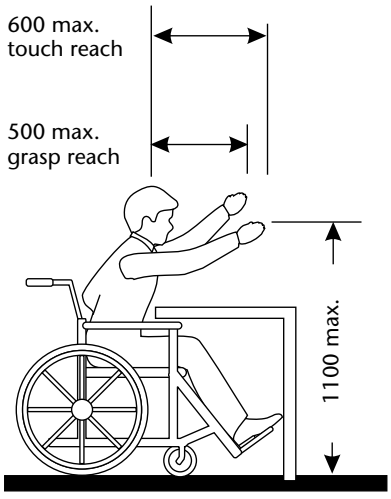


Figure B2
Forward Reach Over Obstruction

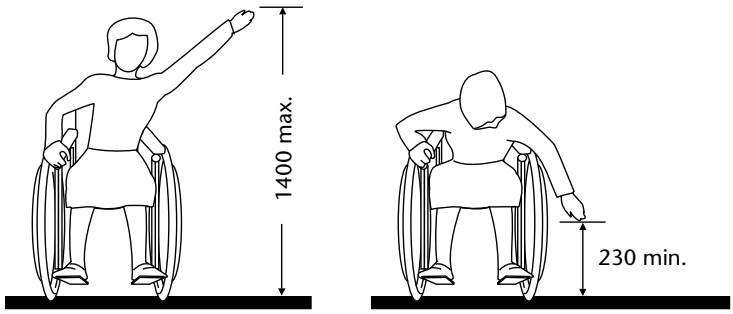


Figure B3
Side Reach Without Obstruction

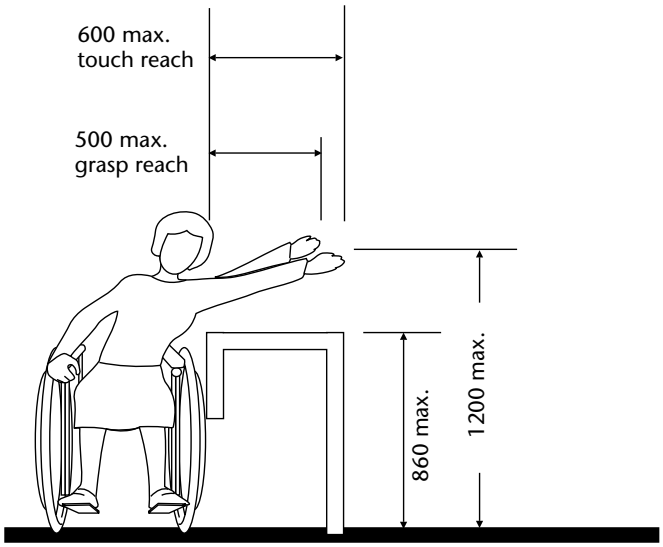


Figure B4
Side Reach Over Obstruction

B3. Wheelchair Dimensions

B3.1

Figure B5 describes some typical dimensions. Manual and electric wheelchairs have similar dimensions, but electric wheelchairs do not always have the same manoeuvrability/capability as manual wheelchairs, and are much heavier. Electric wheelchairs cannot be folded.

For more information on wheelchairs see the following CSA Standards:

CAN/CSA-Z323.4.2-M86, *Wheelchairs—Determination of Overall Dimensions, Mass, and Turning Space;*

CAN/CSA-Z323.4.3-M89, *Wheelchairs—Determination of Static Stability;*

CAN/CSA-Z323.4.4-M89, *Wheelchairs—Determination of Brake Effectiveness;*

CAN/CSA-Z323.4.6-M89, *Wheelchairs—Determination of Maximum Speed, Acceleration, and Retardation of Electric Wheelchairs;*

CAN/CSA-Z323.4.7-M89, *Wheelchairs—Determination of Obstacle-Climbing Ability of Electric Wheelchairs.*

Δ

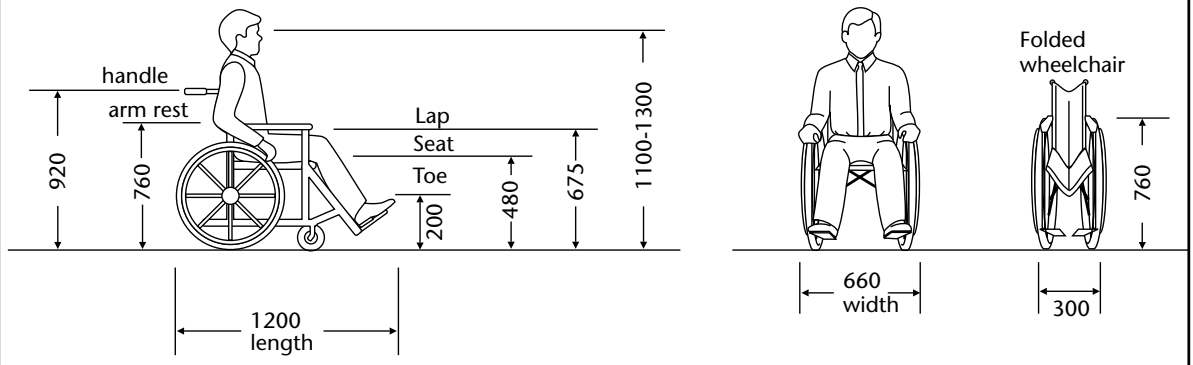


Figure B5
Typical Dimensions of Wheelchairs Commonly Used by Adults

B4. Walkway Widths for Persons Using Crutches

B4.1

Although people who use walking aids can manoeuvre through door openings of 810 mm clear width, they need wider passageways and walks for comfortable gaits (Figure B6). Crutch tips, often extending down at a wide angle, are a hazard in narrow passageways where they might not be seen by other pedestrians.

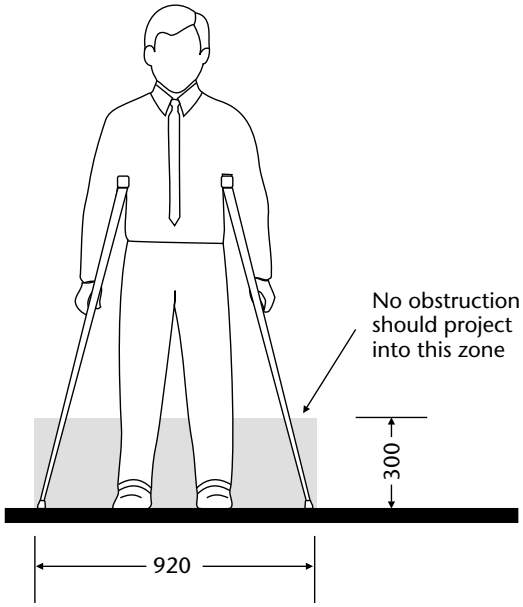


Figure B6
Comfortable Walking Width for Persons Using Crutches

Appendix C
Elevator Requirements

Note: *This Appendix is not a mandatory part of this Standard.*

C1.

C1.1
The following is a reproduction of Appendix E of CSA Standard CAN/CSA-B44-M94.

Appendix E
Elevator Reuirements for Persons with Physical Disabilities

Note: *This Appendix is not a mandatory part of the Standard. It is provided for reference where requirements for persons with physical disabilities are to be incorporated in elevators.*

E1. Scope

E1.1
This Appendix contains reuirements intended to make passenger elevators usable by persons with physical disabilities. These reuirements are in addition to, or modifications of, certain reuirements specified elsewhere in this Standard.

E2. Operation and Levelling

E2.1
The elevator shall be automatic and be provided with a two-way automatic-maintaining levelling device to maintain the floor level to ±13 mm.

E3. Door Operation

E3.1
Power-operated horizontally-sliding car and landing doors opened and closed by automatic means shall be provided.

E4. Door Size

E4.1
The minimum clear width for elevator doors shall be 910 mm.

E5. Door Protective and Reopening Device

E5.1
Doors shall be provided with a door-reopening device that will function to stop and reopen a car door and an adjacent hoist way door to at least 910 mm, in case the car door is obstructed while closing. This reopening device shall also be capable of sensing an object or person in the path of a closing door at a nominal 125 ± 25 mm and 735 ± 25 mm above the floor without re uiring contact for activation.

E5.2
Door-reopening devices shall remain effective for a period of not less than 20 s.

E6. Door Delay (Passenger Service Time)

E6.1
From the time the doors start to open, a minimum period of 4 s shall elapse before the doors start to close, if it is a hall call and 3 s if it is a car call. This time may be reduced after operation of the door close button.

E7. Car Inside

E7.1
The minimum distance between the walls or between wall and door, excluding return panels, shall be not less than 1725 × 1370 mm. The minimum distance from wall to return panel shall be not less than 1295 mm.

E8. Car Controls

E8.1
Controls shall be readily accessible from a wheelchair upon entering an elevator (see Figure E1).

E8.2
Emergency controls and door-operating buttons shall be grouped together at the bottom of the control panel. The centreline of the alarm button and the emergency-stop switch shall be not less than 890 mm from the floor. The centreline of the highest floor button shall be no higher that 1370 mm from the floor. Other controls may be located where it is convenient.

E8.3
Floor registration buttons shall be a minimum 19 mm in size and they may be raised, flush, or recessed. The depth of flush or recessed buttons when they are being operated shall not exceed 10 mm.

E8.4
Arabic numerals shall be adjacent on the left of the floor buttons on a contrasting colour background. Markings shall be a minimum of 16 mm high and raised a minimum of 0.75 mm. Permanently attached plates are acceptable. Where the call buttons are mechanical, the raised markings may be on the buttons.

E8.5
Symbols as indicated in Clause 3.6.1.10 shall be used to assist in readily identifying essential controls.

E8.6
Visual and momentary audible indication shall be provided to show each call registered and visual indication shall be extinguished when the call is answered.

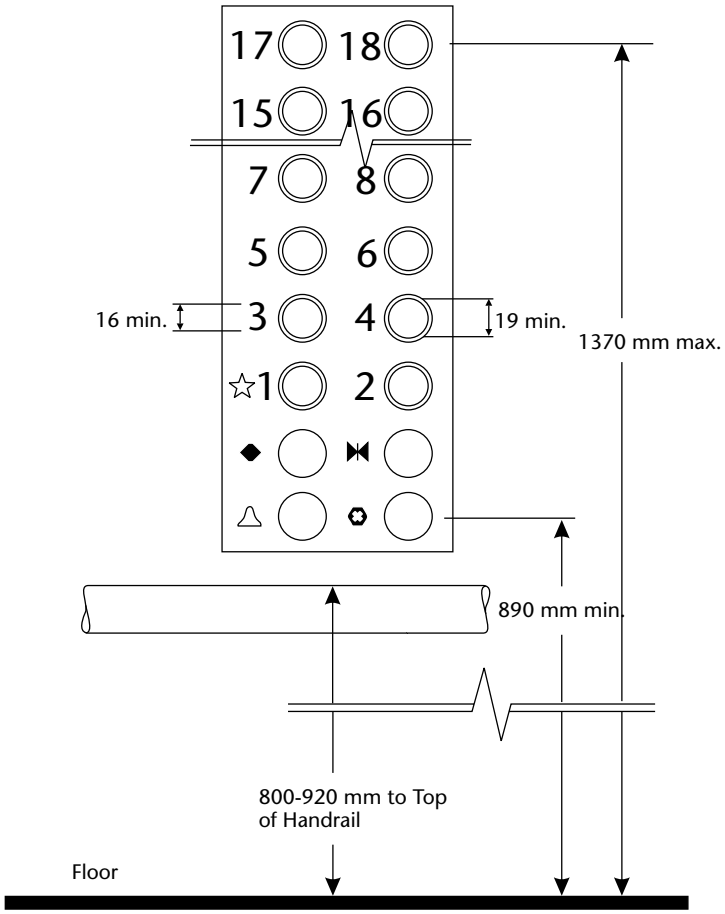


Figure E1
Car Controls

E9. Car Position Indicator

E9.1
An indicator shall be provided in the car to show the position of the car in the hoist way, by illuminating the indication corresponding to the landing at which the car is stopped or passing. Indication characters shall be on a contrasting colour background and a minimum of 16 mm in height.

E10. Telephone

E10.1
The telephone shall be located a maximum of 1220 mm from the floor with a minimum cord length of 900 mm.

E10.2
The international symbol for telephones shall be located on the telephone cabinet in a contrasting colour. The symbol shall be a minimum of 38 mm high and raised a minimum of 0.75 mm. Permanently attached plates are acceptable. Telephones shall be equipped with a receiver that generates a magnetic field in the area of the receiver cap and the telephone shall have a volume control and shall comply with CSA Standard T515.

E11. Floor Covering

E11.1
The floor shall have a firm and slip resistant surface that permits easy movement of wheelchairs.

E12. Handrails

E12.1
Handrails shall be provided on all non-access walls at a height of 800 to 920 mm with a space of 35-45 mm between the rails and wall.

E13. Illumination

E13.1
The illumination at the car controls and landing sill shall be not less than 100 lx.

E14. Hall Buttons

E14.1
The centreline of the hall call buttons shall be 1070 ± 25 mm above the floor. Buttons shall be a minimum of 20 mm in size, and shall be mounted one above the other.

E14.2
Visual indication shall be provided to show each call that is registered and that is extinguished when the call is answered.

E15. Hall or In-Car Lanterns

E15.1
Hall or in-car lanterns shall be provided. The centreline of the fixture shall be a minimum of 1830 mm above the floor. An audible signal, shall be provided when the elevator stops at the landing. Visual elements shall be a minimum of 60 mm in the smallest direction.

E16. Floor Designations

E16.1
Arabic numerals a minimum of 50 mm high and raised at least 0.75 mm shall be placed on both sides of the door jambs, with the centre line at 1500 ± 25 mm from the floor to identify the floor level.

Commentary: Where the depth of the elevator cab makes it difficult for wheelchair users to turn around, provide a mirror on the rear wall so they can see the car position indicator above the door.

C2. Other Considerations

C2.1
In addition to the above requirements of Appendix E of CSA Standard CAN/CSA-B44, it is also recommended that the following be considered:
(a) as the car passes or stops at a floor, an audible signal should sound inside the elevator at a minimum of 20 dB at a frequency no higher than 1500 Hz; and
(b) there should be a colour contrast between the car sill and the building floor and between the door frame and the wall.

Index

A

Adaptable units 10.1
- Aisles 10.1.1.1
- Floor area 10.1.1.3, 10.1.5,10.1.7, 10.1.8

Alarms 6.1, 10.1.4
Anthropometrics App. B
Apartments 10
Application of requirements 1.2
Areas of refuge 4.9
Assistive listening systems 6.3
Audio amplification systems 6.3
Audio loops 6.3
Auditorium seating 8.2
Automatic doors 4.2.8

B

Bathrooms 10.1.5, 10.2.3
- Accessories 10.2.3.3

Balconies—see Thresholds & outdoor living areas
Bathtubs
- Controls 5.8.3, 10.2.3.5.3
- Enclosures 5.8.5, 10.2.3.5.5
- Floor space 5.8.1, 10.2.3.5.1
- Residential, basic 10.1.5
- Residential, complete 10.2.3
- Seat 5.8, 10.2.3.5.3

Basic access 10.1
Benches 9.1
Braille 6.4.5

C

Carpets
- Strong patterns 4.5.3

Changes in level 3.3.2
Checkout lanes 4.1.1
Children 1.3
Circulation 4
- Residential 10.1.1

Clearances for wheelchair 3.1
Closers on doors—see Doors
Clothes dryer or washer—see Laundry
Clothes hanger or rod—see Storage
Coat hook 5.2.1(c)
Cobblestone 3.3.1
Colour contrast
- Detectable warning surface 4.5.3
- Nosings 4.5.2
- Shower curb 5.8.2.6

Communications 6
Complete access 10, 10.2
Controls
- Floor space 3.2.1
- Force to use 3.2.3
- Height 3.2.2
- Illumination 3.2.4
- Operation 3.2.4
- Residential 10.1.2

Cooktop 10.2.4.7
Counters
- Kitchen 10.2.4.1
  - Seating 8.1

Cross slope
- Curb ramps 4.4.1.2
- Ramps 4.3.2

Cupboards—see Storage, clothes
Curbs for showers 5.8.2.6
Curb ramps 4.4
- Flared sides 4.4.4
- Location 4.4.5
- Slope
  - Cross slope 4.4.1.2
  - Running slope 4.4.1.1
- Surfaces 4.4.3
- Width 4.4.2

D

Detectable warning surfaces 4.5.3
Directional signs 6.2.7
Dishwashers 10.2.4.10
Doors
- Clear opening 10.1.1.2.1
- Closet 10.1.1.2.2
- Clear width 4.2.1
- Closers 4.2.6.3
- Double leaf 4.2.2
- Hardware 4.2.6

In series 4.2.4
Manoeuvring space 4.2.3
Opening force 4.2.7
Power-assisted 4.2.8
Pulls (D-type) 5.2.2(d), (e)
Residential 10.1.1.2
Revolving 4.2.8
Sliding 4.2.6.2
Thresholds 4.2.5
Toilet stall 5.2.2
Viewers 10.1.1.2.6
Drinking fountains 5.10
Controls 5.10.2
Floor space 5.10.3
Location 5.10.3.2
Spouts 5.10.1
Wall-mounted 5.10.3.2
Dwelling units—see Residences

E

Egress 4.9.1
Electrical outlets 10.1.2
Elevators 4.7, App. C
Emergency call switch 5.6.2
Entrances 4.2.8
Exit 4.9.1
Exposed aggregate paving 3.3.1
Exterior residential doors 10.1.1.2.5

F

Faucets 5.4.2, 10.2.3.2.2
Lavatories 5.4.2
Fire alarms 6.1, 10.1.4
Firefighters elevator 4.9.1
Fire safety—see Areas of refuge
Flared sides of curb ramps 4.4.4
Floors
Clearance for wheelchair 3.1
Slip resistance App. A
Level changes 3.3.2
Residential 10.1.1.3
Showers 5.8.6
Flush controls
Toilet 5.3.3, 5.3.4
FM systems 6.3
Forward reach App. B2.1
Freezer 10.2.4.9

G

Garage—see Parking
Garbage disposal units 10.2.5
Gates 4.2.8
Grab bars 5.9
Flip-up 5.2.1
Safety 5.9.3
Size & spacing 5.9.1
Strength 5.9.2
Toilet 5.3.4, 10.2.3.1.1
Gradient
Circulation 4.12
Curb ramps 4.4,
Ramps 4.3.1, 4.3.2
Grating 3.3.4
Ground—see Floors

H

Hand-held shower spray 5.8.4
Handrails 4.6
Ramps 4.3.8
Recessed 4.6.2
Stairs 4.5.4
Hardware 4.2.6
Headroom 3.4.5
Hotel rooms—see Residences
Housing 10

I

Illumination
Controls 3.2.4
Elevators App. C
Stairs 4.5.3
Telephones 6.2.4
Indented characters 6.4.5
Induction loops 6.3
Infrared systems 6.3
International symbol of access 6.4.5, 7.4.1
Parking 7.4.3
Telephones 6.2.5.4
Islands 4.4.6

K

Kitchens
Basic 10.1.6
Complete 10.2.4

Controls 10.2.4.3
Cooktops 10.2.4.7
Counters 10.2.4.1
Freezers 10.2.4.9
Ovens 10.2.4.8
Refrigerators 10.2.4.9
Sinks 10.2.4.6
Storage 10.2.4.11
Work surfaces 10.2.4.4
Knee space
Lavatories 5.4.1(c)

L

Landings
Exit stair for area of refuge 4.9.1
Laundry 10.1.7
Lavatories 5.4, 10.2.3.2.1
Letter Box 10.2.5
Lever handles 10.1.1.2.5
Life safety—see Areas of refuge
Lighting—see Illumination
Listening systems 6.3

M

Mail box 10.2.5
Mirrors 5.5.2, 10.2.3.4

N

Nosings of stairs 4.5.2

O

Operating mechanisms—see Controls
Orientation cues 6.4.5
Outdoor living areas 10.1.8
Ovens 10.2.4.8

P

Parking 7
Car space 7.2
Circulation route 7.1
Height 7.3.2
Signs 7.4
Van space 7.3
Passenger loading area 7.5
Access 7.5.1
Size 7.5.1
Vertical clearance 7.5.2
Paths 4.1
Length 4.1.2
Pedestrian crosswalks
Curb ramp location 4.4.4.1, 4.4.5
Platform lifts 4.8.1
Picnic tables 9.2
Post box 10.2.5
Power-assisted doors 4.2.8
Protruding objects 3.4
Projecting objects 3.4
Public telephones 6.2

R

Ramps 4.3
Curb ramps 4.4
Edge protection 4.3.7
Handrails 4.3.8
Landings 4.3.4
Length 4.3.1
Outdoor conditions 4.3.6
Slope
Cross slope 4.3.2
Running slope 4.3.1
Surfaces 4.3.5
Width 4.3.3
Ranges 10.2.4.7
Reach ranges App. B
Refuge—see Areas of refuge
Recreation facilities 9
References 2
Refrigerators 10.2.4.9
Residential units 10
Revolving doors 4.2.8
Risers of stairs 4.5.1
Open risers 4.5.3
Roll-in shower stall 5.8.1
Routes 4.1
Rugs—see Carpets

S

Seating
Bathtub 5.7.1
Benches 9.1
Counters 8.1
Shower 5.8.2, 5.8.2.2

Tables 8.1
Telephone 6.2.5.4
Viewing positions 8.2
Scope 1
Shower stalls 5.8, 10.2.3.6
Controls 5.8.3, 10.2.3.6.3
Enclosures 5.8.5, 10.2.3.6.5
Floors 5.8.6, 10.2.3.6.6
Grab bars 5.8.1.3, 5.8.1.4, 5.9, 10.2.3.7
Heads 5.8.4, 10.2.3.6.4
Roll-in 5.8.1, 10.2.3.6.1
With seat 5.8.2, 10.2.3.6.2
Side reach App. B2.2
Signage 6.4
Car parking 7.4
Character height 6.4.1
Contrast 6.4.2
Illumination 6.4.3
Symbol of access 6.4.5
Tactile characters 6.4.4
Van parking 7.4.3
Sinks 10.2.4.6
Sliding doors
Table 2, 5
Slip resistance of floors App. A
Slope—see Gradient
Smoke-protected 4.9.1
Stairs
Detectable warning surfaces 4.5.3
Handrails 4.5.4, 4.6
Nosings 4.5.2
Risers 4.5.1
Treads 4.5.1
Steps—see Stairs
Storage
Kitchen 10.2.4.5, 10.2.4.11
Clothes 10.2.4.12
Symbol
International symbol of access Fig. 48
Hearing impairment Fig. 45

T

Tactile
Characters 6.4.4
Maps 6.4.5
Warnings 6.5
Tables
Picnic 9.2
Work 8.1.1
Telecommunication devices for the deaf (TDD) 6.2.6.2
Telephones 6.2
Controls 6.2.2
Cord length 6.2.3
Elevator App. C
For persons who are deaf or hard of hearing 6.2.6
For persons in wheelchairs 6.2.5
Illumination 6.2.4
Protruding parts 6.2.1
Seat 6.2.5.4
Signage 6.2.7, 6.2.5.4, 6.2.6.3
Theatre seating 8.2
Thresholds 4.5.2
Residential 10.1.1.2.3
Toe clearance Fig. 37
Toilets 5.3
Flush controls 5.3.3
Grab bars 5.3.4
Location 5.3.2
Paper dispenser 5.2.1
Residential basic 10.1.5
Stalls 5.2
Wall-hung 5.3.4
Towel dispensers 5.6.2
Treads of stairs 4.5.1
Turning space for wheelchair 4.1.1
Turnstiles 4.2.8

U

Universal access—see Basic access
Unisex rooms—see Washroom

V

Van parking 7.3
Vanities 5.5.3
Visual alarms 10.1.4, 6.1

W

Walkway widths App. B4
Walls
Protruding objects 3.4
Warning surface textures 6.5
Wash basin—see Lavatories

Washroom	
Accessories	5.5
Identification	5.1
Individual	5.6
Lavatories	5.4
Toilets	5.3
Toilet stalls	5.2
Unisex washroom	5.6
Unit washroom	5.6
Waste receptacles	5.6.2
Water closet—see Toilet	
Wheelchair	
Clearances	3.1
Dimensions	App. B3
Windows	10.1.3
Work areas	8
Work surfaces	8
In kitchens	10.2.4.4