# RESEARCH REPORT

## ADAPTING LOW-RISE RESIDENTIAL BUILDINGS

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# *Adapting Low-Rise Residential Buildings*

***Prepared by:***

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***for***
***Canada Mortgage and Housing Corporation***

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Cette publication est aussi disponible en français sous le titre : *Adaptation des bâtiments résidentiels de faible hauteur* PF 0292.

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Main entry under title:

Adapting low-rise residential buildings

Issued also in French under title: Adaptation des bâtiments résidentiels
de faible hauteur.

ISBN 0-660-17481-2
Cat. No. NH15-207/1998E

1. Apartment houses – Canada.
2. Architecture and the handicapped – Canada.
3. Physically handicapped – Dwellings – Canada.
I. Canada Mortgage and Housing Corporation

NA2545.P5A37 1998 728'.087'0971 C98-980172-1



Printed in Canada
Produced by CMHC

# BACKGROUND

Most walk-up apartment buildings constructed during the 1970s, 1980s and 1990s were not required by the building code to be barrier-free. However, the number of people with mobility, sight or hearing impairment is growing as our society ages, and the availability of suitable accommodation is limited. Recognizing this changing market, the Multi-family Council of the Saskatoon Home Builders' recommended the preparation of a manual to assist building owners and managers to make barrier-free renovation decisions. The Canada Mortgage and Housing Corporation has developed the Low-Rise Residential Barrier-Free Guide with the assistance of many professionals and organizations.

# ACKNOWLEDGMENTS

We gratefully acknowledge the following for their support in developing this document.

Advisory Committee
Canada Mortgage and Housing Corporation
Saskatchewan Municipal Government – Housing Division
Saskatchewan Home Builders' Association
Saskatoon Home Builders' Association Multi-Family Council
Duncan McKercher – Cypress Property Marketing Ltd.
Mike Laliberte – Remai Construction (1981) Inc.
Bob Jeanneau – Lakeridge Management Ltd.
Ken Morris – Greenways Management Ltd.
Canadian Paraplegic Association (Saskatchewan) Inc.

The Low-Rise Residential Barrier-Free Design Guide is not a substitute for the National Building Code nor does it replace the requirements of the municipal or provincial authority having jurisdiction.

The recommendations in this guide are based on the requirements of the 1995 National Building Code (NBC), the Canadian Standards Association (CSA) CAN/CSA-B651-M95 Barrier-Free Design and recommendations of the accessibility advocacy organization. Where the requirements of the CSA Standard are more restrictive than those of the 1995 NBC, the CSA Standard has been used.

We have taken care to ensure accuracy, the examples and explanations in the guide are for the purposes of illustration and constitute opinion only.

## How to use the Guide

This guide has been designed to satisfy two needs. First, it identifies renovations that will create a barrier-free, three-storey walk-up apartment building. Second, it provides decision-making tools to help building owners and managers determine occupants' requirements, building suitability and the extent of renovations required to create a barrier-free living environment.

The first six chapters identify accessibility barriers that are common to three-storey walk-up apartment buildings. Modifications are suggested to remove or minimize these barriers. The chapter "Assessment Tools" identifies the basic level of service for tenants in each occupant group.

The "Looking Ahead" section at the end of each chapter provides renovation options that can be undertaken at the same time as regular maintenance activities. These low-cost options will make the building more accessible and livable for current and future occupants.

Each building must be evaluated on an individual basis. You can ensure that all health, safety and accessibility requirements are implemented by engaging a consultant who is familiar with both barrier-free design and the applicable codes, standards and by-laws.

The following "Occupant Group" classifications are used:

Group 1: two or more people, one person using a wheelchair.
Group 2: one person only, using a wheel chair.
Group 3: two or more people, one person with a visual impairment.
Group 4: one person only, with a visual impairment.
Group 5: two or more people, one person with a hearing impairment.
Group 6: one person with a hearing impairment.

## Application of the Guide

The information in this guide applies to low-rise residential buildings. In order to decide which walk-up apartment buildings to renovate, consider the proximity of features and services in the surrounding community:

- public transportation;
- medical facilities and pharmacies;
- shopping;
- amenity spaces such as parks;
- recreational facilities; and
- places of worship.

## Accessibility Standards Application to Low-Rise Residential Renovations

### New Construction

Sentence 9.5.2.3(2) of the National Building Code states that, in two cases, a barrier-free path of travel need not be provided in new apartment buildings: first, if the difference in floor elevation between the entrance level and each dwelling in building exceeds 600 mm; and, second, if the building is not equipped with an elevator or platform equipped passenger elevating device.

### Remodeling Existing Buildings

In existing apartment buildings, renovation work must comply with the code; however, there is no requirement to make all or any part of the building barrier-free.

For example:

- Renovations to install a barrier-free entrance in an existing building do not oblige the owner to create barrier-free hallways or suites.

- Renovations that render one floor of a building barrier-free (i.e., entrance or hallways) do not oblige the owner to create barrier-free suites.

- Renovations that make sections of a suite barrier-free do not oblige the owner to make all parts of a suite barrier-free.

Therefore, you have the flexibility to modify your buildings and the individual suites on an as-required basis. This allows you to invest in barrier-free building modifications in stages in response to market demand.

This guide deals with physical, visual or hearing limitations, as folows:

- mobility impaired,
  - paraplegic wheelchair users;
  - users of walkers and canes;
  - those with limited strength and endurance;
  - those with limited flexibility.
- hearing impaired,
  - those with severe loss of hearing.
- sight impaired,
  - those with severe loss of sight.

**Typical Apartment Building Characteristics**

For the purposes of this guide, a typical walk-up apartment building has the following characteristics:

- a 600 mm difference in floor elevation between the entrance level and each dwelling unit;
- no elevator;
- no fire sprinklers;
- only two floors (older buildings) or three or four floors (15 years old or less);.
- typically wood frame construction;
- two or more stairwells;
- two-bedroom suites (75 percent) and the remainder one-bedroom (very few three bedroom suites);
- washers and dryers located in a common laundry room that is in the basement near the mechanical room;
- suites heated with a boiler and radiant heaters;
- typically with sliding patio doors leading to a balcony;
- bearing wall and beams running the width of the suites;
- fire separations between the suite and hallway and between suites;
- units with intercoms between the main entrance and each suite;
- bathrooms typically minimum size to accommodate a tub, toilet and sink (1,525 mm x 2,285 mm);
- apartment entry doors and suite entry doors typically 914 mm or 812 mm wide;
- bedroom entry doors typically 762 mm wide;
- bathroom entry doors typically 711 mm.

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# CHAPTER 1 – PARKING, LOADING AND APPROACHES

## Parking Stalls

### Introduction

Many people with mobility limitations drive standard or customized vehicles. Parking areas are often inconvenient for safe loading and unloading.

Size and location of parking stalls are the two major problems. Regular parking stalls are not wide enough: people who use wheelchairs require extra space beside their vehicles. Locate designated parking stalls near barrier-free entrances. This may interfere with parking lot layout and reduce the number of parking stalls; however, it is important in bad weather or in winter when ice and snow accumulate. To make a direct approachway from the parking area to the building entrance, you may have to modify the landscaping and sidewalks. Clearly identify designated parking stalls.

*Location*

*Recommendations*

Locate special parking stalls for those with mobility limitations as close as possible to the entrance (preferably within 50 metres). Place the parking spaces in locations that are very near the entrance.

Make a direct barrier-free approach from the designated parking area to the entrance. Install sidewalks, curb ramps and ramps as needed. Design the approachway so that wheelchair users can avoid travelling in the driving lanes of the parking lot (Fig. 1).

*Considerations*

The re-design of the parking lot may mean reallocating all parking stalls. This should not be a problem unless electricity to the stalls is metered to individual suites. Electrical wiring may have to be re-routed or, alternatively, tenants may reach agreements regarding usage of parking stall electricity.

*Size*

*Recommendations*

Designated parking stalls must be wide enough for the side and rear chair lifts that are common in customized vans and cars. As a minimum, make nose-in parking stalls for cars 2,400 mm wide with an adjacent aisle that is at least 1,500 mm wide, near a curb ramp (Fig. 2). Similar parking stalls for vans should be at least 4,600 mm wide. Parallel parking spaces for vans can be narrower (2,600 mm) but may also need to be longer (7,400 mm).

*Considerations*

When you make wider stalls, the total number of parking spaces will be reduced. This could pose a problem since space for additional stalls is usually

**Figure 1**
**Nose-in parking space for a car**

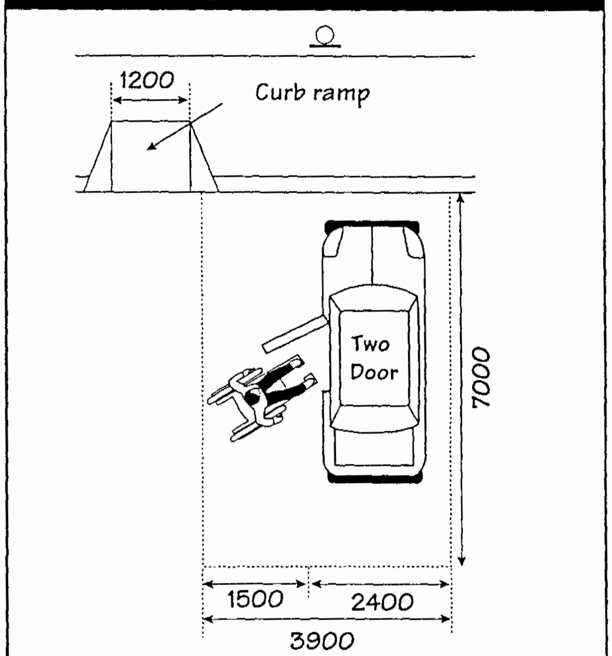
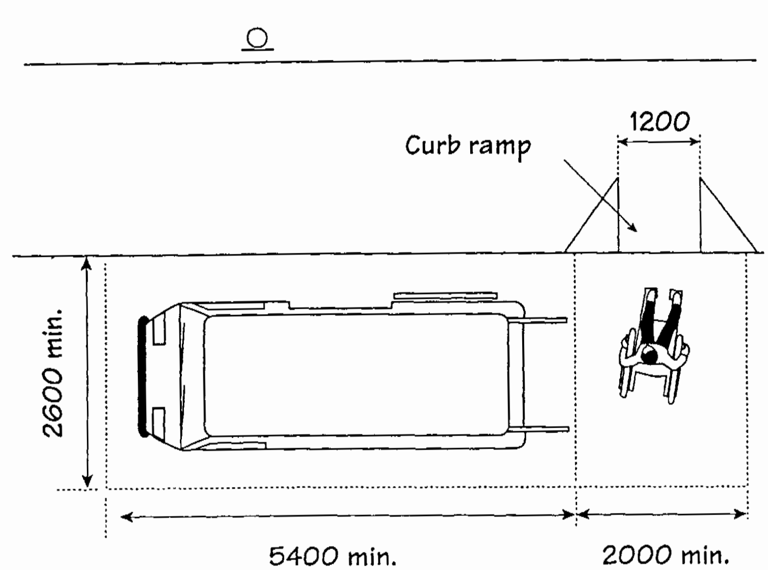


**Figure 2**
**Parallel parking space for rear loading vans**




*Location*

*Recommendations*

Establish a loading zone near the barrier-free building entrance. Place it as close to the building as possible in order to reduce distances and exposure to traffic or bad weather. If you are intending to build a new barrier-free entrance, plan a designated loading and unloading area.

*Considerations*

There may not be room for a loading and unloading zone, or vehicles may block traffic by parking in the loading/ unloading area.

at a premium around established buildings. You may have to redesign the entire parking lot and alter sidewalks and landscaping in order to provide disabled parking stalls.

*Signs*

*Recommendation*

Universally recognized signs for disabled parking should identify each designated parking stall (Fig. 3).

## Loading and Unloading

### Introduction

Many people with mobility or sight impairment rely on special transportation services. There should be a dedicated area for the loading and unloading requirements of these people.

Arrange for a loading and unloading zone as close as possible to the barrier-free entrance. A covered area is even better. Make sure that signage identifies the restricted use of the area.

You may have to make some alterations to establish a new specific loading zone – for example, the re-routing of parking lot traffic or relocation of signage, light poles, bicycle racks and garbage containers.

**Figure 3**
**Typical reserved parking sign**

*Size/Level*

*Recommendations*

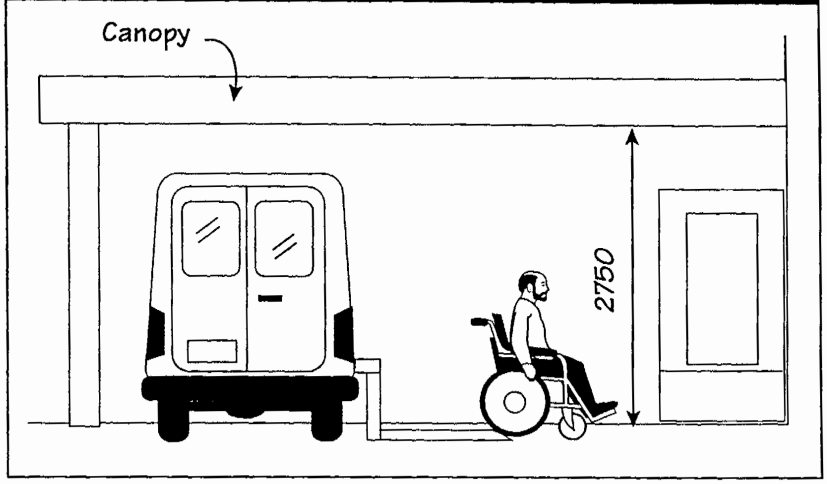
Plan to accommodate various types of vehicles including cars, vans and buses with lifts, and both side- and rear-loading vans and buses. Most vehicles that discharge passengers at sidewalk level have side-operating lifts.

Allow for an access aisle parallel to the vehicle, 1,500 mm x 6,000 mm wide. Construct a discharge level with the approach to the building that slopes not more than 1:50. Where the wheelchair lift is located at the rear of the vehicle, provide a ramp or curb ramp for access to the sidewalk (Fig. 4).

*Considerations*

Buses or vans need nine metres or more of length, plus room for turning; and, the loading zone must not extend into roadway. Consider changing existing pads or sidewalks.

**Figure 5**
**Covered loading/unloading zone**




***Canopy***

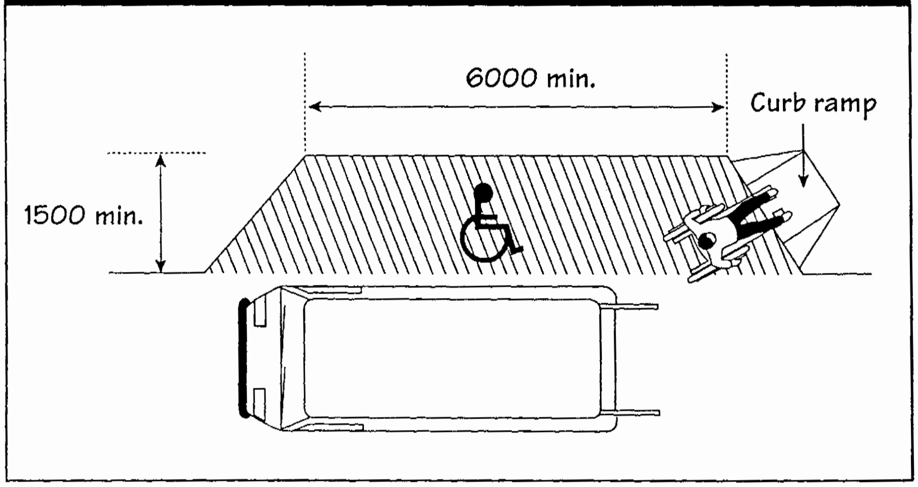
*Recommendations*

Loading and unloading can take some time. Provide a canopy (or some form of cover) at the loading area to protect from bad weather. A minimum clearance of 2,750 mm will let vehicles stop directly under the canopy (Fig. 5).

*Considerations*

If it is impractical to cover the whole distance from loading zone to the building entrance, consider a freestanding structure.

**Figure 4**
**Loading/unloading zone**




***Signage***

*Recommendations*

Identify the loading zone as a designated pick-up/drop-off point. Signage should discourage others from using the area for general parking or other kinds of loading/unloading.

## Approaches to Building Entrance

### Introduction

People approach the building from either the parking lot or the loading zone. It can be challenging to provide a barrier-free path to the building taking sidewalks, stairs, ramps and landings into consideration. Keep in mind that people with limited mobility or sight may have different needs. The goal is to satisfy everyone.

*Sidewalks*

*Recommendations*

Design sidewalks to accommodate people with both mobility and sight impairments. Your first priority is sidewalk access to and from the parking lot and the loading zone.

Cut and slope sidewalk curbs to allow wheelchair users to pass (Fig. 6). The minimum width of a curb ramp should 920 mm (1,200 mm, if the ramp will be exposed to snow). The slope should not exceed 1:12. Place a colour-contrasting tactile warning strip at the top of the slope.

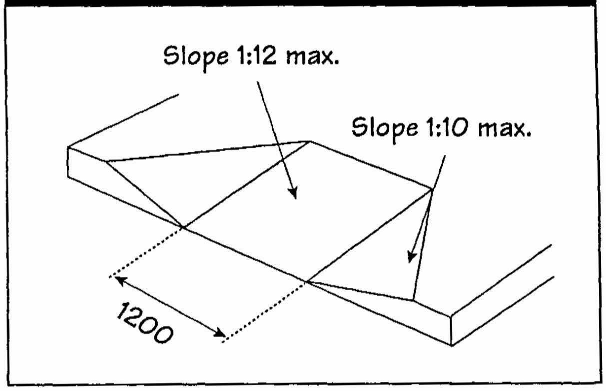
The sidewalk should have a minimum 1,200 mm width; however, a width of 1,500 mm will permit two wheelchairs to pass each other (Fig. 7).

*Important!*

The surface of the sidewalk should be slip resistant, firm and even. Broom-finish freshly poured concrete surfaces to give them a rough texture. If the surface is made of precast materials (such as concrete paving stones), check the joints for smoothness; allow a maximum lip of 6 mm.

If the drop from the surface of the sidewalk to the surrounding grade exceeds 75 mm, install edge protection to prevent wheelchairs from going over the edge and to guide the sight impaired. If the drop exceeds 600 mm, install a guardrail.

**Figure 6**
**Curb ramp**




Grates are found where sidewalks or entranceways run over drainage pipes or vents. To prevent canes and wheelchairs from catching in grates, make sure the gaps do not exceed 13 mm (Fig. 9).

*Considerations*

Curb ramps are easy to install; the challenge is locating them to provide the shortest possible route to the barrier-free entrance. You may need to modify a grass median or move a parking stall.

Where a sidewalk is installed level with an existing curb, the drop can be 100 mm or more to the surrounding grade. If you install edge protection – as recommended – you may restrict other access to the sidewalk. On the other hand, building up the surrounding grade might be costly.

**Figure 7**
**Sidewalk widths**

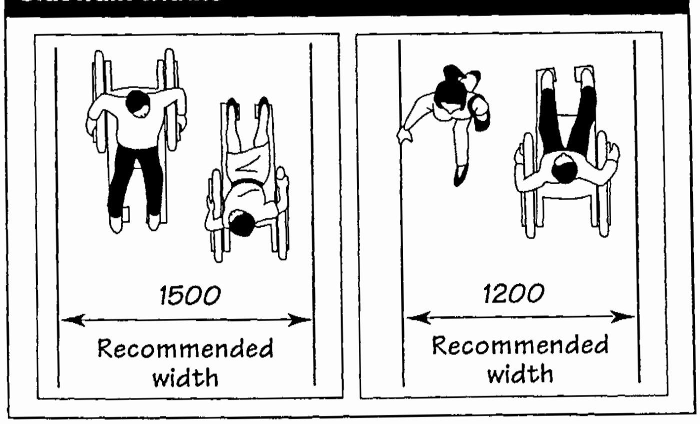
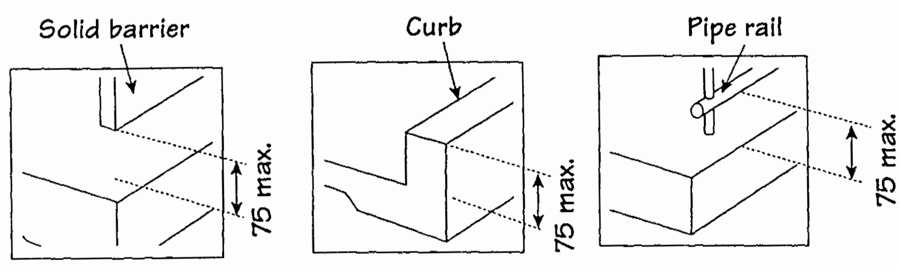


**Figure 8**
**Edge protection**




*Stairs*

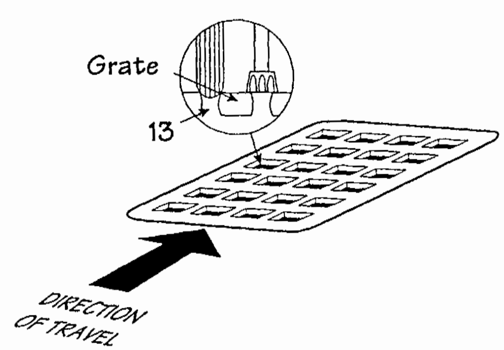
*Recommendations*

Make sure that the treads and landings of all stairs have a slip-resistant surface; where the surfaces are smooth, install slip-resistant strips. Tactile warning strips at the top of stairs warn the sight-impaired. Define the edge of each step with contrasting-colour strips (Fig. 10).

Stairs should have a rise of between 125 mm and 180 mm, with a tread width of not less than 280 mm. The nosing (the outer edge of the step) should not project more than 38 mm. Avoid using open or unraked treads (Fig. 25).

**Figure 9**
**Grate openings**

Openings larger than 13mm may catch wheelchair wheels or canes.

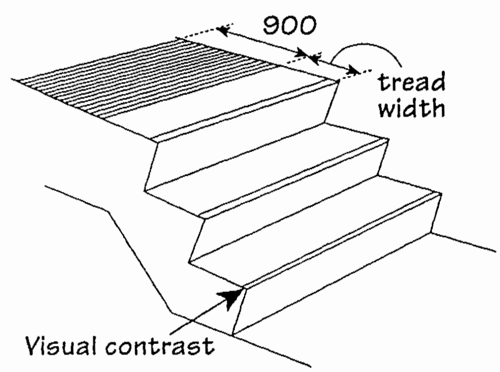



*Considerations*

Tactile warning strips on outside stairs can come loose and make snow clearing difficult. While painting the edges of the steps a contrasting color is easy, the paintwork demands periodic maintenance. Many exterior stairs do not have nosings or proper rake backs (the amount by which the back part of the step is recessed (Fig. 25).

It is hard work to modify existing steps.

**Figure 10**
**Tactile Strips**




*Ramps*

*Recommendations*

While ramps provide access to a new elevation, both steps and ramps should be available. Design the ramp with a minimum clear width of 920 mm, a maximum slope of 1:12 and a cross slope of 1:50. The ramp should not exceed 9,000 mm in length; if it is longer, build a landing as a rest stop. Surfaces should be slip-resistant. Do not allow water to accumulate on ramps (Fig. 11).

Ramps need landings – as wide as the ramp and 1,500 long – at the bottom and the top respectively. Where the ramp changes direction, construct a landing that measures 1,500 mm in each direction. Where the landing occurs at a door, allow 1,500 mm in each direction to permit wheelchair users to open the door.

If ramps or landings are not at grade or adjacent to a wall, install edge protection – for example, a curb, a raised barrier or a rail. The curb should be at least 75 mm high, with an opening to the bottom of the raised barrier or rail of not more than 75 mm. Where the ramp has a rise of more than 150 mm, install a handrail on each side. Set handrails at between 800 mm and 920 mm from the ramp and make them continuous on switchback or dogleg ramps. Handrail extensions at the top and bottom of ramps support and guide people with visual impairments: however, they should not extend into the path of travel, and they should return to the wall, floor or post (Fig. 27).

*Considerations*

Ramps use up a lot of space, and at building entrances, space is limited. This will be especially true if you intend to retain the existing stairs. You may need to modify landscaping and install new landings.

Depending on the location, the ramp or the guards/handrails may obstruct the view from some windows.

**Figure 12**
**Ramp handrails**

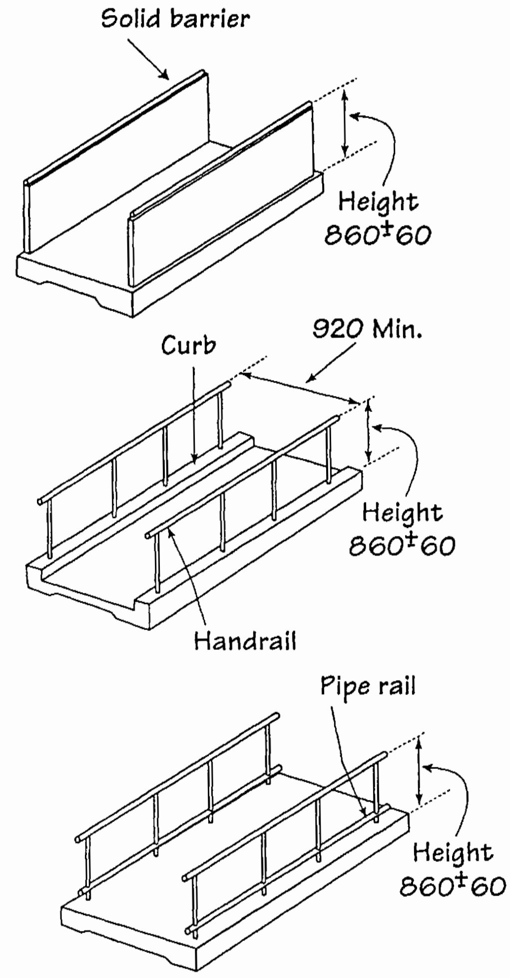
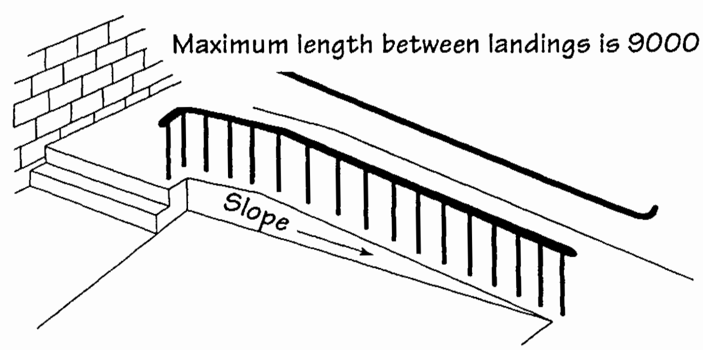



**Figure 11**
**Allowable ramp slope**




*New Entrance*

*Recommendations*

Many walk-up apartments have split-level entrances where the basement entrance is about 900 mm below grade. Consider installing a barrier-free entrance to the building at the basement level (Fig. 13).

Since you will be installing a ramp at this entrance, maintain proper ramp grades while excavating from the sidewalk to the new entrance. Keep in mind all the requirements mentioned above with regard to barrier-free entrances and barrier-free travel; in particular, consider providing a canopy or cover for the new access route.

You may need to renovate or take out a basement suite to make room for the new entrance or an interior corridor.

Modify the intercom system and relocate mailboxes for the tenants who will use this entrance.

*Considerations*

Excavation will expose the building's footings: beware of water and frost penetration which can lead to structural problems down the road.

Consider drainage, as water and snow will tend to accumulate on the ramp. Install a permanent drain at the bottom of the new ramp and tie it into the building's main sewer.

Depending on the depth and slope of the excavation, consider installing guardrails or a retaining wall.

## Looking Ahead

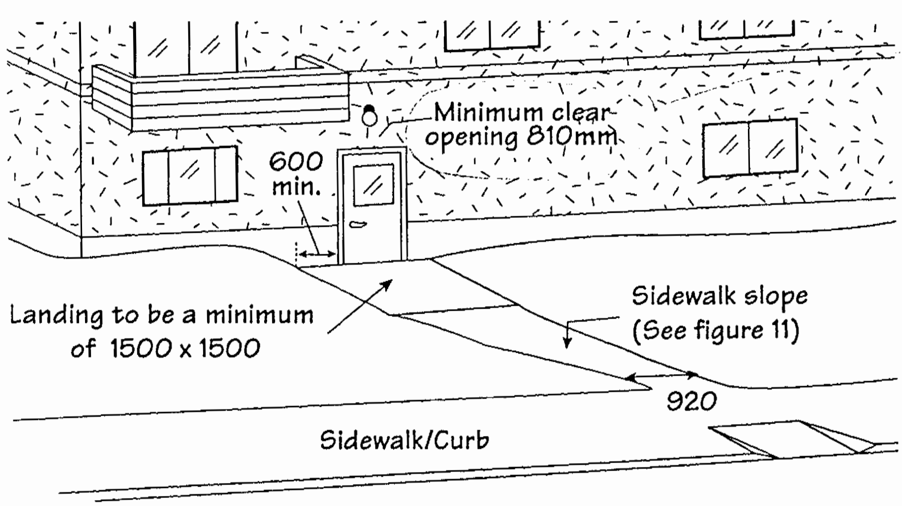
### Introduction

All these issues are illustrated on pages 1 – 7.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

The costs presented here are for general information only. Cost estimators with experience in renovation have worked out approximate costs, basing them on typical material and labour rates in Winnipeg. These estimates do not include mark-ups for overhead, supervision or taxes but they will allow you to calculate the relative

**Figure 13**
**Barrier-free entrance to basement**



incremental costs of improving accessibility as part of a larger repair or replacement activity.

*When replacing an exterior landing or step,* consider installing a ramp to the landing or step. A ramp gives easy access to the landing or step for those in wheelchairs or using walkers.

Cost: Ramp, 1,000 mm wide, 100 mm thick, handrails both sides; $75 per linear metre
Ramp, 1,000 mm wide, 100 mm thick, no handrails; $27 per linear metre

*When repaving,* consider relocating disabled parking stalls near to the entrance. Shorter distances to the entrance mean less travel over ice and snow and fewer obstacles for those using wheelchairs or walkers.

Cost: None, assuming any electrical outlets can be reassigned.

*When repaving,* consider widening parking stalls to provide parking for the disabled. A vehicle equipped with a wheelchair lift requires more width than a standard vehicle.

Cost: None, assuming there is room enough for the wider parking stalls and that any electrical outlets can be reassigned.

*When repaving,* consider installing curb ramps. This allows wheelchair users to travel from the pavement to the sidewalk without having to climb a curb.

Cost: Remove existing curb; $50
Form and pour curb ramp; $75

*When repaving,* consider installing proper signage. Disabled parking signs will discourage others from using a parking stall that has been specifically designed and located to improve access.

Cost: Disabled parking sign, installed; $90

*When replacing sidewalks,* consider widening the sidewalks to allow easier passage of those using wheelchairs or walkers.

Cost: Concrete slab, 100mm thick; $20/m$^2$
Base, base preparation, forming; $10/m$^2$

When replacing sidewalks, consider incorporating a slip-resistant finish for better traction. This may be as simple as roughening or texturing the concrete after it is poured.

Cost: None

When replacing sidewalks, consider installing a curb ramp. This allows wheelchair users to travel from the pavement to the sidewalk without having to contend with a curb.

Cost: Forming; 0.5 hours

When replacing sidewalks where elevation differences exceed 6 mm, consider incorporating a ramp to ease the transition for users of wheelchairs and walkers.

Cost: Forming; 0.5 hours

## Doors

### Introduction

While entrance doors are usually wide enough for people using wheelchairs and walkers, door hardware and high thresholds cause problems. Door handles and locks must be accessible from a sitting position and should be easy to operate. Thresholds are an obstacle for many people as they are a tripping hazard and a barrier to the small wheels on some walkers. Both wheelchair and walker users require gently sloped thresholds. Many auto-closers make entrance doors difficult to open or cause the doors to close with excessive force. An entrance wall of uniformly coloured glass renders the doorway invisible to the sight impaired.

*Widths*

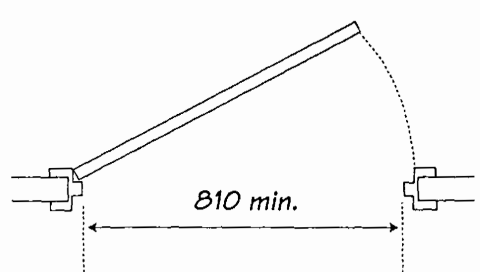
*Recommendations*

Provide a minimum clear door width of 810 mm for entrance doors (a clear opening of 914 mm is even better). Measure the clearance from the face of the door to the door stop while the door is open 90° (Fig. 14).

*Considerations*

You may need to modify structural framing members or existing sidelights.

**Figure 14**
**Minimum clear width opening for doors**




*Thresholds*

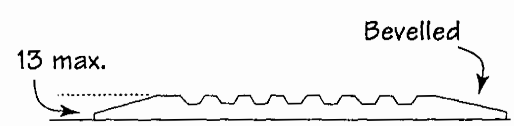
*Recommendations*

Build thresholds to a maximum height of 13 mm. Bevel thresholds that measure more than 6 mm to permit easy passage for wheelchairs and wheeled walkers (Fig. 15).

*Considerations*

Raised thresholds provide space for weather-stripping and compensate for building movement. A unitized door system is pre-assembled and includes a raised threshold, frame, door and hinges. Doorways without a raised threshold require more on-site fabrication.

**Figure 15**
**Maximum threshold height**




*Locks*

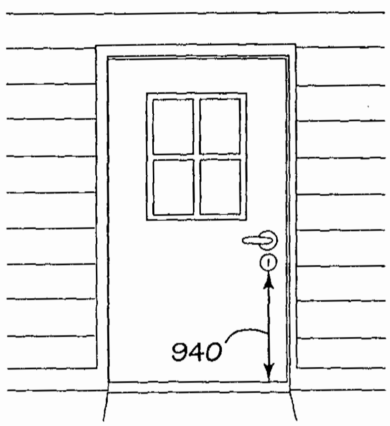
*Recommendations*

Choose door locks that allow the user to remove the key from the lock before opening the door. Avoid spring-loaded locks. Locate the entrance door lock approximately 940 mm (or lower, if possible) from the floor where someone in a sitting position can reach it (Fig. 16).

*Considerations*

In order to lower the lock, you may have to move the locking mechanism down and cover the hole at the previous location. Relocation of the door lock may be costly if it means replacement.

**Figure 16**
**Height of door lock**



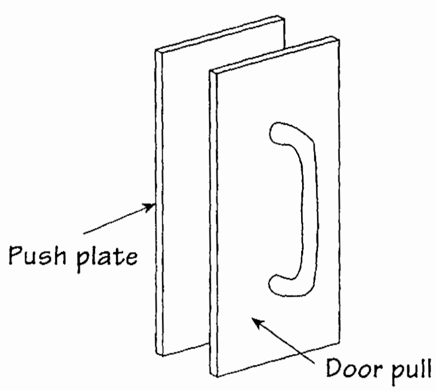

*Handles*

*Recommendations*

Choose a pull handle that requires minimum grasping strength and motion. A large D-shaped handle between 30 mm and 40 mm in diameter is ideal. Locate handles approximately 1,000 mm, but not more than 1,200 mm, above the floor (Fig. 17 – Fig. 18).

Avoid door handles that require a twisting action of the wrist to open. Door handles with integral locks should have a lever handle that is at least 75 mm long and requires only a downward force to open.

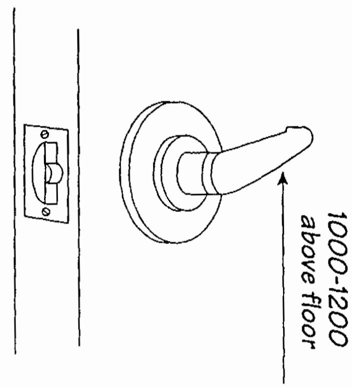
**Figure 17**
**D-shaped door pull**




*Considerations*

Changing door handles is normally a simple procedure. However, where steel door frames require a new hole for the latch, patching the old one can be difficult, and poor patching can cause problems in door operation.

**Figure 18**
**Recommended door handle**




*Visibility*

*Recommendations*

Select doors and frames in contrasting colours. A glass door often looks dark from the outside and light from the inside since the perceived colour of glass is determined by the source of backlighting. Avoid highly reflective surfaces or finishes.

*Considerations*

A professional designer or decorator can help with colour selections and materials that will not interfere with the architectural detail of the building entrance. Exterior, interior and changing natural light can often alter the colour of an object. Avoid shiny surfaces.

***Power Assist***

*Recommendations*

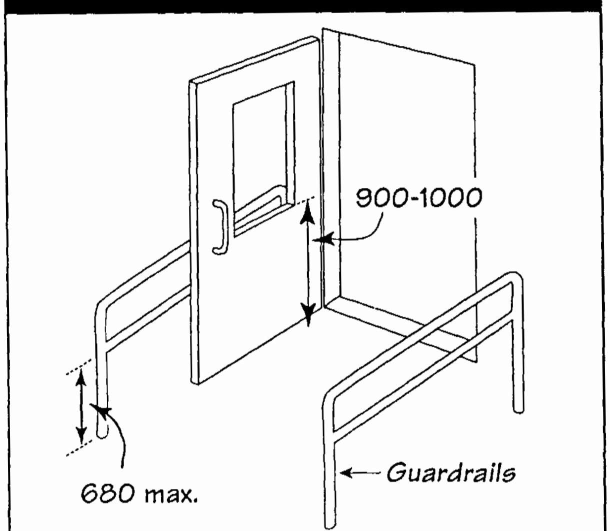
Select exterior hinged doors that require a force of less than 38 N to open (38 N represents approximately 7 pounds of force). Power-assisted doors use a motion detector, pressure plate, key pad, hand button, security card or remote transmitter to allow entry and exit.

Power-assisted doors should take a minimum of three seconds to move from a fully closed to a fully open position with a force of not more than 66 N to stop the door movement. To assist the visually impaired, install guards at a level that can be detected by canes. Where the door swings into the path of travel, extend the guard at right angles to the wall (Fig. 19).

*Considerations*

Proper access privileges (e.g. an electronic card or key) may be required for power-assisted doors. These doors can jam closed if the locking mechanism is not released before the door opener is activated. The user must be able to release the door lock and move to a suitable location before the door opens. This may require a larger approach area or a landing with sufficient space for the door to open without hitting the wheelchair

**Figure 19**
**Power-assisted door with barriers**




## Intercoms

### Introduction

Intercoms allow visitors to announce their arrival; they also permit residents to call for help from the building entrance. Often the intercom is located outside the building or in the entry vestibule, at a position that is too high or blocked by mailboxes or storage bins. Most intercom systems are used from a standing position. People with sight impairments often cannot identify the characters on the call buttons. Good lighting, together with tactile characters or symbols on the buttons, will help the sight impaired to identify the intercom and to press the correct buttons.

***Height and access***

*Recommendations*

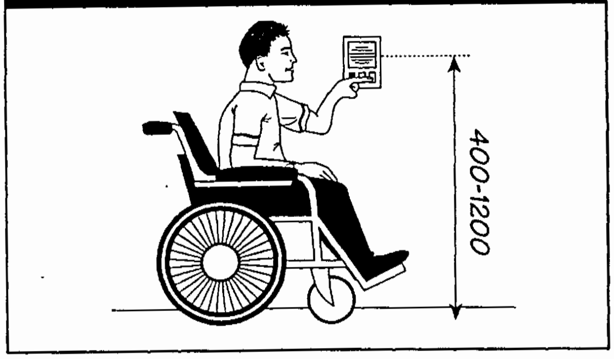
Provide a clear floor space, 750 mm by 1,200 mm, in front of the intercom and ensure that a wheelchair user can reach the handset and controls. Locate the intercom controls between 400 mm and 1,200 mm above the floor (960 mm is recommended) (Fig. 20). Where space is limited or relocation costs are prohibitive, install an add-on station to the central intercom unit.

*Considerations*

The cost of moving an intercom can include wiring, repairs to walls or building a new location.

If the required clearance is lacking in front of the intercom, you may have to relocate the intercom or install new or larger landings to provide access.

**Figure 20**
**Intercom height**




*Visibility*

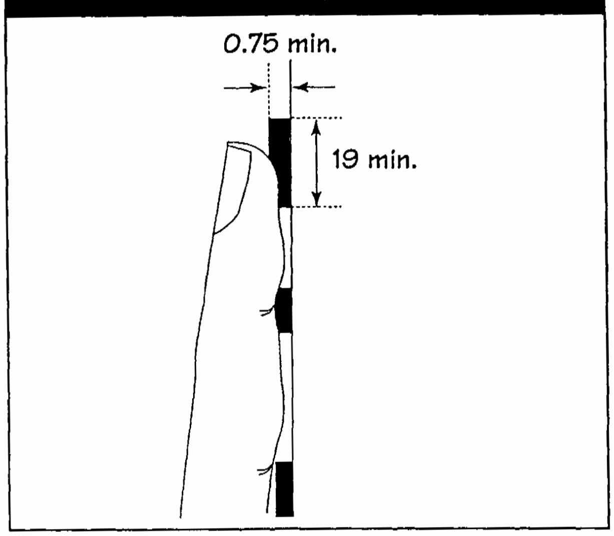
*Recommendations*

Provide 100 lux lumination for the intercom and its controls. Provide an intercom with numbers that are at least 19 mm high raised a minimum of 0.75 mm (Fig. 21). Shop for handset intercom systems with large keypads that feature raised letters and consider providing Braille buttons.

*Considerations*

The existing intercom may have limited space for new or enhanced controls. If there is enough space, consider installing an add-on station. The installation of spot lights in the entryway will improve lighting.

**Figure 21**
**Raised intercom buttons**




## Mailboxes

### Introduction

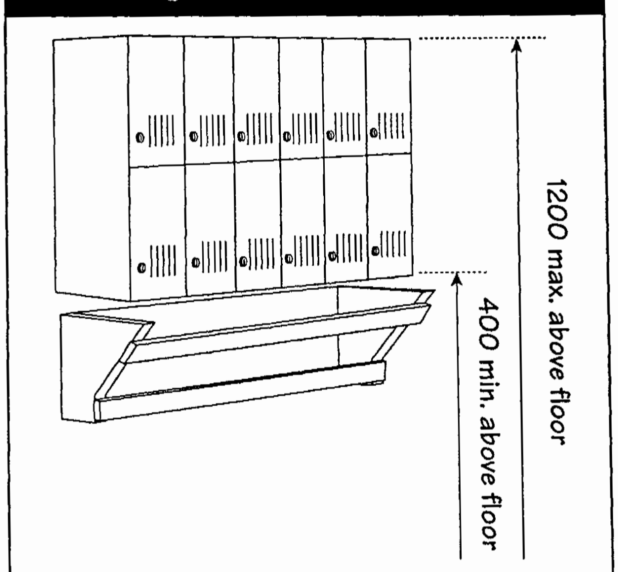
People normally reach into their mailboxes from a standing position and banks of mailboxes are usually designed with that in mind. However, users of wheelchairs and walkers should also be able to approach their mailboxes and reach into them comfortably. This means providing a clear path of access to lower mailboxes. Small letters and numbers on mailboxes pose problems for the sight-impaired. Mailboxes are sometimes located in dimly lit areas of the lobby or in a stairwell, away from the entrance landing. Locking mechanisms and small keys are difficult to use.

*Height*

*Recommendations*

Install mailboxes between 400 mm and 1,200 mm from the floor (980 mm is recommended) with a clearance in front (minimum 750 mm by 1,200 mm) (Fig. 22).

**Figure 22**
**Mailbox heights**



*Considerations*

You may have to lower some mailboxes or re-assign numbers of lower boxes to people in wheelchairs. If the intercom and mailboxes are located together in the same vestibule, it may be difficult to find space for any such relocation.

*Access*

*Recommendations*

Use card entry locks instead of keys.

*Considerations*

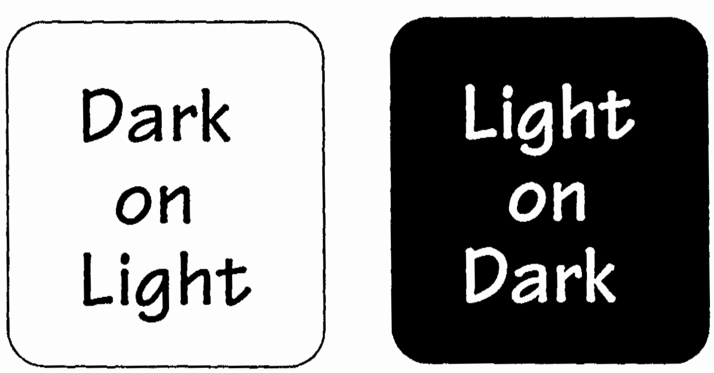
Retrofitting existing mailboxes with a new access system can be expensive. Providing a few accessible and easy-to-open mailboxes in another location may be the best option. Tenants may agree to a mail delivery system that does not require locked boxes.

***Lighting and identification***

*Recommendations*

Provide at least 100 lux lumination for the mailbox area. Use large, colour-contrasted identification numbers (e.g., dark numbers, light background) (Fig. 23). Consider using raised numbers.

**Figure 23**
**Colour contrast signage**




*Considerations*

The installation of new lights may be necessary. Adding raised numbers to existing mailboxes may interfere with their operation.

## Looking Ahead

### Introduction

All these issues are illustated on pages 9 – 13.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

The costs presented here are for general information only. Cost estimators with experience in renovation have worked out approximate costs, basing them on typical material and labour rates in Winnipeg. These estimates do not include mark-ups for overhead, supervision or taxes, but they will allow you to calculate the relative incremental costs of improving accessibility as part of a larger repair or replacement activity.

*When replacing an exterior landing or step,* consider lowering the entrance threshold. Thresholds that are too high or not leveled are difficult for wheelchairs to cross. Replacing the threshold does not require replacing the entire door frame.

Cost: Threshold materials, $35
Installation labour, 1 hour

*When replacing an exterior landing or step,* consider adjusting the size of the landing or step. Users of wheelchairs and walkers require larger landings in order to maneuvre and access the door lock.

Cost: Concrete slab, 100mm, installed, $20/m^2$
Base, base preparation, forming, $10/m^2$

*When replacing an entry door*, consider increasing the width of the door. A wider door allows easier entry for people in wheelchairs or using walkers, as well as people carrying large packages or moving furniture.

Cost: Minimal, assuming there is space and the structure does not need altering.

*When replacing an entry door*, consider installing lever-style hardware. Everyone finds this kind of hardware easier and more convenient to use. Individuals with limited mobility or restricted hand motion may not be able to use hardware that requires a twisting motion of the wrist.

Cost: Hardware, $75
Installation, 0.5 hours

*When replacing an entry door*, consider lowering the lock height. This will allow someone in a wheelchair to operate the lock without excessive reaching.

Cost: Cover plate at old lock location, $5
Labour to move lock, 0.75 hours.

*When replacing an entry door*, consider lowering the threshold. Thresholds that are too high or not beveled are difficult for wheelchairs to cross.

Cost: Threshold materials, $35
Installation labour, 1 hour

*When replacing or repairing the intercom*, consider lowering the intercom station. Intercom stations are generally installed at face height for an adult who is standing. The intercom is, therefore, difficult for someone sitting in a wheelchair to use.

Cost: Wire and labour, $350
Repair wall at old location, $125

*When replacing or repairing the intercom*, consider installing a station with tactile numbers and characters, as these are much easier for the visually impaired to use.

Cost: Upgrade of intercom unit, $150

*When replacing or repairing the intercom*, consider upgrading the lighting. This will assist all users including those with vision limitations.

Cost: New light fixture, $30
Installation, 0.5 hours

*When upgrading the mailboxes*, consider lowering all the mail boxes as this will make the entire unit accessible.

Cost: Move mailbox unit, 2 hours
Repair wall at old location, $100

*When upgrading the mailboxes*, consider lowering a few boxes and designating them for use by people in wheelchairs.

Cost: Mailboxes, bank of 6, $175
Installation, 0.5 hours

## Landings

### Introduction

Landings are located between and at each floor level in three-storey walk-up buildings. They are usually just large enough to allow proper egress for able-bodied building occupants. This is well below the minimum requirement to accommodate wheelchairs, chair lifts and elevators. Most landings do not provide enough space for wheelchairs to turn and maneuvre. Since suites normally surround landings, modifications are not easy.

*Size*

*Recommendations*

Construct landings 1,500 mm deep; this allows someone in a wheelchair to open a door. The following guidelines should be followed (Fig. 24) (also see Fig. 74):

- Where the door swings into the landing, provide 600 mm minimum on the latch side of the door.
- Where the door swings away from the landing, provide 300 mm minimum on the latch side of the door.
- Where the landing is a porch (double set of doors) provide the door width plus 1,200 mm.

Clearances required at latch side of door, Larger landings may berequired

if they are to be used as areas of refuge (Fig. 34).

*Considerations*

Modifications to landings are complicated; you must consider the impact on surrounding exterior walls, suites or stairs. Increasing landing depth may require modifications to suite entrances and stairways.

*Shape*

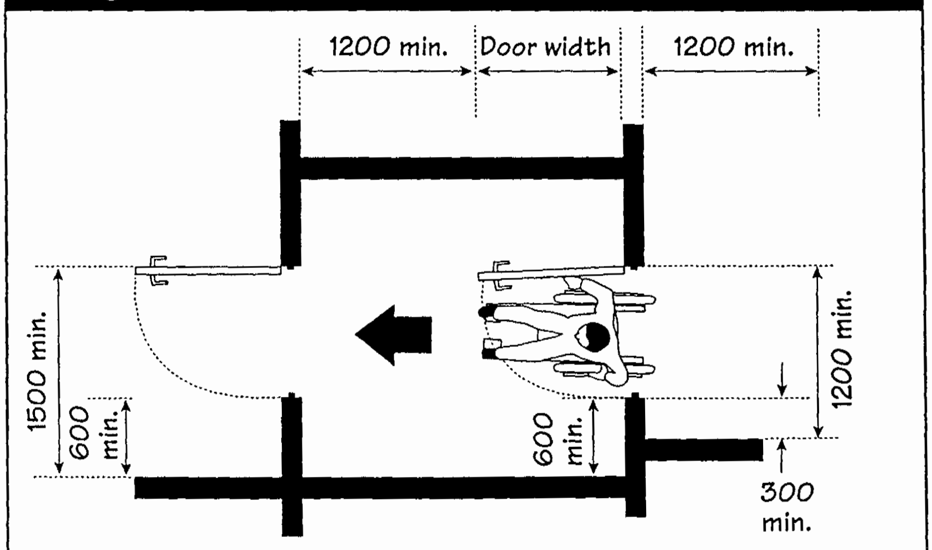
*Recommendations*

Build rectangular landings 2,000 mm to 2,500 mm wide and 1,300 mm to 2,000 mm deep; the minimum landing width to accommodate a turning wheelchair is 1,500 mm. Enlarge interior landings by moving stairs or exterior walls.

*Considerations*

If the exterior walls are moved, pay attention to structural support and protecting the site from the weather. There are potential structural

**Figure 24**
**Landing size for double set of doors**



consequences from moving stairs further into hallways, and you may be required to remodel the floor layout. There may be an impact on the locations of fire doors and fire-rated compartments.

## Stairs

### Introduction

People with mobility and sight impairments find stairs difficult and sometimes hazardous to use. The handrails that are installed to comply with the building code may not meet the needs of all users. Steps are often steep with slick tread surfaces, improper nosings and no backs. Stairways are often poorly lit or have windows that reflect light from shiny surfaces. Stairs are often covered with vinyl or carpet, making the rise and run blend visually. They normally lack tactile warning strips as a clue to where the stairs begin. Many stairways are lit by natural light and have minimum artificial lighting for the evenings and nights. Handrails are an important safety feature and make stairs more usable for people with partial mobility. Motorized chair assists or elevators are rare in three-storey walk-up buildings; however, inclined lifts or platform lifts allow wheelchairs to access one or more floor levels.

*Steps*

*Recommendations*

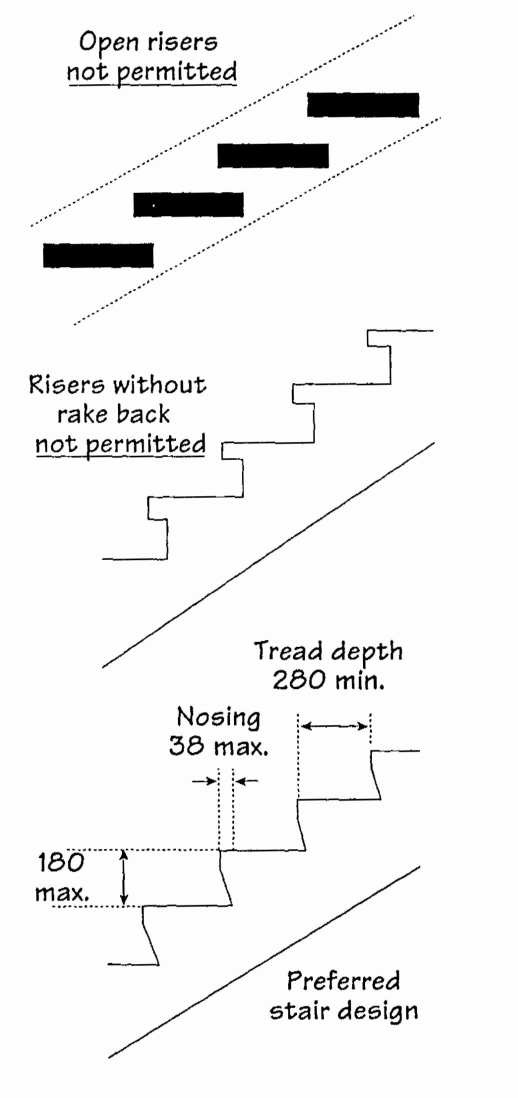
Build stairs with risers not more than 180 mm high and non-slip treads not more than 280 mm deep, measured from riser to riser; the stair nosing should not project more than 38 mm from the rake-back (this is a riser that slants outward). Install stair backs with proper rake and nosings on open stairs (Fig. 25).

*Considerations*

Where windows are located behind stairwells, a decision to close a set of open stairs may reduce lighting in stairways. Modifying the rise and run to reduce steepness may require landings to be adjusted to provide sufficient headroom (2,050 mm). Modifications to stairs and landings may have an impact on neighbouring suites and the location of fire doors and separations.

Stairs with longer treads and a smaller rise are easier to use than steep stairs, as long as the rise and run remain within code requirements. Keep in mind that stairs that are very gentle inhibit a natural walking motion.

**Figure 25**
**Stair details**



### *Tactile Strips*

*Recommendations*

Install a warning surface, of a different texture and colour to the surrounding floor, at the top of the stairs. This surface should commence 900 mm from the first step and stop one-tread width from the beginning of the stairs (Fig. 26). Place a tactile strip at the nosing of each step. Take care to ensure that strips are firmly fixed; loose strips create a tripping hazard.

*Considerations*

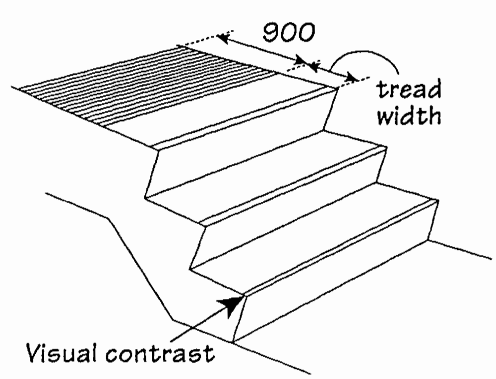
Tactile strips that protrude above the finished flooring can trip people. Standard strips can be installed directly on vinyl floor surfaces (carpet surfaces may have to be replaced). Placing tactile strips on one stair set will require all stairs to be treated equally. It is not acceptable to remodel only one set of stairs.

### *Edge Contrast*

*Recommendations*

Choose a contrasting colour for the stair nosing to make the tread edge more visible. The edge should also be slip-resistant.

**Figure 26**
**Edge contrast on stairs**




*Considerations*

New flooring for the entire stairway may be necessary in order to provide a colour contrast. In that case, consider installing non-slip flooring with colour contrasting tactile strips.

### *Lighting*

*Recommendations*

Ensure that the lighting level in stairways is not less than 100 lux. Position and direct new lighting so as to avoid reflections on stairs or landings.

*Considerations*

Shadows and reflections on stairways and landings cause problems and must be controlled at all times. You may need to provide artificial lighting on a 24-hour basis to combat reflections caused by daylight. Pay attention to the location and direction of artificial lights; these, too, affect shadows and reflections.

### *Handrails*

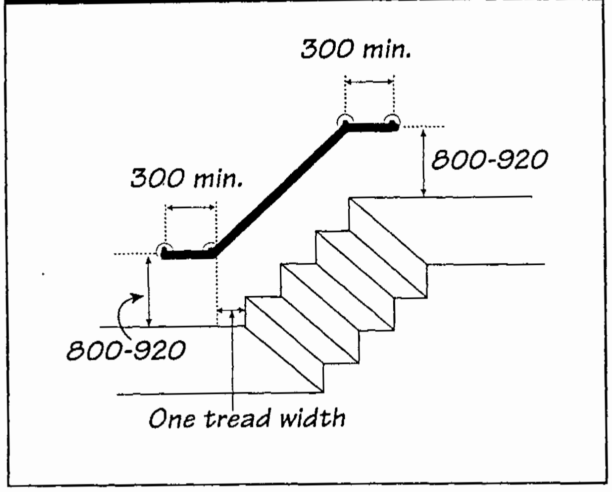
*Recommendations*

Purchase circular or oval handrails with a circumference of 30 mm to 40 mm in a colour that contrasts with the walls. Install these 35 – 45 mm from the wall and 800 mm to 920 mm above the stair nosing on both sides of the stairs; one side should be continuous from top to bottom. Where a handrail is discontinuous, extend it 300 mm horizontally before the top step and 300 mm plus one-tread-width at the bottom. Ensure that handrails return to the wall, floor or to a post; do not leave exposed ends (Fig. 27).

*Considerations*

Adding or extending handrails may interfere with door swings which can damage a door and prevent it from opening fully.

**Figure 27**
**Handrail on stairs**




*Stair Assists*

*Recommendations*

Install rails for a platform or "wheelchair" lift. Attach the rails to a middle handrail on the stairs or to the wall adjacent to the stairs. Place operating controls at convenient locations (i.e., the top and bottom of each lift).

*Considerations*

There is a wide range of lift products with a variety of capacities. Some lifts are self-storing when not in use. You may need to strengthen the existing walls or floor structures. The rails may take up considerable space in stairways and on landings and minimum stair widths must be maintained. Installation of the operating controls may require access to wall cavities. The lift is intended primarily for people in wheelchairs (some liftsare equipped with a fold-down seat for ambulatory users); it may be unsafe for others and people with mobility limitations may need to use the stairs.

***Elevators***

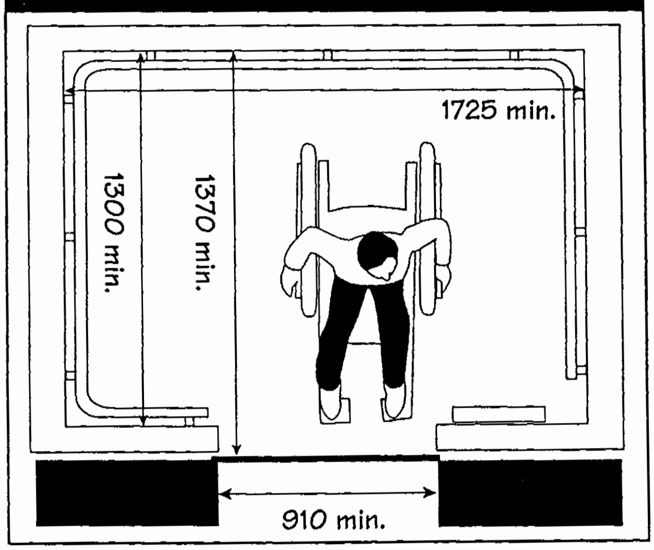
*Recommendations*

Elevators must comply with CSA Standard CAN/CSA-B44-M90; this standard requires that the unit meet the needs of all users including those with mobility, sight and hearing limitations (Fig. 28). Install the elevator at the entrance to the building, in an existing stairwell, or in an exterior wall addition.

*Considerations*

Elevators come in many sizes and capacities; some low-end models may not satisfy the needs of the sight or hearing impaired. The building must have more stairways than are required by the building code if one is to be used for the installation of an elevator. Installation may require remodeling one or more suites or the construction of an elevator shaft on the exterior of the building. Excavation or drilling may be required to create a pit at the bottom of the elevator shaft. The installation of an elevator creates fire safety concerns and, for older walk-up buildings, may require renovations to bring the building up to current fire protection standards (e.g., fire sprinkler systems, smoke alarms, areas of refuge). Evacuation instructions must describe the procedures that apply to the use of the elevator. In the event of a fire, elevators may be designed to become inoperable, or only operable by a key that overrides normal functions. In the latter case, an authorized operater will use the elevator for the evacuation of persons who are mobility

**Figure 28**
**Minimum elevator car size**



impaired. An area of refuge must be established of sufficient size to protect all persons in the building with mobility impairments (Fig. 34).

## Corridors

### Introduction

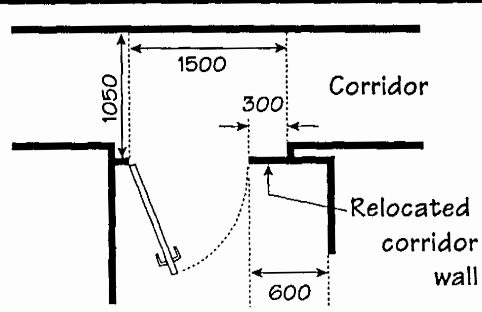
Most older buildings were designed with narrow corridors of uniform width that run the building's entire length. These corridors have minimum lighting, occasionally enhanced by windows at each end. In response to the rising cost of energy, some building owners have reduced the number of light bulbs in fixtures or the wattage of each bulb. Normally resilient flooring or carpet is installed and handrails are uncommon.

*Width*

*Recommendations*

Provide corridors with a minimum width of 1,200 mm. This will permit a wheelchair to pass a person who is walking. Better yet, a width of 1,500 mm will permit two wheelchairs to pass each other. In addition, width is critical at doorways. For a latch side approach, provide a corridor width of 1,050 mm for a length of 1,500 mm; for a hinge side approach, provide a width of 1,050 mm for a length of 1,350 mm. Where corridors cannot be widened for their entire length, widen the corridor at the suite entrance by relocating a small portion of the corridor wall into the suite (Fig. 29).

**Figure 29**
**Required corridor width at suite entry**




*Considerations*

A minimum width of 1,100 mm is required for public corridors. Widening these may require significant alterations. Corridor walls are typically load-bearing: moving them will have structural implications. The walls also serve as fire separations: moving them will require moving firestops. Finally, many suites have bathrooms and kitchens backing onto corridor walls: utility and plumbing will have to be moved.

Moving a portion of a corridor wall at the suite entrance would eliminate the major costs of relocating utility lines; however, the structural and fire rating issues would still have to be addressed. Differences in elevations between hallways and suites must be resolved.

*Surface/Elevation*

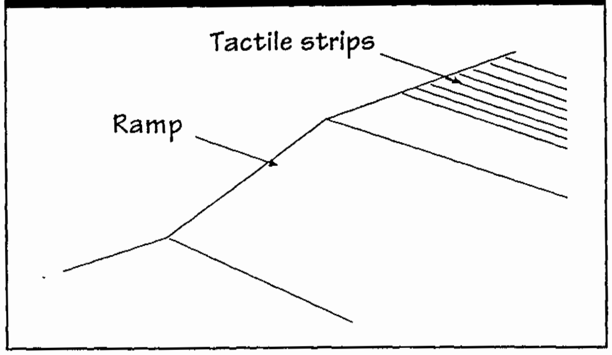
*Recommendations*

Provide floor finishes that are slip-resistant for the easy movement of wheelchairs and to protect people using walkers or canes. Use non-glossy resilient flooring. Securely fasten high-density, commercial carpeting directly to the subfloor; underpadding should not be used. Install a ramp (rather than a step) with a slope that does not exceed 1:12 where elevation differences occur in the corridor.

*Considerations*

A trend in corridor carpeting is to place a strip of differently coloured carpet along the corridor walls and in front of stairways. However, people with sight limitations find this visually confusing and interpret the colour change as a change in elevation. The main carpet colour should extend up to suite doors and to stair edges; avoid using decorative colour strips. (See Tactile Strips, Fig. 26 – Fig. 30).

**Figure 30**
**Tactile strip at ramp in corridor**




## *Lighting*

*Recommendations*

Maintain lighting levels at a minimum of 100 lux to ensure that people with sight impairments are able to identify obstacles, elevation changes and the location of individual suites. Provide non-reflective surfaces. Install additional lighting at suite entrances and in stairways.

*Considerations*

Reflective surfaces create difficulties for people with sight impairments. Contrary to popular belief, reflective and non-reflective flooring accumulate dirt at the same rate.

## *Handrails*

*Recommendations*

Purchase circular or oval handrails with a 30 mm to 40 mm circumference (Fig. 31). Install these 35 – 45 mm from the wall on both sides of the corridor; 800 mm to 920 mm above the floor. Handrails should be continuous between doorways and return to the wall without leaving exposed ends.

*Considerations*

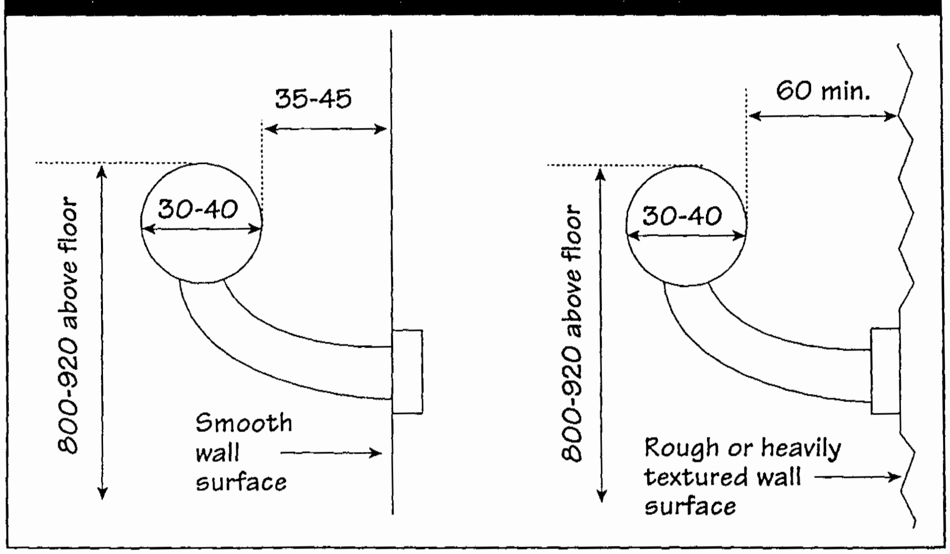
In most cases, there will be enough studs to support handrails. However, where the studs do not provide sufficient support, the walls will require additional backing. Handrails will reduce the effective width of the corridors – a concern, if the corridors are narrow.

# Floor/Suite Identification

### Introduction

Each floor and individual suite must be identified. However, suite numbers placed on doors of identical colour are difficult to see. Floor numbers are often lacking at elevators or in stairwells; the prevailing assumption being that people know that Suite 23 is located on the second floor. Persons with sight impairment have difficulty locating the edges of openings, such as doorways.

**Figure 31**
**Recommended handrail for corridor**




## *Numbers*

*Recommendations*

Provide large, raised floor numbers in the stairwell at the door leading to the floor. Purchase suite numbers (25 mm high and 0.8 mm thick or raised) that are colour-contrasted to the background colour (Fig. 32). Install these numbers 1,500 mm from the floor.

*Considerations*

Painted numbers or thin stick-on numbers do not provide tactile information and are unsuitable. Raised numbers may have to be mechanically fastened to walls or doors (Fig. 23). Light numbers on a dark background or dark numbers on a light background are best. Numbers may require regular maintenance if they are damaged or removed.

***Visibility***

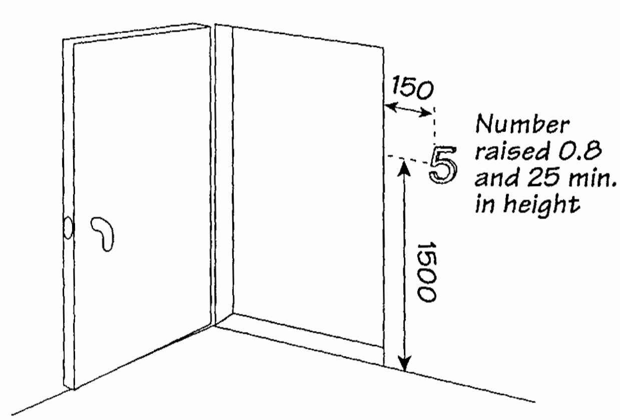
*Recommendations*

Paint the frames of all suite entry doors and all exit doors a colour that contrasts with the surrounding walls.

*Considerations*

In order to maintain consistency of contrasting colours throughout the building, floors with different colour schemes may have to be re-painted.

**Figure 32**
**Floor/suite identification**




## Fire Protection

### Introduction

Most walk-up buildings have a fire-resistance rating of 30 minutes or less for stairwells and corridors. If elevators or chair lifts are installed, the fire protection may be inadequate. Fire doors are often propped open by tenants and do not close in the event of a fire.

***Hardware***

*Recommendations*

Equip fire doors with auto release hardware that will close them in the event of a fire (Fig. 33). The doors remain open when there is no fire which permits tenants to pass through fire doors without having to touch them. Ensure that all automatic devices are connected to the fire alarm system and smoke detectors; this will cause all fire doors to close immediately.

*Considerations*

Most fire doors in older buildings are normally in a closed position. When auto-closers and auto release hardware are installed, tenants must be educated in safe fire door usage.

***Size***

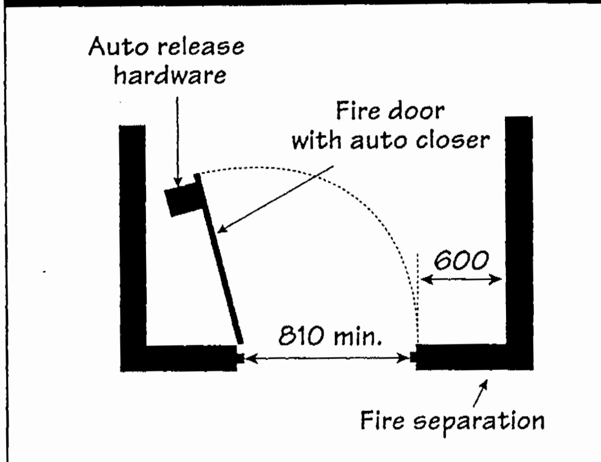
*Recommendations*

Provide a clear door width of 910 mm for fire doors (the minimum clear door width is 810 mm).

*Considerations*

Fire doors are normally of adequate size; however, most have very basic hardware.

**Figure 33**
**Auto release hardware for fire door**




*Area of Refuge*

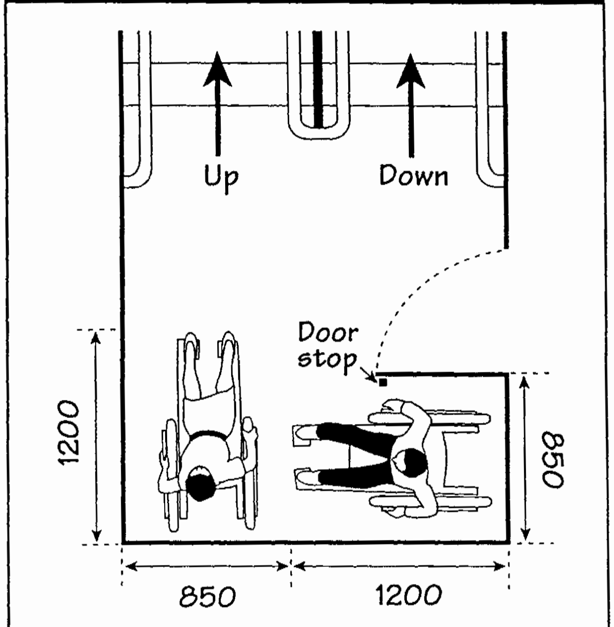
*Recommendations*

On each barrier-free floor, construct an area of refuge with a floor space of 2 $m^2$ for each non-ambulatory occupant and attendant. Provide a minimum of two spaces. Locate the area of refuge near an exit. Construct a fire separation between the area of refuge and the main floor area. Ensure that doors do not encroach on the space required for wheelchairs. Provide early-warning systems for tenants with mobility impairment and ensure that they know about the refuge area.

*Considerations*

The area of refuge must provide safety from fire and smoke until help arrives for building evacuation. Landings are often not large enough to accommodate two wheelchairs and still allow egress for others (Fig. 34). Enlarging the landing may be difficult and costly or impractical. Development of an adjacent area on each floor as a refuge may result in a loss of suite space.

**Figure 34**
**Area of refuge located in exit area**




Spaces for 2 wheelchairs

## Looking Ahead

### Introduction

All these issues are illustrated on pages 15 – 22.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

The costs presented here are for general information only. Cost estimators with experience in renovation have worked out approximate costs, basing them on typical material and labour rates in Winnipeg. These estimates do not include mark-ups for overhead, supervision or taxes, but they will allow you to calculate the relative incremental costs of improving accessibility as part of a larger repair or replacement activity.

*When replacing hallway carpet,* consider an alternative type of flooring, such as sheet vinyl or tiles. Wheelchairs do not roll easily on some types of carpet.

Cost: Variable due to wide selection of floorings.

*When replacing hallway carpet,* consider using contrasting colours at suite entrances and stairs. This allows for those with limited vision to identify locations in the halls more easily.

Cost: Labour to install, \$2/metre

*When replacing hallway carpet,* consider installing tactile strips at the top of stairs. These strips warn those with limited vision that they have arrived at the top of a flight of stairs.

Cost: Tactile strip, per metre, \$1.50
Installation, per metre, \$1

*When painting hallways and landings,* consider using contrasting colours for door frames. This makes the doors more recognizable for people with limited vision.

Cost: Labour, per door, \$5

*When painting hallways and landings,* consider installing additional handrails to provide support for those with limited mobility and to guide those with sight impairment.

Cost: Handrail, wood, brackets, per metre, \$3.75
Installation, per metre, \$1.50
Paint/stain, per metre, \$2

*When painting hallways and landings,* consider installing large, coloured numbers at suites and at landings. People with limited vision benefit from larger numbers in contrasting colours.

Cost: Larger numbers, per suite, \$1.50
Installation, per suite, \$1

*When replacing light fixtures,* consider selecting fixtures with higher lighting levels. This benefits everyone, particularly those with limited vision.

Cost: None.

*When replacing light fixtures,* consider changing the location. This may provide for better lighting without having to upgrade the output of the fixtures or increase the number of fixtures.

Cost: Wire and installation, per fixture, \$75
Repair old location, \$40

*When replacing suite entry doors,* consider widening the entryways to make access easier for users of wheelchairs and walkers.

Cost: Wider door and frame, assuming no structural implications, \$150
Labour, 1.5 hours

*When replacing suite entry doors,* consider installing lever-style hardware which is easier to use. People with limited mobility or hand motion may be unable to use hardware that requires a twisting motion of the wrist.

Cost: Hardware, \$75
Installation, 0.5 hours

*When replacing suite entry doors,* consider installing additional door viewers at a height appropriate for wheelchair users. Door viewers are typically installed about 1,500 mm from the floor – too high for a person in a wheelchair.

Cost: Door viewer, \$15
Installation, 0.5 hours

*When replacing suite entry doors,* consider installing a kick plate on the door. Wheelchairs can then brush against doors without causing damage.

Cost: Kick plate, $25
Installation, 0.5 hours

*When modifying hallway doors,* consider installing automatic door release hardware that allows doors to remain open until automatically released. This is a fire safety feature for all tenants and eliminates the practice of propping fire doors open.

Cost: Auto release hardware, wire, per door, $125
Installation, connection to fire alarm system, per door, 2.5 hours

## Doors

### Introduction

Bathroom doors are generally too narrow for wheelchairs: the clear door width is often the same as or less than the width of a wheelchair. Doors that swing into the bathroom seldom open beyond 90°. In addition, insufficient clearances (particularly on the latch side) make the doors hard to approach and pull open. If the swing of the door is changed to be an outswing door, adequate space will likely not be available if it swings into a hallway.

*Width*

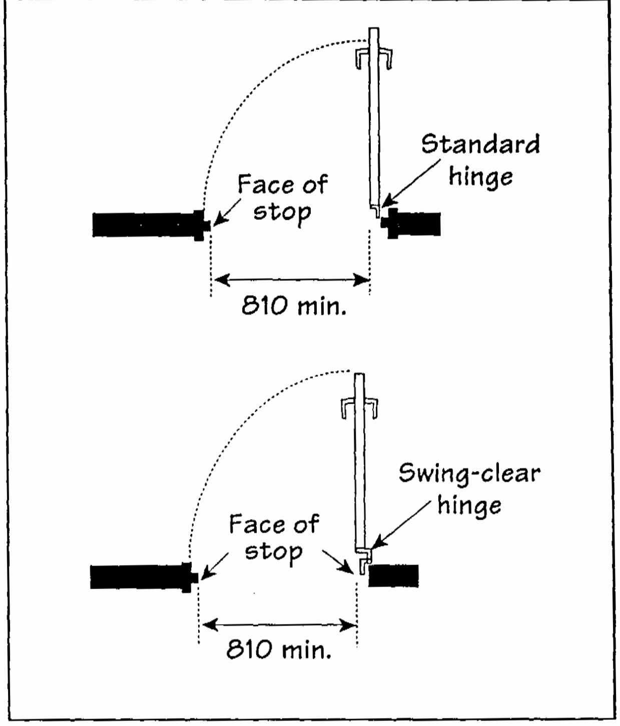
*Recommendations*

Provide a clear door opening width of 810 mm. There are three options for doors that will ensure full use of this clear width. First, using a standard door, install swing-clear hinges (Fig. 35). These allow the door to swing completely out of the door opening, leaving the full width of the door opening clear for passage. Second, purchase and install a wider door. The third option is installation of pocket doors. However, select hardware carefully for pocket doors, taking those with limited hand mobility into consideration.

*Considerations*

Installation of a wider door may mean redesigning the entire bathroom. (e.g., moving walls, fixtures, plumbing lines and electrical outlets and wires). Pocket doors must be able to slide sideways into an open space in a wall cavity. Often, there are services (e.g. electrical switches, outlets, plumbing lines, paper holders and medicine chests) in that space.

**Figure 35**
**Use of swing-clear hinges**

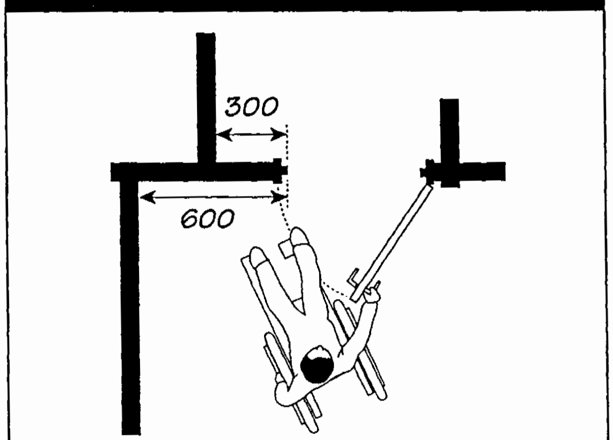



*Clearances*

*Recommendations*

Provide adequate space on the latch side of the door. This will allow someone in a wheelchair

**Figure 36**
**Minimum latch-side clearances**



sufficient room to unlock the door and swing it open. A minimum of 600 mm is needed beside the door on the inswing side. On the outswing side, provide 300 mm clearance.

*Considerations*

Providing extra wall space may require moving fixtures and even the wall.

***Swing***

*Recommendations*

Bathroom doors may be reversed so that they swing out rather than in to the bathroom (Fig. 37). A door that swings out of the bathroom requires only 300 mm of latch side space inside the bathroom. The 600 mm of space required on the outside may also be more readily available. Although a 814-mm or wider door is still needed, an outswinging door will make for easier movement in the bathroom.

***Important!***

A door that swings out of the bathroom is preferable simply because, if person should fall inside the bathroom and block an inswinging door, it is more difficult to assist them.

*Considerations*

Ease of movement in the hallway and around an outswinging door must be considered. Remember that a minimum of 600 mm is needed on the latch side of the outswinging door, and the hallway or open area must be large enough to allow a wheelchair user to move out of the way of the door as it swings open. For a hinge-side approach, a hallway width and length of 1,500 are required; for a latch-side approach, a hallway width of 1,200 mm and length of 1,500 mm are enough.

***Hardware***

*Recommendations*

Provide lever-style handles that are easy to grasp and operate. Install these 915 mm to 1,050 mm from the floor with a clearance of not less than 50 mm between the handle and door.

Install a second pull handle 200 mm from the hinge, 900 to 1,000 mm from the floor: wheelchair users can pull this to close the door (Fig. 38).

*Considerations*

Hollow-core doors will require good anchors for extra handles, or the hardware will easily loosen and detach.

**Figure 37**
**Out-swing bathroom door**

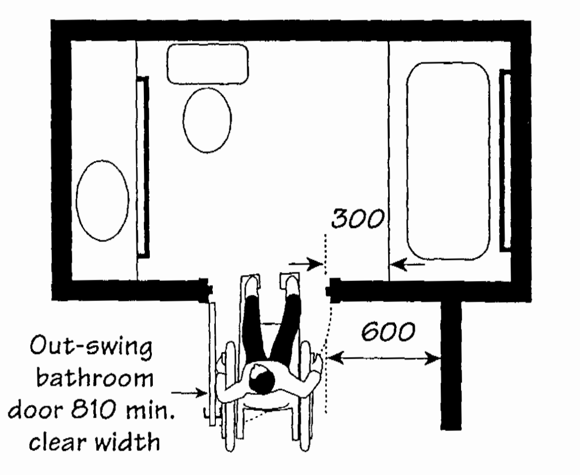
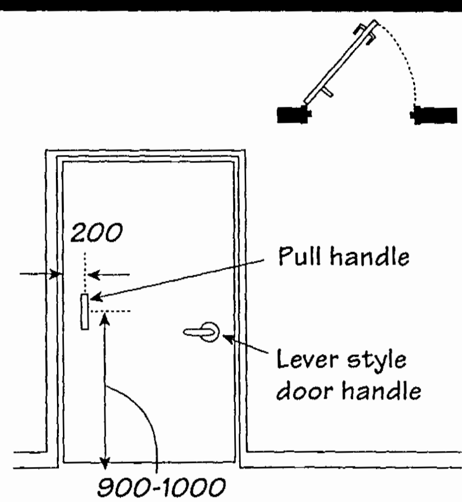



**Figure 38**
**Pull handle near hinge side of door**



*Colour*

*Recommendations*

Paint door frame and casing a colour that contrasts with the wall to identify the doorway edges. Paint the door a colour that contrasts with the wall.

*Considerations*

Proper colour selections must be made when using contrasting colours. If colours clash or are very bold, the marketability of the suite may be reduced.

## Tubs

### Introduction

Standard tubs and accessories are difficult for people with mobility limitations to use. Controls are usually hard to reach and difficult to operate, and this can result in hot water burns. Bathtubs are normally too low for comfortable transfer from wheelchair level.

Bathtubs are seldom equipped with grab bars, and tub surfaces can be dangerously slippery, both conditions that make bathtub entry and exit difficult and hazardous. Shower doors reduce the space available to get into or out of the tub and limited space beside the tub does not allow a wheelchair user to get near enough for easy transfer.

***Shower doors and curtains***

*Recommendations*

The rim of the tub is often used as the transfer surface. Remove tracks or other hardware from this area. Most types of shower doors are not acceptable on tubs.

*Considerations*

Consider removing shower doors at the tenant's request.

***Grab Bars***

*Recommendations*

Install a minimum of two slip-resistant grab bars with diameters of 30 mm to 40 mm to assist with safe and easy transfer to and from the tub. Locate one 1,200-mm long grab bar horizontally along the length of the tub, 180 mm to 280 mm above the rim. Position the second grab bar vertically, 180 to 280 mm above the rim, at the foot of the tub adjacent to a clear floor space. Allow a space of 35 mm to 45 mm between the grab bars and the wall surface. Ensure a solid backing as grab bars must resist a force of 1.3 kN (approximately 290 lbs.), when applied either vertically or horizontally (Fig. 39, Fig. 40).

*Considerations*

The primary consideration is adequate backing. Numerous grab bar options exist and the entire area around the tub may need to be reinforced. In some cases, reinforcement may require the removal of drywall and tiles. Backing should be sufficiently extensive to allow for repositioning of grab bars, if required.

**Figure 39**
**Size, clearance and capacity of grab bars**

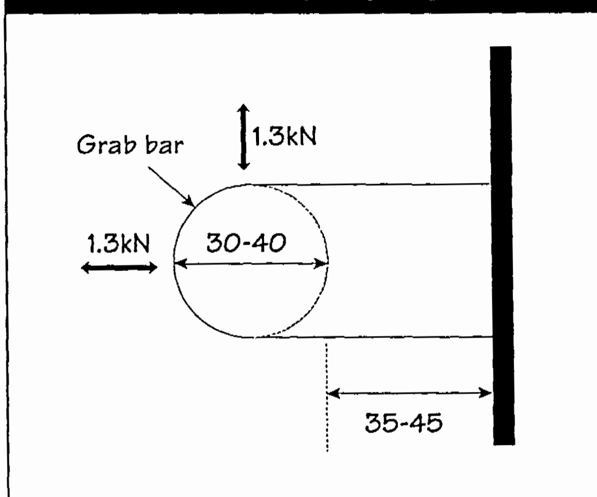
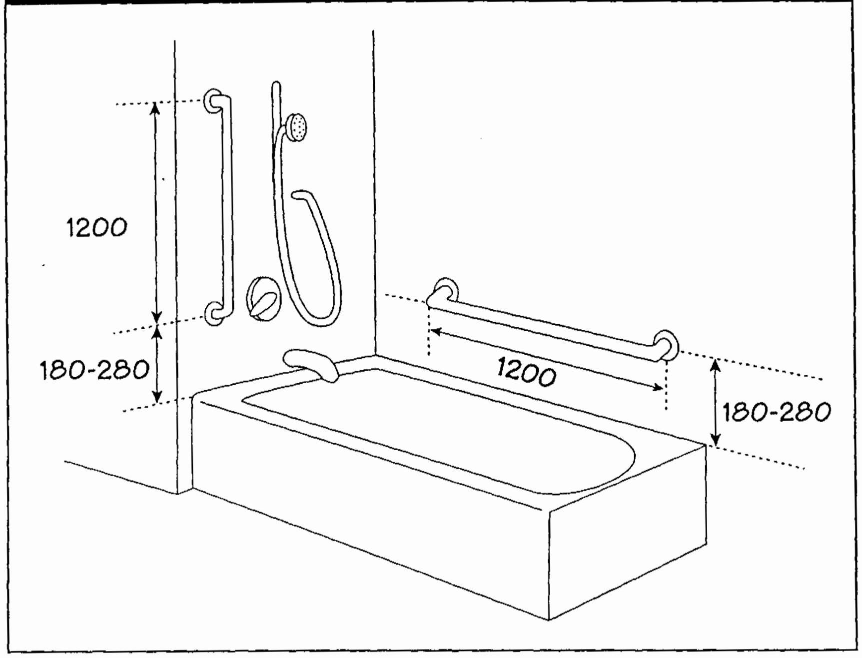


**Figure 40**
**Location of grab bars around bathtub**

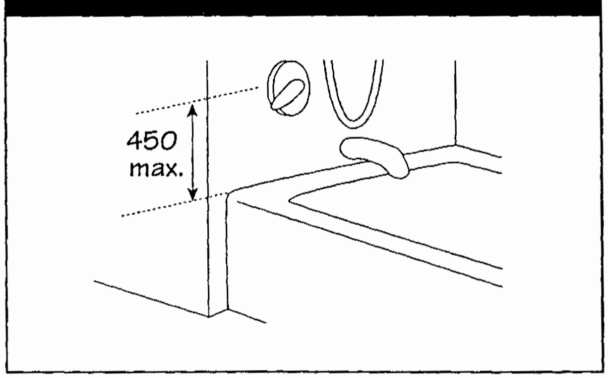



*Shower taps*

*Recommendations*

Locate controls a maximum of 450 mm from the bathtub rim, at the foot of the tub between the centreline of the tub and the outer edge (Fig. 41). Hand-operated controls should be operable with one hand, require no tight grasping, pinching or wrist twisting and a force of less than 22N to activate. Install a pressure-equalizing valve or an automatic, thermostatically controlled valve for water temperature control to compensate for water use elsewhere that can cause hot and cold water surges.

**Figure 41**
**Location of controls for bathtub**




Provide a hand-held shower with a water shut-off button and a hose that is at least 1,500 mm in length. Ensure the hose is usable in a fixed position that does not interfere with the use of the grab bar. Install a second holder on the side wall (or on a moveable slide or track), within easy reach of someone in the tub.

*Considerations*

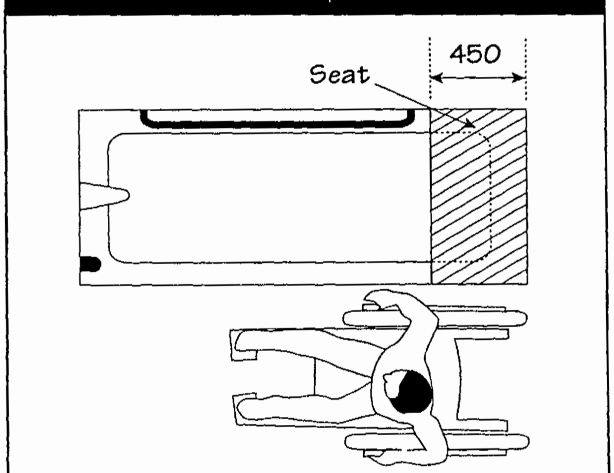
Installing the controls between the centreline of the tub and its outer edge means relocating the current controls. Installation of the vertical grab bar may present some problems in terms of the wall's backing.

***Seat***

*Recommendations*

Install a 450-mm-wide deck-mounted seat at the head of the bathtub to facilitate transfer from a wheelchair to the bathtub (Fig. 42). This seat is

**Figure 42**
**Seat for bathtub**



also a convenient place to sit while showering. Alternatively, provide a portable stool that fits into the tub (a fixed in-tub stool would not help with transfer).

*Considerations*

If a seat is installed, it should be removable or should fold up against the wall to leave the full tub available to other users.

***Heights***

*Recommendations*

Raise the bathtub approximately 150 mm off the floor to bring the top of the tub level with the seat of a wheelchair and to permit use of a tub-side lift. A raised tub makes it easier to stand up from a seated position on the tub rim and will reduce the amount of bending for an attendant (Fig. 43).

*Considerations*

Controls, soap dishes, grab bars and other fixtures will have to be relocated if the tub is raised.

**Figure 43**
**Raised bathtub allows use of tub-side lift**

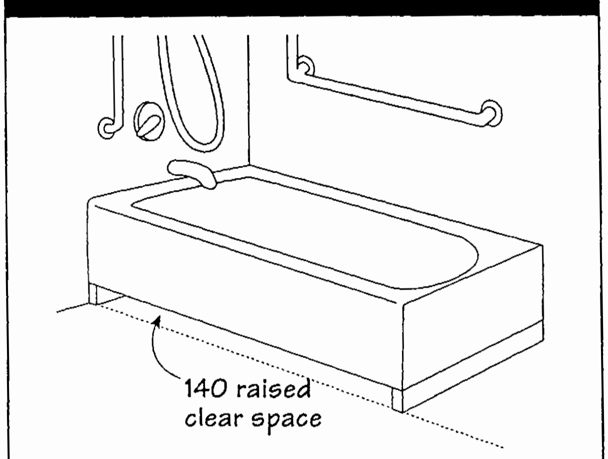
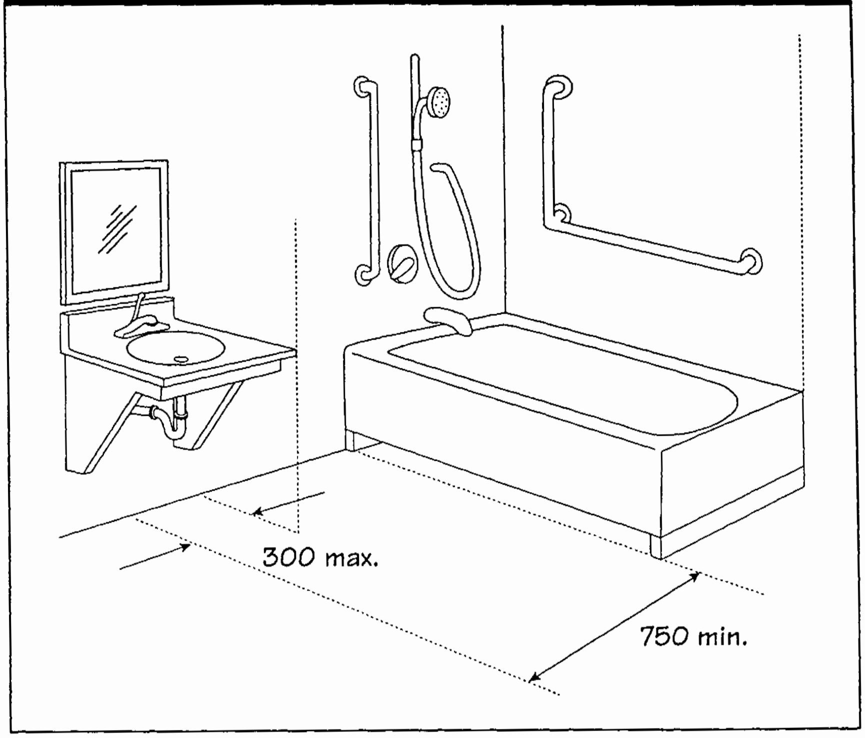



**Figure 44**
**Required clear space in front of bathtub**




***Clearances***

*Recommendations*

Provide a clear floor space 750 mm wide and 1,200 mm long (the full length of the tub is recommended); this allows a wheelchair parallel approach to the tub for transfer and to reach the controls. The lavatory can intrude a maximum of 300 mm into this space provided there is a clear knee and toe space under the lavatory (Fig. 44).

*Considerations*

Very few bathrooms have this amount of space available. If the bathroom is remodelled, consider arranging the required clearances.

## Showers

### Introduction

Many people prefer showering to bathing. The installation of a separate shower unit can be more difficult than creating an accessible bathtub.

Generally, there is inadequate space in front of the shower to allow for approach by a wheelchair. Controls are often improperly located and do not protect the user from dangerous water temperature changes. The curb on the shower unit is a potential barrier that makes it impossible to enter the shower in the wheelchair. Slippery finishes and lack of proper supports can be dangerous.

### *Roll-in Shower Stalls*

*Recommendations*

Roll-in shower stalls accommodate people who prefer to remain in their wheelchairs while taking a shower (Fig. 45).

Install a roll-in shower stall with a minimum interior dimension of 750 mm by 1,500 mm (915 mm by 1,500 mm is even better).

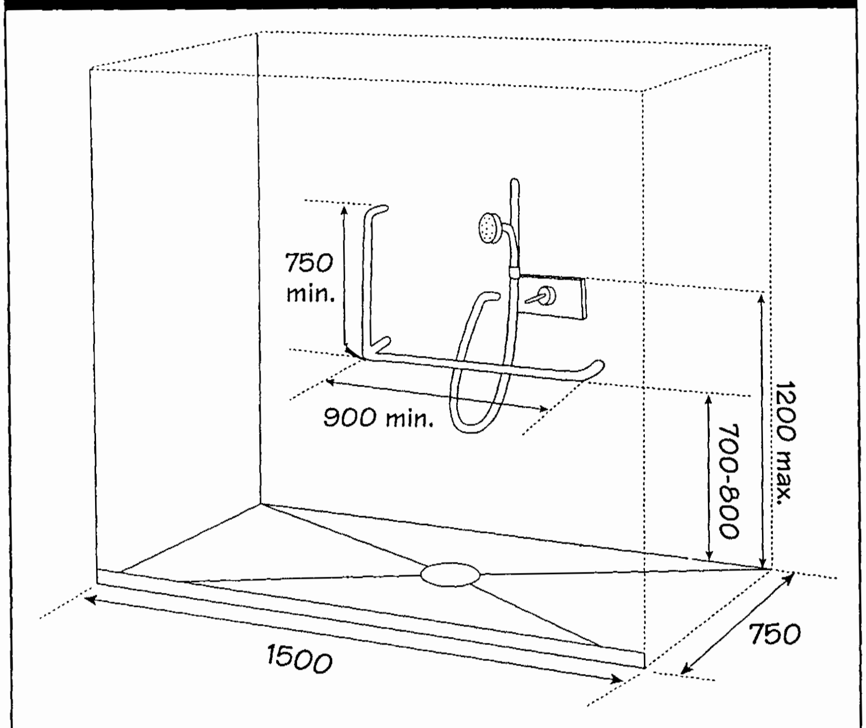
Provide 900 mm by 1,200 mm clear floor space in front (with the 1,200-mm dimension parallel to the shower entrance). Ensure that the curb is between 6 mm and 13 mm high and beveled at a slope of 1:2.

Provide an L-shaped grab bar (or two grab bars configured to form an L) that is slip-resistant, 30 mm to 40 mm in diameter with a vertical and horizontal force resistance of 1.3 kN. The configuration should measure 750 mm vertically and 900 mm horizontally. Install the bar on the long wall of the shower with the horizontal section 700 mm to 800 mm from the floor, 35 mm to 45 mm from the wall surface (Fig. 45).

Locate controls on the long wall above the horizontal grab bar (not more than 1,200 mm above the floor). Hand-operated controls should be operable with one hand, require a force of less than 22N to activate without twisting the wrist, grasping or pinching.

Install a pressure-equalizing valve or an automatic, thermostatically controlled valve for water temperature control to compensate for water use elsewhere and to eliminate surges of hot or cold water.

**Figure 45**
**Location of grab bars and controls for roll-in showers**




*Considerations*

There may be inadequate clear space in front of the roll-in shower. Installation of additional backing in the proper locations for grab bars may necessitate wall repairs. Controls and plumbing lines for the existing bathtub will have to be relocated.

### *Shower Stalls with Seat*

*Recommendations*

Shower stalls with a seat accommodate people who prefer to transfer from their wheelchairs to a fixed seat or for those who prefer or need to be seated while showering.

Install a shower stall with a minimum interior dimension of 900 mm by 900 mm (larger, if possible).

Provide 900 mm by 1,200 mm clear floor space in front (with the 1,200 mm dimension parallel to the shower entrance) (Fig. 46). Ensure that the curb is not higher than 100 mm.

Provide two slip-resistant grab bars, 30 mm to 40 mm in diameter, 750 mm long with a vertical and horizontal force resistance of 1.3 kN. On the back wall of the shower, install one bar horizontally 700 mm to 800 mm from the floor. Install the second bar vertically 80 mm to 120 mm from the front edge of the shower, with the lower end 700 mm to 800 mm from the floor (Fig. 46). Provide a space of 35 mm to 45 mm between the grab bars and the wall.

Locate controls on the wall opposite the seat, 1,200 mm from the floor. Controls should be reachable from outside the shower, operable with one hand and require a force of less than 22N to activate without twisting the wrist, grasping or pinching.

**Figure 46**
**Location of grab bars for shower with seat**

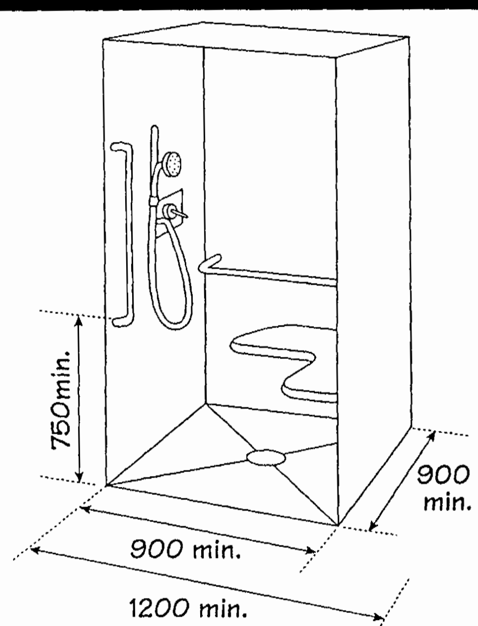
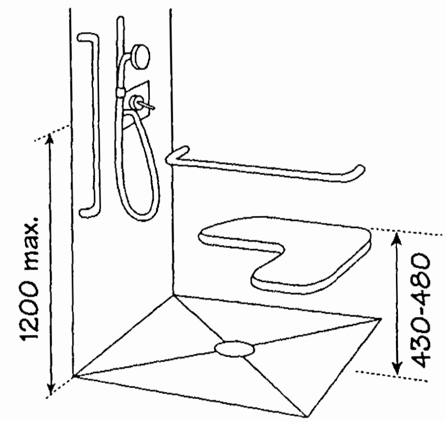



**Figure 47**
**Location of controls for shower with seat**




Install a pressure-equalizing valve or an automatic, thermostatically controlled valve for water temperature control to compensate for water use elsewhere and to eliminate hot and cold water surges.

Install a 400-mm-wide shower seat, 430 mm to 480 mm from the floor (Fig. 47). A fold-away seat will allow full use of the stall by those who do not need to sit.

*Considerations*

Remodelling a shower to include a seat, grab bars and proper shower fittings will not involve significant cost – unless, that is, space available is too small and alterations are required to walls or fixtures.

***Shower Head***

*Recommendations*

Provide a hand-held shower with a water shut-off button and a hose that is at least 1,500 mm long (Fig. 48). Ensure that the hose is usable in a fixed position and does not interfere with the use of the grab bar. Install a second holder on the side wall (or on a moveable slide or track), within easy reach by someone in the tub.

**Figure 48**
**Showerhead with flexible hose**

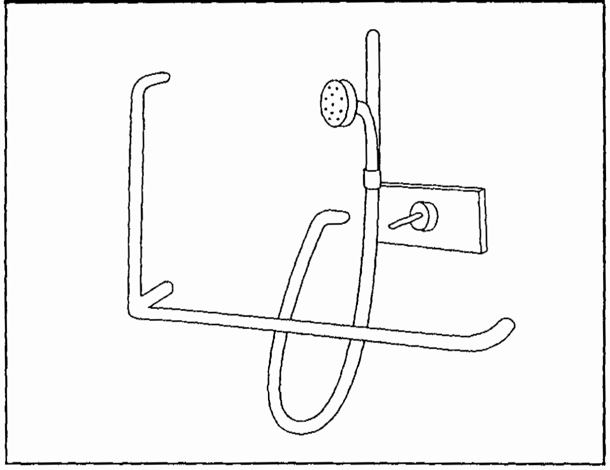
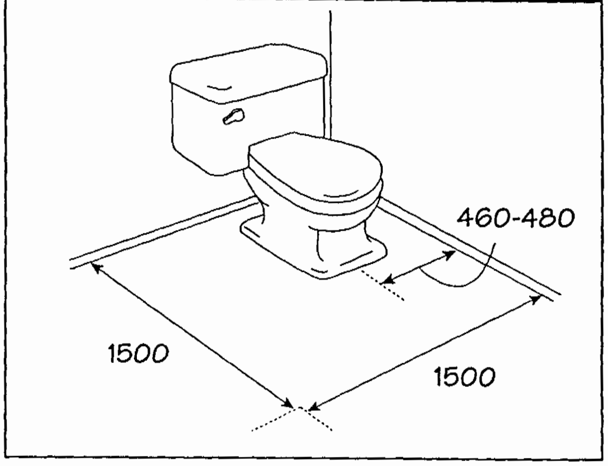


**Figure 49**
**Recommended clear space around toilet**




## Water Closet

### Introduction

Water closets are typically located in a very narrow, inaccessible space, often between the vanity and the bathtub. With this layout, wheelchair users may not be able to get close enough for transfer from their chair to the water closet, and assistance is usually required. Most water closets do not have grab bars for support and users must hold or lean on other fixtures. People with limited mobility may find that the water closet seat is too low and the paper holder inaccessible.

***Location***

*Recommendations*

Provide an access space of 1,500 mm by 1,500 mm in front of and to one side of the water closet (Fig. 49). This may overlap access space for the bathtub, shower or lavatory.

Locate the water closet beside a wall and install grab bars behind it and to one side (Fig. 49).

*Considerations*

Space in bathrooms is usually limited. Providing appropriate clear space around the water closet will likely mean increasing the size of the bathroom and moving the water closet and other fixtures.

***Grab Bars***

*Recommendations*

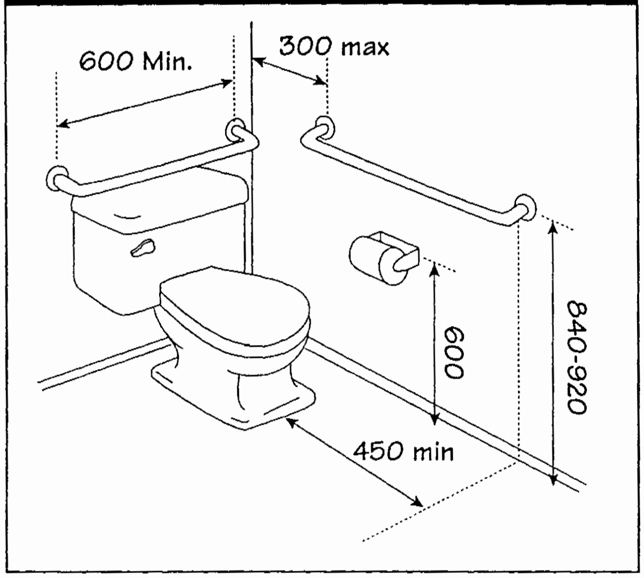
Provide two slip-resistant grab bars, 30 mm to 40 mm in diameter with a vertical and horizontal force resistance of 1.3 kN. Select a grab bar that is fully as wide as the water closet. Install this on the back wall, horizontally, 750 mm to 850 mm from the floor. Mount the second horizontal bar on the adjacent wall, 750 mm to 850 mm from the floor, and ensure that it extends 450 mm in both directions from the front of the fixture. Provide a space of 35 mm to 45 mm between the grab bars and the wall (Fig. 50).

If a vertical grab bar is used, it should be located on the side wall approximately 250 mm in front of the water closet.

*Considerations*

To support grab bars with solid backing, wall repairs may be required. Installation at the appropriate location may mean that other fixtures (e.g., medicine cabinet, shelving and mirrors) need to be relocated.

**Figure 50**
**Grab bars around water closet**




*Seat*

*Recommendations*

Conventional-height water closets are best for a variety of users. Although water closets with higher seats are available, adjustable seat adapters will raise the seat 75 mm to 150 mm (Fig. 51). The adapter will bring the seat and the wheelchair to the same level, making transfer easier. Seat adapters come with additional features such as a shower arm that sprays warm water and a heated air dryer.

*Considerations*

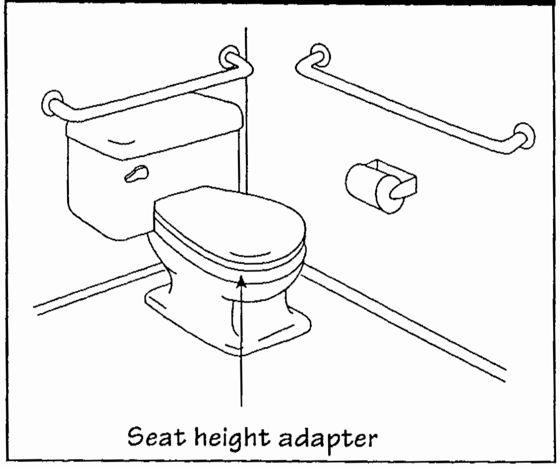
Some specialized hygienic seats are quite costly and involve extra plumbing and electric hook-ups.

***Accessories***

*Recommendations*

Provide a surface-mounted paper holder (Fig. 52). Install this 600 mm from the floor, on the wall adjacent to the water closet, below the grab bar, in line with or within 75 mm of the front of the fixture.

**Figure 51**
**Seat adapter raises height of toilet seat**




*Considerations*

Removal of the existing paper holder means repairing the old location.

## Sinks

### Introduction

Bathroom sinks are typically located near the entry door, where there is very limited space for a wheelchair to maneuvre. A below-sink vanity means that the lavatory is usually too high, and wheelchairs cannot easily roll up to it. Mirrors are usually too high, and above-sink medicine chests are inaccessible to wheelchair users.

**Figure 52**
**Surface-mounted paper holder is recommended**

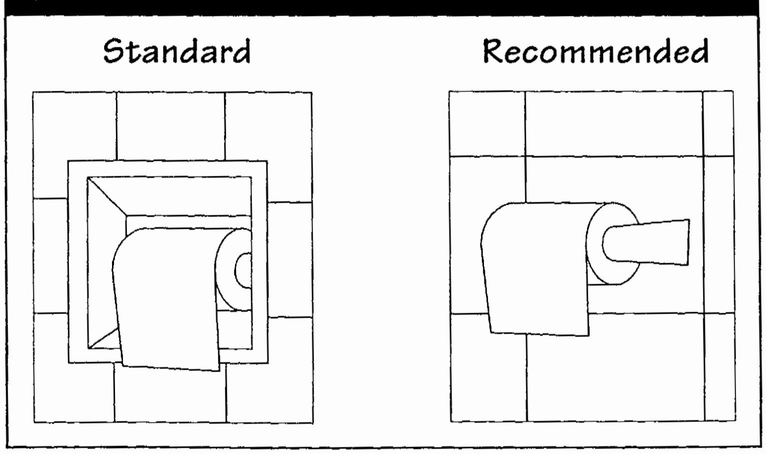
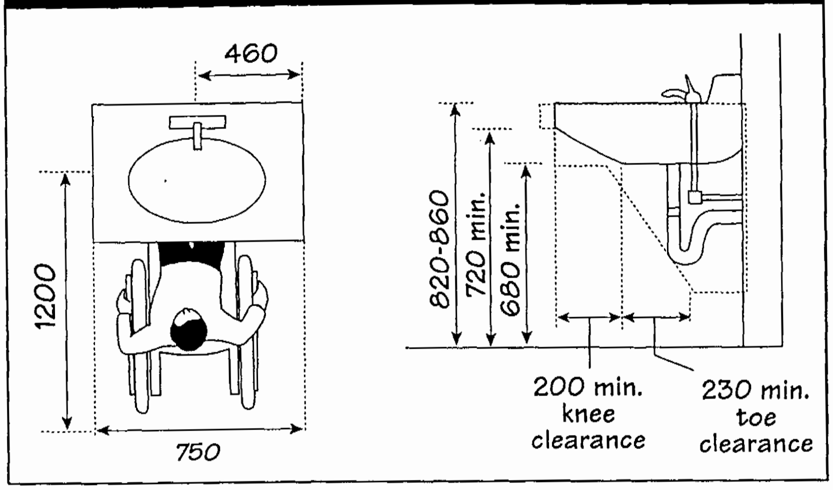


**Figure 53**
**Height and clearances around bathroom sink**




### *Height*

*Recommendations*

To provide knee clearance under the sink, offset plumbing traps 150 mm to the rear, and insulate hot water supply pipes to prevent burns.

Locate the sink with the centreline of the unit no less than 460 mm from the side wall and the top 820 mm to 860 mm from the floor. Provide a knee space 750 mm wide by 200 mm deep by 680 mm high, and a toe space 750 mm wide by 230 mm deep by 230 mm high (Fig. 53). Provide a clear floor space in front of the vanity 750 mm wide by 1,200 mm deep.

*Considerations*

Providing clear space in front of the sink may require moving walls and changing the location of the sink and other fixtures.

### *Taps*

*Recommendations*

Install faucets and other controls with lever-type colour-coded handles that are not self-closing. These could be electronically or infrared-controlled and operable with a closed fist.

### *Mirror*

*Recommendations*

Place the mirror with its bottom edge no higher than 1,000 mm from the floor (Fig. 54) (tilt the mirror, if necessary).

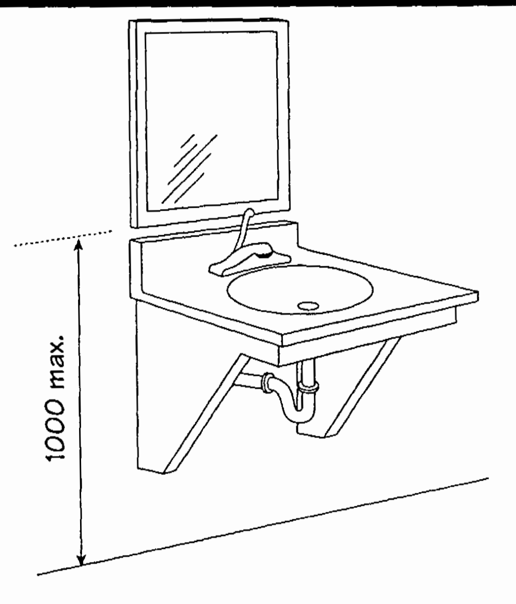
If the below-sink vanity has been eliminated or the above-sink medicine cabinet replaced with a larger mirror, provide one or more shelves for medicine and grooming products and position it not more than 1,200 mm from the floor.

Provide a GFI (ground fault indicator) protected electrical outlet for hair dryers, curling irons and other appliances. Position it near the sink so that it is accessible from a wheelchair.

*Considerations*

A new, larger mirror may involve moving the medicine chest. If a mirrored medicine chest is lowered, it may require locks to keep the contents

**Figure 54**
**Recommended height of bathroom mirror**



safe from children. If the vanity and medicine chest are removed, alternative storage space will be necessary.

*Towel Bars*

*Recommendations*

Install towel bars 900 mm to 1,200 mm from the floor. Ensure that the bars are firmly attached; they may need to support some weight as a person removes or replaces a towel.

*Considerations*

Towel bars may need replacing or relocating, which will necessitate wall repairs.

## Looking Ahead

### Introduction

All these issues are illustrated on pages 25 – 34.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

The costs presented here are for general information only. Cost estimators with experience in renovation have worked out approximate costs, basing them on typical material and labour rates in Winnipeg. These estimates do not include mark-ups for overhead, supervision or taxes, but they will allow you to calculate the relative incremental costs of improving accessibility as part of a larger repair or replacement activity.

*When replacing ceramic tiles around a bathtub,* consider changing to temperature balancing taps. These will be safer for everyone, as they can prevent scalding.

Cost: Temperature balancing taps, $175
Labour, 1 hour

*When replacing ceramic tiles around a bathtub,* consider the introduction of backing to support future grab bars. Once ceramic tiles and drywall are removed, the installation of backing is easy.

Cost: Material for backing, $5
Labour, 0.25 hours

*When replacing ceramic tiles around a bathtub,* consider installing grab bars. While these are especially important for those with limited mobility, they are safer for everyone.

Cost: Material for backing, $5
Grab bars, $45 each
Installation, 0.75 hours

*When replacing ceramic tiles around a bathtub,* consider changing taps to lever-style hardware. Many people prefer this style of hardware, but it is important for those with mobility limitations.

Cost: Lever style taps, $55
Labour, 1 hour

*When replacing a bathroom door,* consider increasing the width. Bathroom doors are usually the minimum width allowed by code – that is, too narrow for wheelchair or walker users.

Cost: Wider door and frame (assuming no structural alterations), $140
Labour, 1.5 hour

*When replacing a bathroom door,* consider using clear swing hinges. These provide a wider clear opening and better access.

Cost: Hinges, $8 per pair

*When replacing a bathroom door,* consider changing the swing of the door. Bathroom doors typically swing into the room; a door that swings into the hallway improves access for wheelchair users, and provides safety for older tenants who may fall in the bathroom and block the doorway.

Cost: Door frame, $45
Frame installation, 0.75 hours
Stain/paint frame, 0.5 hours

*When replacing a bathroom door,* consider providing a space on the lock side of the door. Users of wheelchairs and walkers require extra space on the lock side of any door that swings into their path of travel.

Cost: Costs vary widely depending layout, as the change could involve moving walls, electrical, etc.

*When replacing sink or tub taps,* consider changing to temperature-balancing taps that can prevent scalds.

Cost: Temperature-balancing taps, $125
Labour, 1 hour

*When replacing sink or tub taps,* consider changing taps to lever-style hardware. Many people prefer this style of hardware, and it is important for those with mobility limitations.

Cost: Lever style taps, $55
Labour, 1 hour

*When replacing sink taps,* consider adjusting the height of the sink top and providing clearance under sink. Wheelchair users require knee and toe space beneath the sink to allow a straight-on approach.

Cost: New vanity and top, $95
Labour, 3.5 hours

*When repairing drywall and painting the bathroom,* consider lowering the mirror so that someone in a wheelchair can see into at least the bottom part.

Cost: Move mirror, 0.25 hours

*When repairing drywall and painting the bathroom,* consider the introduction of backing to support future grab bars. Installation of backing is easy, and the drywall can be repaired at the same time.

Cost: Material for backing, $5
Labour, 0.25 hours

*When repairing drywall and painting the bathroom,* consider installing grab bars at the water closet. These are an important safety feature for those with limited mobility, but they provide safety for everyone.

Cost: Material for backing, $5
Grab bars, $45
Installation, 0.75 hours

*When replacing a damaged tub,* consider installing an easy-access tub with hinged opening that make it easier for those with limited mobility to get in.

Cost: Easy access tub, $900
Installation, None since damaged tub is being replaced.

*When replacing a damaged tub,* consider a roll-in shower instead so that wheelchair users or those with limited mobility do not have to cross a threshold or climb over a tub edge.

Cost: Costs vary widely depending on base preparation and plumbing restrictions. The cost of the tub can be credited against the costs of the roll-in shower.

### Innovative Idea

Most bathrooms have limited space with little, or no, opportunity for expansion. The typical alignment of fixtures makes transfer from a wheelchair to a bathtub or water closet difficult.

A workable solution is to waterproof the floor and wall surfaces (e.g., with ceramic tiles) and provide an in-floor drain. Replace the sink vanity with a wall-mounted sink and replace the tub with hand-held shower hardware. The whole area is turned into large shower with a toilet and sink in it. A fold-down seat, grab bars and a curtain rod around the shower area along with grab bars by the toilet make the facility very functional. This arrangement removes many barriers for the users of wheelchairs or walkers.

## Layout

### Introduction

The kitchen should be convenient, spacious and easy to move around. U-shaped, L-shaped and galley kitchens are the most common in walk-up apartments. Typically, these are compact, with limited space between cabinets and walls. In some layouts, where the dining area is part of the kitchen, the table is not easy to approach.

***Size and Shape***

*The U-Shaped Kitchen*

This layout allows continuous movement between workspaces. The sink is normally located at one end of the U, and the refrigerator and cooking appliances face each other (Fig. 55).

Provide a clear floor space 750 mm by 1,200 mm so that a wheelchair can approach appliances sideways. Appliances include range or cooktop, oven, refrigerator, freezer and dishwasher. Provide 1,500 mm space between facing counters so that wheelchairs can turn around.

*The L-Shaped Kitchen*

This layout usually features the refrigerator near one end of the L and the cooking appliance near the other end. The sink is often located on the longest length of counter (Fig. 56).

Such a layout puts working areas close together. By placing the sink in the corner of the L, work spaces are provided on either side of the sink.

**Figure 55**
**U-shaped kitchen with adequate turning space**

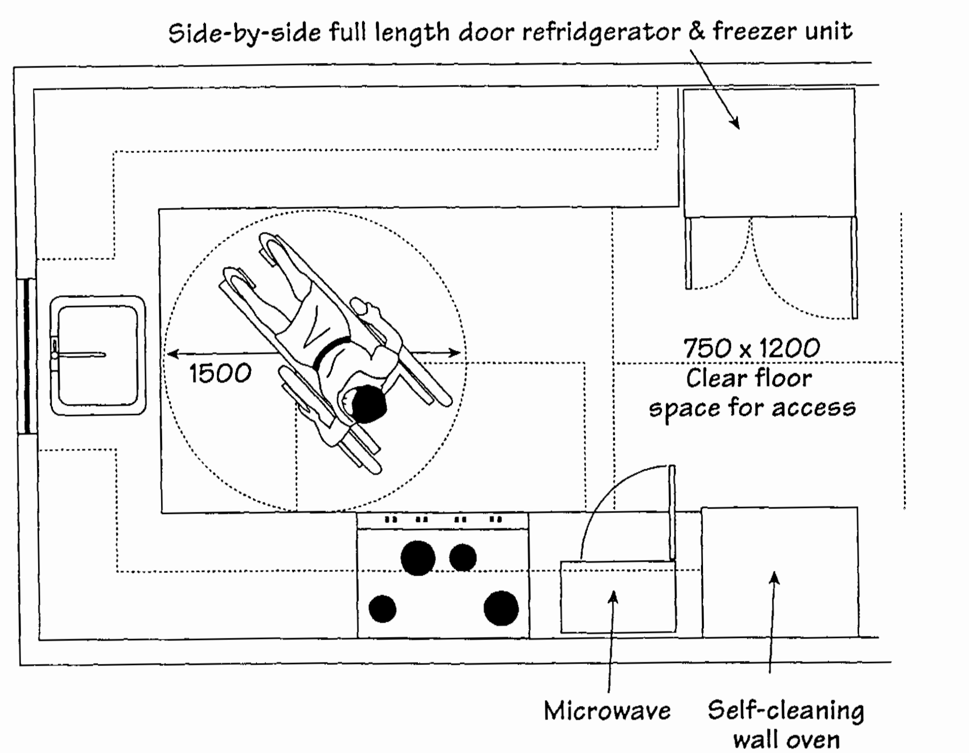
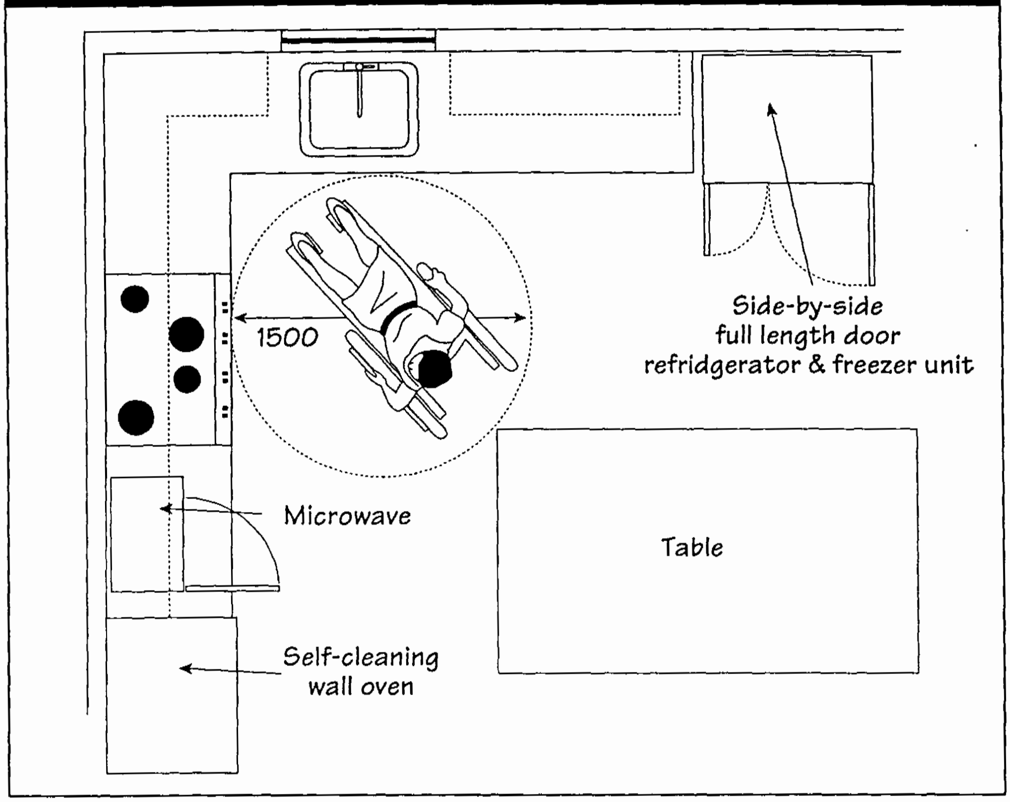


**Figure 56**
**L-shaped kitchen with turning space for wheelchair**




Provide a clear floor space 750 mm by 1,200 mm so that a wheelchair can approach appliances sideways. Appliances include range or cooktop, oven, refrigerator, freezer and dishwasher. Provide 1,500 mm space between counters and the facing walls so that wheelchairs can turn around.

L-shaped kitchens often incorporate a dining area in the kitchen: there must be enough space so that a wheelchair can maneuvre in this area.

*Galley Kitchen*

This layout (Fig. 57) is quite common and works well for wheelchair-users who can bend and reach easily. Once again, proper clear space must be provided in front of all appliances. A minimum space of 1,500 mm is required between counters so that a wheelchair can turn around. However, a narrower aisle space can work if the lower cabinet doors do not swing 90° into the aisle.

*Considerations*

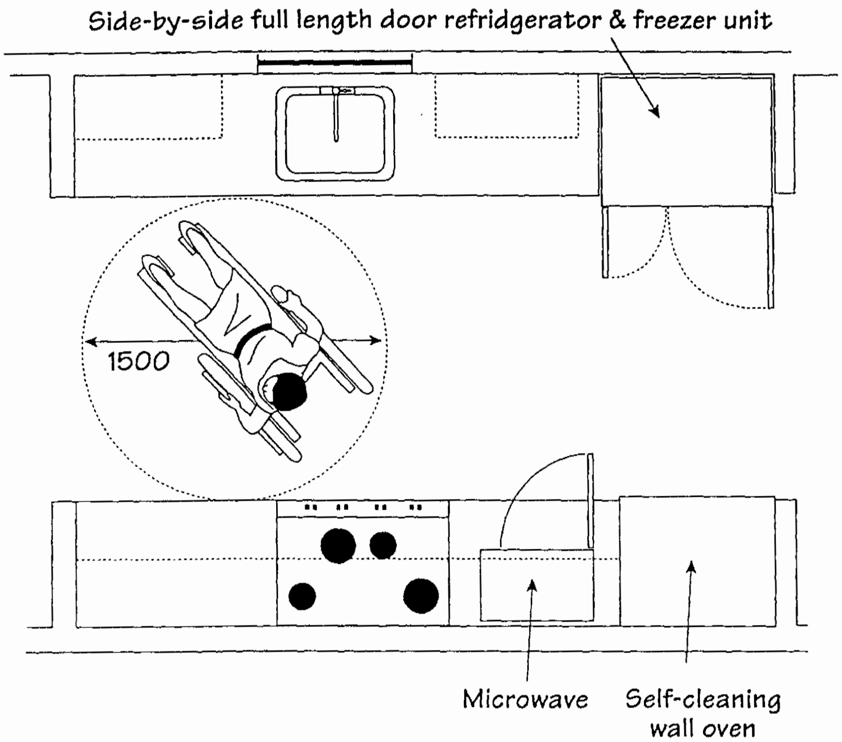
Enlarging kitchen space may entail major, costly modifications to cabinets and other elements. Electrical and plumbing services may need to be moved or adjusted. Relocation of walls may reduce space in hallways and other rooms.

## Cabinets

### Introduction

Standard, modular kitchen cabinets are designed for adults working in a standing position. The counter and cabinets are often set too high to be reached from a wheelchair. The back parts of lower cabinet shelves are unreachable.

**Figure 57**
**Gallery style kitchen with adequate space between counters**

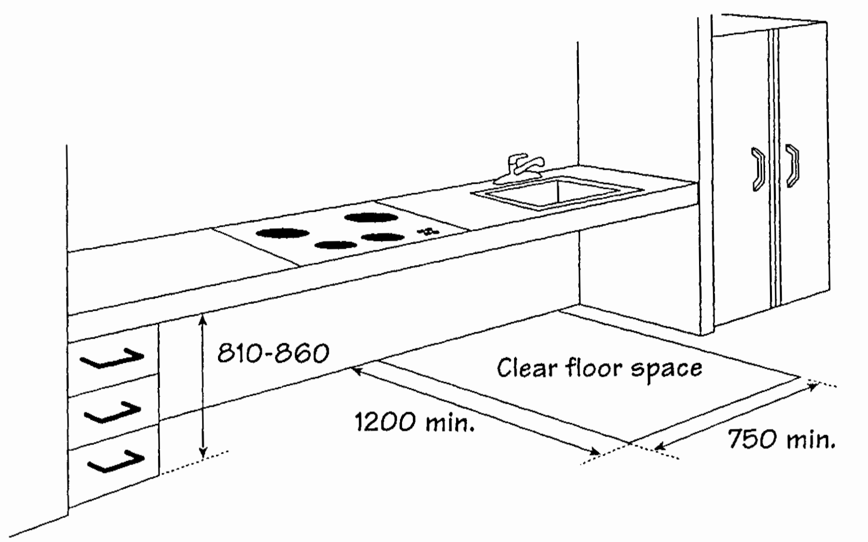



*Countertops*

*Recommendations*

Lower one section of the counter to a height between 810 mm to 860 mm from the floor (Fig. 58). Alternatively, install a section of the counter on an adjustable wall bracket so that it may be moved up and down. Place the lowered counter next to a lowered sink. Counters should be 750 mm wide by 600 mm deep, with a clear floor space in front of 750 mm by 1,200 mm. Provide a knee space 750 mm wide by 480 mm deep by 680 mm high and ensure that the knee space has no sharp or abrasive surfaces. Install accessible electrical outlets at the side or on the front of the lowered work surface.

**Figure 58**
**Knee space below counter allows approach with wheelchair**



Install additional electrical outlets near the fronts of cabinets and counters and alongside, so that all outlets can be reached from a wheelchair.

*Considerations*

Lowering or adjusting the countertop may involve moving electrical wires or plumbing lines. Cantilevered countertops may need additional support and strengthening of the wall on which they hang. Moving counter plugs will require wall repairs and the installation of junction boxes or new circuits.

***Cabinets***

*Recommendations*

Position upper cabinets so that at least one shelf is a maximum of 1,200 mm from the floor (Fig. 59). Alternatively, install the cabinet on adjustable brackets.

Install racks on the backs of cabinet doors for cans and jars, and build a false back to one or more of the cabinet shelves to prevent items from being pushed out of reach (Fig. 60).

Replace the fixed shelving in pantries with pull-out shelves, or create a wheel-in pantry with racks on the backs of the doors.

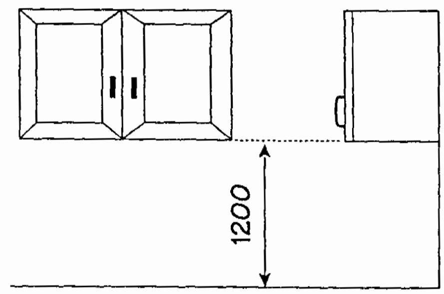
Install D-shaped handles in contrasting colours at the bottom corner of upper cabinet door and at the top corner of lower cabinet doors (Fig. 61). Choose push and release hardware to provide optimum ease.

Provide a toe space 150 mm deep and 230 mm high.

Install corner "lazy susans" which turn and provide access to all areas of the shelves: otherwise, the lowest shelf may be unreachable from a seated position.

Replace lower cabinets with drawers to reduce the need to bend and reach. Drawers and other pull-out devices should glide easily and be fitted with end stops.

**Figure 59**
**Lowered upper cabinets are reachable from wheelchair**

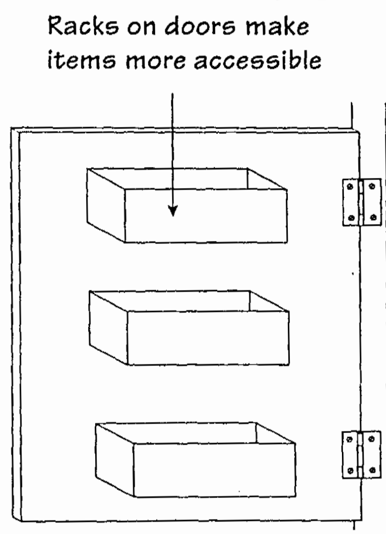



Side-hinge doors should open to 180° and be strong enough for use as support.

Provide a food trolley that can be stored below the counter and used to move meals and groceries from place to place (Fig. 63).

To make up for lost storage space, install pantries and full-height storage cabinets near the kitchen and provide various wall racks and hooks for pots, pans and utensils.

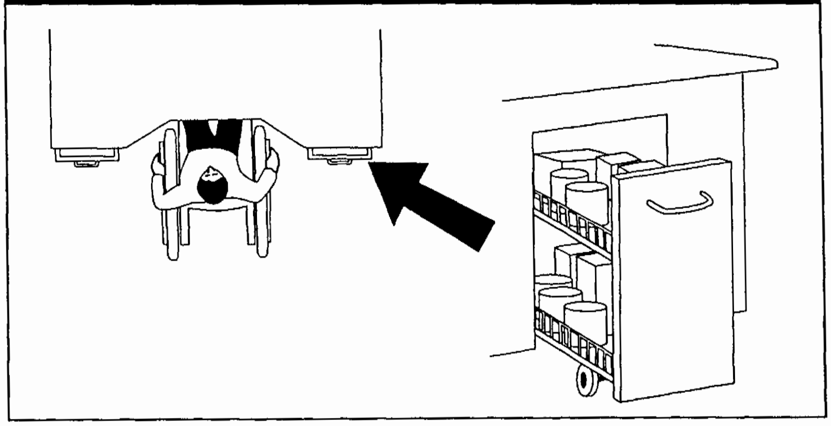
**Figure 60**
**Racks on doors make items more accessible**



*Considerations*

If upper cabinets are lowered and the lower cabinets are not, the space between the counter and the upper cabinets will be restricted. It is especially important to maintain a safe clearance when lowering upper cabinets over a stovetop or range. Moving cabinet handles will leave holes, and some cabinet doors may need to be replaced.

**Figure 63**
**Food trolley stores under cabinets**



It is not easy to provide adequate toe space with standard cabinets. In order to increase the height of the toe space, the cabinets must be raised (along with, inadvertently, the countertop). The height of the cabinets themselves must then be modified. Modifications to incorporate a storage room for a food trolley may mean replacing the countertop.

**Figure 61**
**D-shaped handles are easier to grasp**

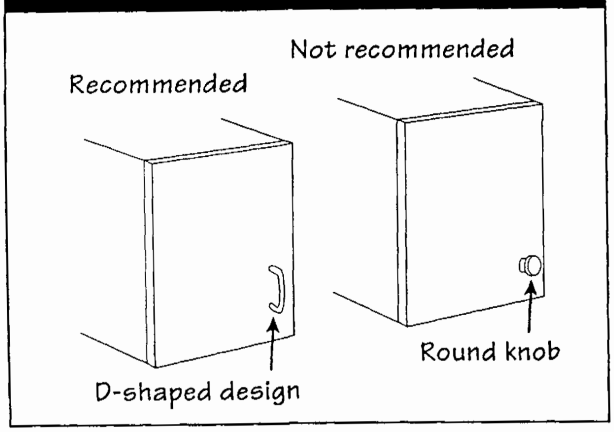
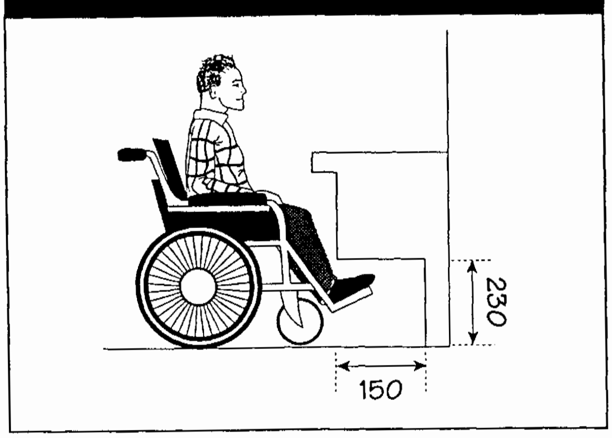



**Figure 62**
**Toe space required for wheelchair user**




## Appliances

### Introduction

Most ranges in walk-up buildings have their controls located at the back of the range top. This configuration requires reaching over burners or hot pots, and this is hazardous for everyone and dangerous for wheelchair-users. The controls are often marked with small symbols or lettering, dimly lit and hard to reach; people with sight impairments often cannot read them. Many controls require a twisting action of the wrist which is difficult for people with limited hand mobility. Freezer compartments over refrigerators are not accessible from a wheelchair.

***Controls***

*Recommendations*

Locate controls between 400 mm and 1,200 mm from the floor, with a clear space 750 mm wide in front so that a wheelchair can easily approach from the side.

Provide controls that can be operated with one hand and with a force of less than 22 N without twisting the wrist, grasping or pinching. Controls should be marked with large letters or symbols and be illuminated to a level of 100 lux. Avoid touch-pad controls as these are difficult for many seniors and people with sight impairment.

Provide ranges, cooktops and ovens with controls located on the front of the unit (Fig. 64). Locate the controls for a range hood on the front of a base cabinet or on a side wall.

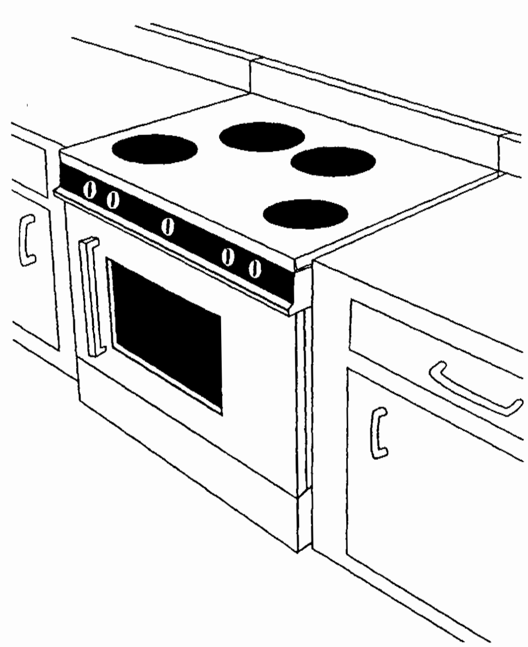
Provide refrigerators with controls that are located less than 1,370 mm from the floor.

*Considerations*

Moving the range hood control will involve new electrical wiring and modification of or repairs to walls or base cabinets. Special relays or other controls may be needed.

Appliances with front controls may have to be specially ordered.

**Figure 64**
**Front-mounted controls allow safe use of range**



***Height***

*Recommendations*

The tops of most ranges are too high for people in wheelchairs to reach. Purchase a shorter range or provide separate cooktops and wall ovens.

For greater flexibility, install a cooktop on an adjustable counter at a height between 810 mm and 860 mm. Select cooktops with staggered burners so the user does not have to reach over burners (Fig. 65) to get at the controls. Choose an oven with side-hinge doors and install this adjacent to a counter or pull out shelf for hot dishes. The pull-out shelf should measure the full width of the oven and pull-out from under the oven to a minimum of 250 mm. A self-cleaning oven is recommended, as it eliminates a difficult task.

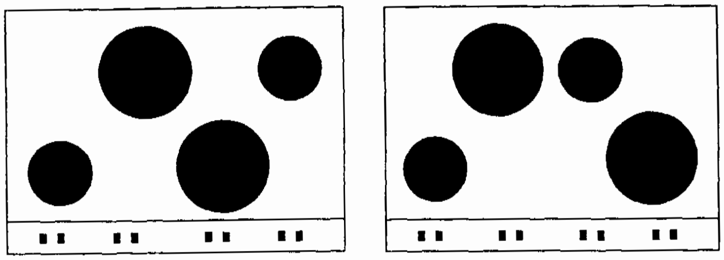
Standard refrigerators have the freezer unit located above the refrigerator. A side-by-side refrigerator/freezer is the best choice (Fig. 66), however, if the standard over-under model is used, it should have at least 50 percent of the freezer space and all of the refrigerator space at a height less than 1,370 mm. The unit should be self-defrosting. Some refrigerator/freezer units provide convenient ice-makers and a cold water tap on the front of the door.

Microwave ovens can be located on any surface that is accessible to the wheelchair user; ensure that the control panel is also easy to reach.

*Considerations*

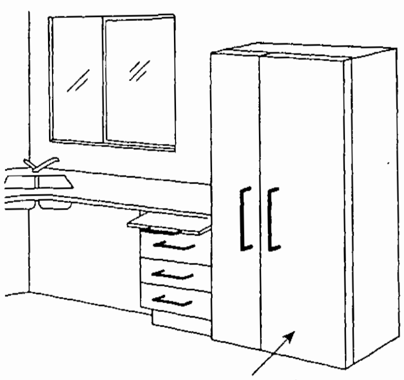
Installing separate cooktops and wall ovens will involve electrical modifications. Refrigerators with ice-makers and water taps will need some plumbing work. Appliances with added features such as self-cleaning, frost-free and built-in ice-makers are relatively expensive both to buy and operate.

**Figure 65**
**Staggered burner layout for stove top**



Staggered burners are recommended

**Figure 66**
**Side-by-side refrigerator provides better access to freezer**




## Sink

### Introduction

Kitchen sinks are typically installed into a standard height countertop – too high for someone in a wheelchair or for someone who needs to be seated while working at the sink. Sinks are enclosed by a base cabinet and are inaccessible to those seated in a wheelchair. The taps on the kitchen sink often have controls that require a twisting motion of the wrist that is difficult for people with limited hand mobility. The taps are usually set at the back of the kitchen sink counter (600 mm deep), and they are very difficult to reach from a seated position.

***Height***

*Recommendations*

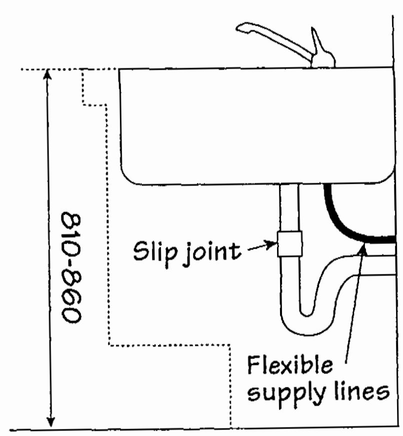
Install the kitchen sink with the rim 810 mm to 860 mm from the floor, level with the adjacent counter. This height should be comfortable to work at while seated. In order to install the sink on a movable, adjustable top, use flexible water supply lines and ensure the drain line has a slip joint to accommodate movement (Fig. 67).

Other options include a shallower sink, a dishwasher and a motorized movable top that can be adjusted with a flip of a switch, although this is more expensive.

*Considerations*

Plumbing modifications may be required to more than just the sink. The work may involve lowering drain lines, moving pressure lines and installing special connections to hook flexible supply lines to existing copper lines. The traps should be insulated to prevent burns.

**Figure 67**
**Adustable height sink**



*Depth*

*Recommendations*

Provide a knee space 750 mm wide by 250 mm deep by 680 mm high below the kitchen sink with additional toe space that is at least 750 mm wide by 230 mm deep by 230 mm high. Offset sink traps 150 mm to the rear to provide more space under the sink. Insulate the hot water pipe and drain to protect the user from burns.

Provide a clear space 750 mm by 1,200 mm (up to 480 mm of this can be under the sink) to permit wheelchairs to approach the sink.

*Taps*

*Recommendations*

Provide faucets with lever-type, colour-coded handles or that are electronically controlled. Mount the taps on the side of the sink, if possible.

*Considerations*

Side-mounted taps may require a custom-made sink with holes drilled in specific locations.

## Looking Ahead

### Introduction

All these issues are illustrated on pages 38 – 44.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

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*When replacing kitchen taps*, consider changing the taps to lever-style hardware. This style is preferred by almost everyone and is important for those with limited hand movement.

Cost: Lever-style taps, $55
Labour, 1 hour

*When replacing kitchen taps,* consider changing to temperature-balancing taps. These benefit everyone, as they can prevent scalds.

Cost: Temperature balancing taps, $125
Labour, 1 hour

*When replacing kitchen taps,* consider adjusting the sink height and providing knee and toe space below the sink. This will permit working at the sink from a seated position while facing the sink. An adjustable sink would allow various users to adapt the sink to a preferred height.

Cost: New sink top with adjustable plumbing, $175
Plumbing labour, 1.5 hours
Remove sink section of base cabinet, 1 hour

*When installing a new countertop,* consider providing a lowered work surface, which would be more comfortable for someone in a seated position. A knee space and toe space should also be provided.

Cost: Remove existing base cabinet, 1 hour
Miscellaneous adjustment labour, 1 hour
Installing counter is part of new countertop replacement.

*When replacing appliances,* consider selecting a range with front controls that would allow someone in a wheelchair to reach the controls easily and without reaching over the burners.

Cost: None, depending on the model selected.

*When replacing appliances,* consider selecting a side-by-side refrigerator with controls that can be reached from a seated position. This allows someone in a wheelchair to reach all compartments of the refrigerator, including the freezer and the controls.

Cost: None, depending on the model selected.

*When repairing kitchen drywall,* consider moving electrical outlets from the back to a side wall. This will allow someone in a wheelchair to reach the outlets more easily.

Cost: Materials, $15 per outlet
Labour, 0.75 hours per outlet

*When repairing kitchen drywall,* consider moving the range hood control to the front of the cabinets for easier use by someone in a wheelchair.

Cost: Materials, $25
Labour, 1.5 hours

*When repairing drywall,* consider removing walls to improve ease of movement. An open plan is more flexible and can make movement with a wheelchair or a walker much freer.

Cost: Costs vary depending on structural implications, movement of electrical outlets, movement of plumbing lines, etc.

## Doors

### Introduction

Suite entry doors may be wide enough to accommodate the passage of a wheelchair, but in most cases the doors could be wider. Deadbolts and locks are normally too high. Someone in a wheelchair cannot use a door viewer. The width of bedroom doors is typically equal to the width of a wheelchair with little allowance for passage. Most door handles require a twisting action of the wrist to open and do not have handles suitable for wheelchair users on both sides.

Suites with balconies often have a radiant heater under the balcony door. This raised threshold makes access to the balcony virtually impossible for wheelchair-users. Balconies are often too narrow to allow wheelchair users to maneuvre. People with mobility limitations have no access to storage rooms that may lie off the balcony.

*Entry to Suite*

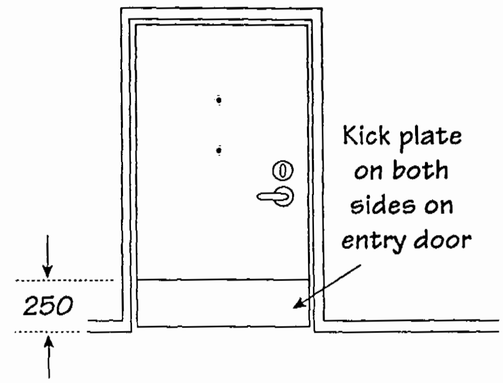
*Recommendations*

Provide suite entry doors with clearance of 810 mm (914 mm is better) when the door is fully open. Install a 250-mm kick plate on both sides of entry doors to protect the door from wheelchair foot rests. Place deadbolts no higher than 1,050 mm from the floor. Provide lever-type door handles on all doors (Fig. 68).

Install security viewers between 1,100 and 1,200 mm from the floor. It is not necessary to remove existing viewers – two are better than one (Fig. 69).

Provide adequate space at the entrance door for someone in a wheelchair to unlock and fully open the door. The maximum force to push or pull open a door should not exceed 22 N. On the inswing side, provide clearance of 600 mm and, on the outswing side, 300 mm.

**Figure 68**
**Recommended height of kick plates on entry door**




*Considerations*

Adequate clear space on the latch side of the corridor door is not usually a problem unless the suite entry door is recessed or located at the end of a corridor. If the entrance hall is confined by interior walls, it may be more difficult to provide the 600-mm clearance required on the inside of the suite.

**Figure 69**
**Recommended height of security viewer on entry door**

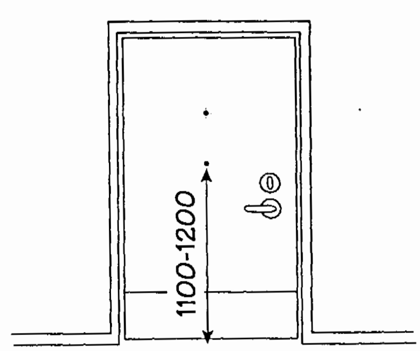
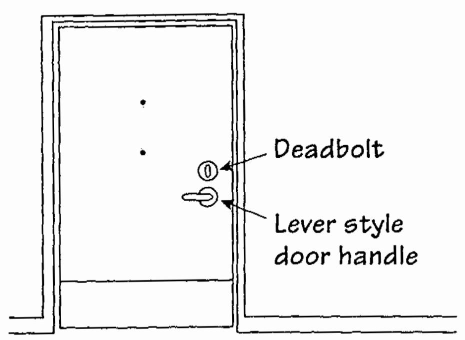


**Figure 70**
**Deadbolt and lever-type handle on suite entry door**

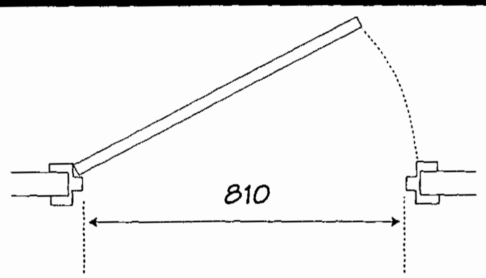



### *Doors to Other Rooms*

*Recommendations*

Provide lever-type door handles: these are much easier to use and essential for people with hand or wrist mobility limitations (Fig. 70). Provide clearance of 810 mm at bedroom doors (Fig. 71).

**Figure 71**
**Minimum clear width for bedroom door**

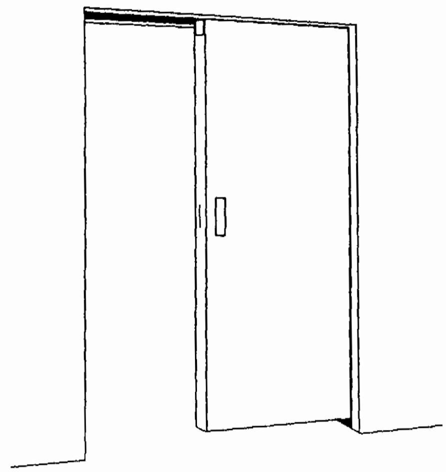



Pocket doors provide the greatest amount of clearance for a given door size (Fig. 72). Select hardware that is suitable for persons with limited hand mobility.

Install a second handle or pull on the outswing side of the door, 200 mm from the hinge and 860 mm from the floor (Fig. 73).

As with suite entry doors, provide adequate space for someone in a wheelchair to open the door with maximum force not to exceed 22 N. On the

**Figure 72**
**Pocket door hardware must be easy to manipulate**



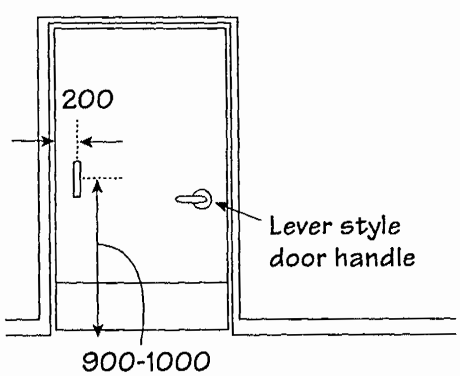
Ensure that the hardware on pocket doors is easy to use when door is fully open

inswing side, provide clearance of 600 mm and, on the outswing side, 300 mm (Fig. 74). Paint door frames a colour that contrasts with the wall colour to help those with sight limitations locate doorways.

*Considerations*

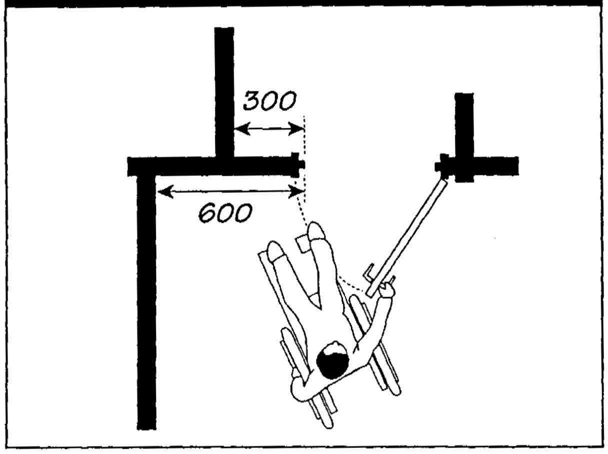
Installing a wider door with adequate latch side clearance can be quite a challenge because of space limitations. It may be necessary to move

**Figure 73**
**Pull-handle near hinge side of door**



partitions or change the swing of the door to achieve adequate clearances. This type of activity could involve moving electrical outlets and remodelling closets.

**Figure 74**
**Clearances required at latch side of door**




*Balconies*

*Recommendations*

Cantilevered floor joists impose a maximum width of 1,200 mm on most balconies and, with railings and wall finishes, the net width may be even less. To make the balcony completely accessible for persons in wheelchairs, increase its width to 1,500 mm (Fig. 75).

Remove baseboard radiant heaters located along exterior walls under balcony doors and install a threshold with a maximum height of 19 mm and slope of 1:2 (Fig. 76). Provide clearance of 810 mm at the balcony door. Install door hardware that is easy for people with limited hand mobility (lever-type handles are best for swing-type doors). Illuminate the balconies to 100 lux.

Balcony railings are typically 914 mm to 1,050 mm high, with uprights that are spaced (Fig. 77) 100 mm apart. This design may limit the view of a person in a wheelchair. Where possible, adjust balcony railings to provide maximum visibility from a seated position.

*Considerations*

Removing radiant baseboard heaters from exterior walls may reduce the amount of heat available to a suite or necessitate extensive re-plumbing of supply lines. It is less difficult to remove electrical baseboard heaters.

Widening a balcony may require structural alterations. If a wood frame balcony is extended an additional 300 mm to 600 mm, the floor must be strengthened by decreasing the spacing between joists or increasing the effective depth of the joists or a combination of the two. Providing support brackets or posts may be a good alternative.

## Room Space and Movement

### Introduction

Many rooms in walk-up buildings were designed to the minimum standards allowed by the building code at the time of construction. Rooms sized to minimum code requirements may not be usable for their intended purpose by people with physical impairments. People who use wheelchairs or walkers require more space to maneuvre and

**Figure 75**
**Required size of balcony**

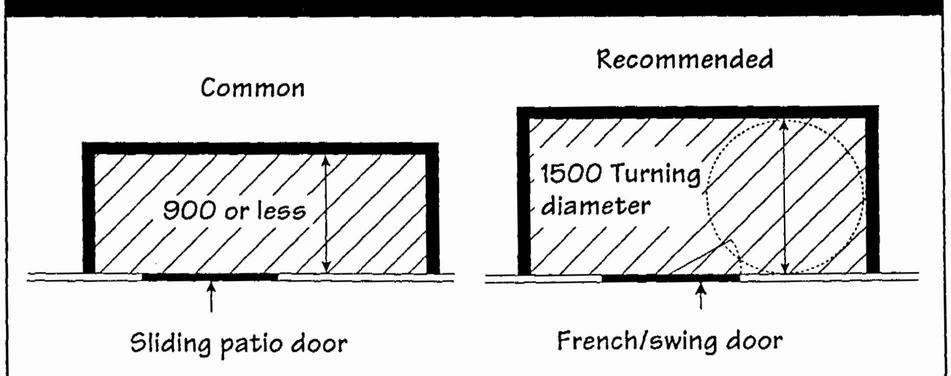
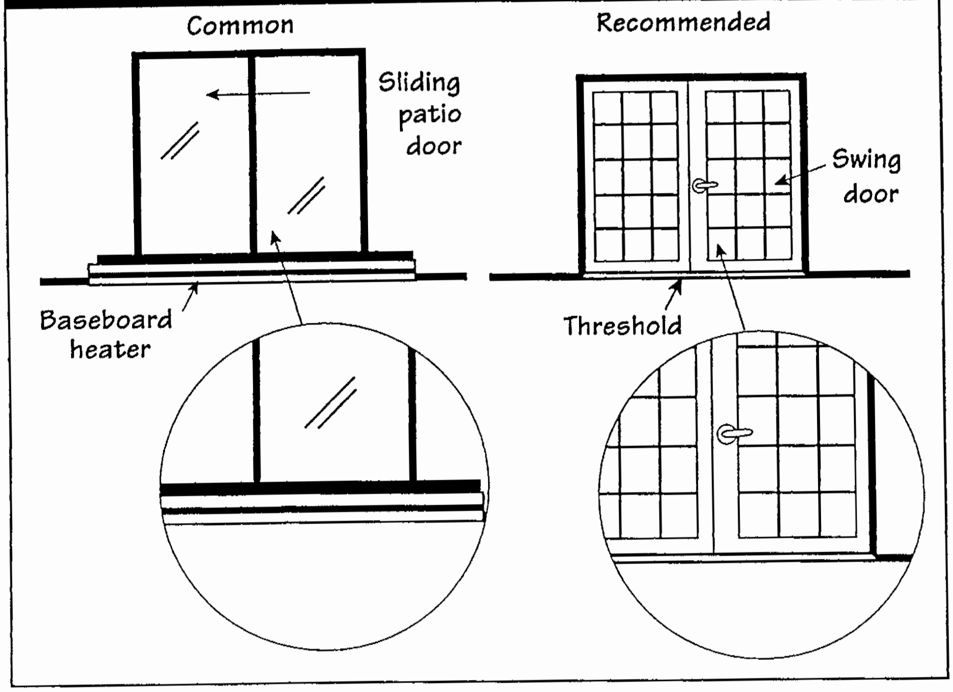


**Figure 76**
**Swing-type door to balcony is recommended**




wider door openings than may be available in some suites. Floor coverings in many suites are not suitable for wheelchairs. Elevation changes between rooms or between floor finishes also cause problems.

### *Movement in Suite*

*Recommendations*

Provide rooms with a clear area of at least 1,500 mm by 1,500 mm and a space of 920 mm for movement between furniture (Fig. 78). This allows people in wheelchairs access to closets and to maneuvre around furniture.

Bedroom size that is appropriate depends on the number of people using it, the mobility of the occupants and the number and type of beds.

*Considerations*

Consider converting a two-bedroom to one-bedroom suite where the interior wall is not

**Figure 77**
**Balcony railings**

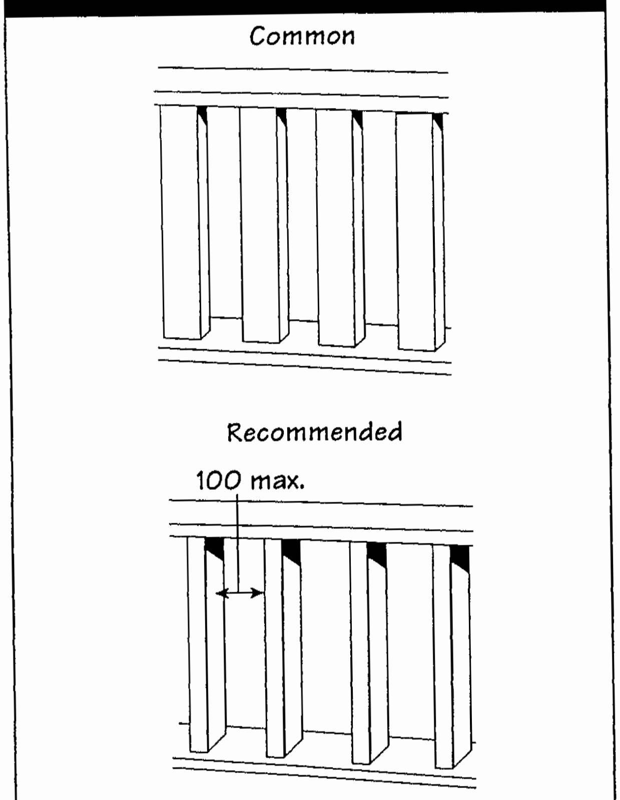
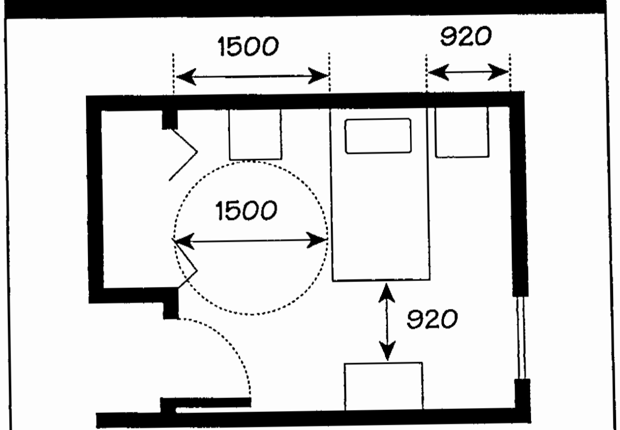



**Figure 78**
**Minimum bedroom space**



load-bearing. Careful removal will allow the wall to be re-established for future tenants.

*Elevation Changes*

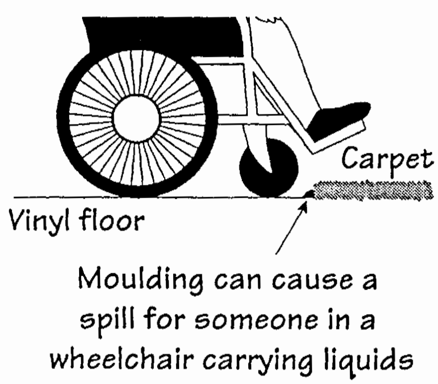
*Recommendations*

Provide slip-resistant, non-glossy resilient vinyl floors that people in wheelchairs or using walkers or canes can move across easily. Avoid changes in floor surfaces within the suite. Install one type of flooring throughout, leaving occupants to provide area rugs to their taste.

Where carpeting is used, provide high-density commercial quality and fasten it securely to the subfloor. Do not use underpadding (Fig. 79).

Provide transition strips to accommodate elevation differences or changes in floor materials, if any.

**Figure 79**
**Transitions between elevations should be minimized**




## Equipment and Controls

### Introduction

In a typical walk-up building, equipment controls in suites (e.g., thermostats) are positioned for use by a person in a standing position; thus, someone in a wheelchair cannot reach them. While light switches are usually within reach, most electrical outlets are found behind furniture. In-suite parking space is required for an electric wheelchair that is being recharged.

Fire and smoke alarms do not warn occupants with hearing impairments; in addition, many seniors with otherwise perfect hearing are unable to distinguish some frequencies. Smoke detectors and fire alarms can save lives, but only if they can be heard. People with hearing impairments may not be able to hear even very loud sounds or may not be able to distinguish the source of the sound. Standard intercoms and door bells are also of little value to those with hearing impairments.

*Intercom*

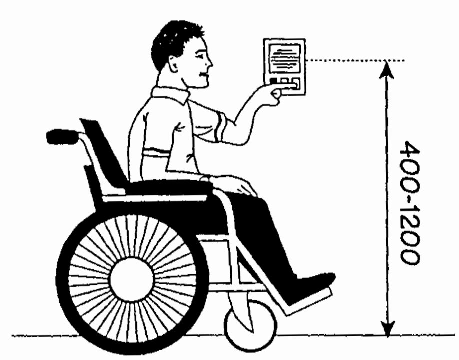
*Recommendations*

Install a notification system that uses a flashing light to signal an arriving visitor. Locate the intercom and security door release button between 400 mm and 1,200 mm from the floor in an area fully accessible to a wheelchair user (Fig. 80). Mark the intercom with tactile numbers and letters. Provide a 750-mm-wide clear space in front of all controls.

Alternatively, provide portable intercoms that can plug into outlets in a suite (wireless units are also available).

Encourage tenants with mobility, sight or hearing impairments to obtain emergency call buttons from a medical emergency service. Install emergency call buttons in bathrooms.

**Figure 80**
**Recommended height for intercom**



*Considerations*

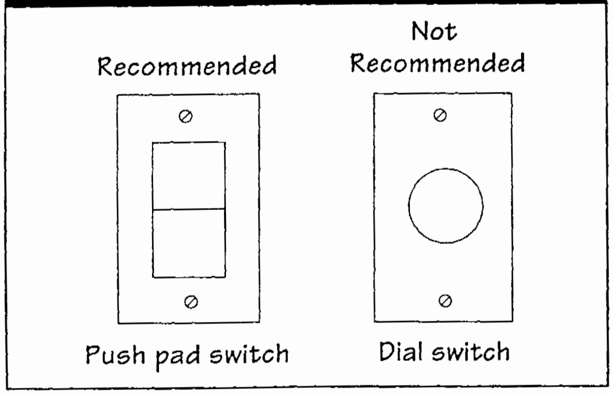
Making the intercom and visitor announcement system available to wheelchair-users and those with hearing impairments may require relocation of the intercom system or installation of a portable system. This is easy to do, and cost is the only consideration.

***Electrical***

*Recommendations*

Install push pad or rocker-style light switches between 900 mm and 1,000 mm from the floor (Fig. 81 and Fig. 82).

**Figure 81**
**Push pad or rocker style light switches**

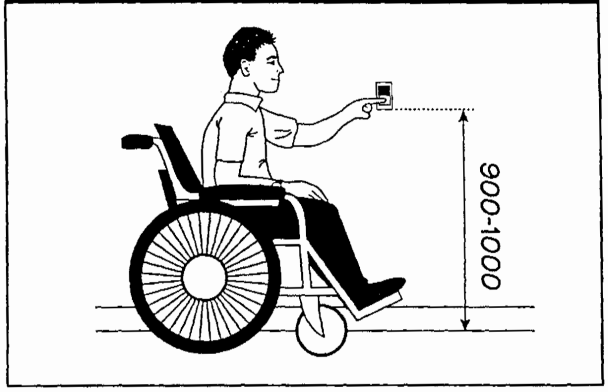



Install electrical outlets between 400 mm and 500 mm from the floor (Fig. 83). This position is easier for everyone to reach including people in wheelchairs. Provide 750-mm-wide clear floor space in front of light switches.

*Considerations*

Altering the height of electrical outlets and switches is difficult as wires will have to be extended or cut off and walls will have to be repaired. This type of renovation may be low on the priority list unless walls are being remodeled anyway.

**Figure 82**
**Recommended height of light switches**




***Charging Units***

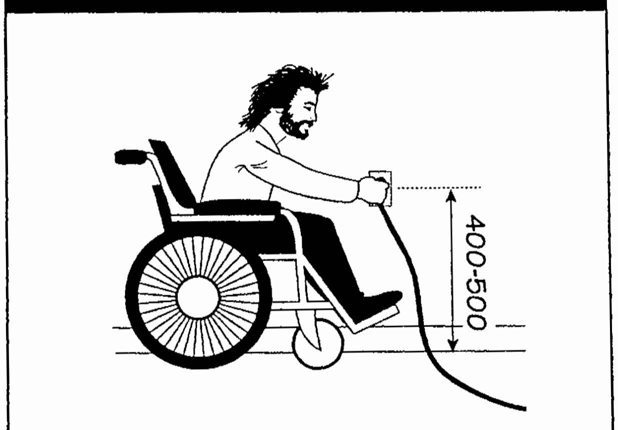
*Recommendations*

The batteries of electric wheelchairs need to be recharged regularly, and most charging units require a 110-volt power source. To eliminate the risk of circuit failure (i.e. a breaker trip), install a dedicated circuit. Choose a convenient and safe location where the wheelchair can be parked while its battery is charged.

*Considerations*

Finding a space to park the wheelchair may be as difficult as installing a dedicated outlet as the wheelchair must not block hallways and doorways while the battery is being charged.

**Figure 83**
**Recommended height of electrical outlets**



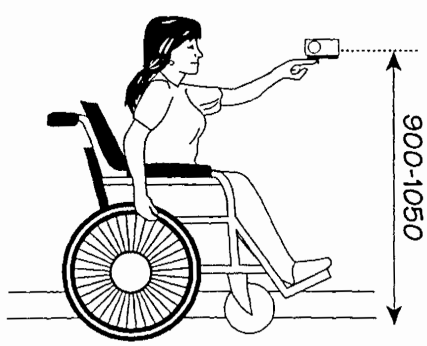
## *Heating, Ventilation, Air Conditioning (HVAC)*

*Recommendations*

Place thermostats for heating and air conditioning between 900 mm and 1,050 mm from the floor,where someone in a wheelchair can be reach them (Fig. 84). Provide a clear space of not less than 750 mm in front of the controls.

Install lever-type controls that are operable with one hand (Fig. 85). These should not require twisting or the wrist, grasping or pinching. Consider providing remote controls.

**Figure 84**
**Recommended height of thermostat**



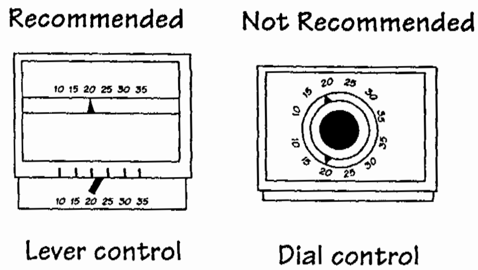

Where possible, provide appliance controls that are colour contrasted, illuminated to 100 lux, and with large print.

*Considerations*

If the controls on the walls have to be lowered, wall repairs and electrical alterations will be necessary.

Small, older HVAC controls may have to be updated. New styles with digital readouts and programmable buttons often are not well understood and are difficult to use without adequate instruction.

**Figure 85**
**Lever-type controls**



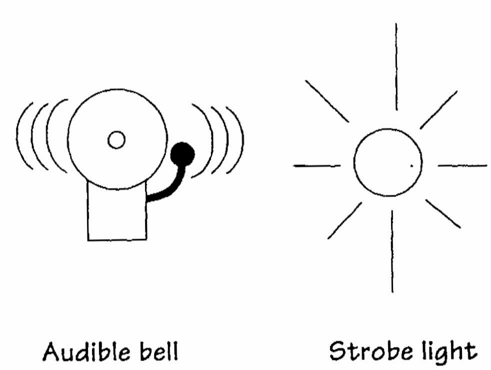

## *Fire and Smoke Alarms*

*Recommendations*

Install fire and smoke alarms that allow interconnection to a strobe light (or similar device) that flashes at a frequency of 1 Hz in conjunction with the audible alarms (Fig. 86). Place these strategically where they can be easily seen. The lights should be significantly brighter than the ambient light.

Other devices such as vibrating pillows and vibrating wrist bands are available and can be connected to the building alarm system to alert those with hearing impairments. Consider installing audible devices inside each suite, in addition to those in hallways.

**Figure 86**
**Strobe and audible warning alarms**



*Considerations*

Installing interconnected visual fire and smoke alarms will mean substantial electrical work and some drywall repairs. Vibratory warning systems will require an activation module in each suite that is connected to the building alarm system.

## Windows

### Introduction

Bedroom windows are typically positioned with sill heights that prevent people from looking in, but these heights significantly reduce the value of a window for a person in a wheelchair. In addition, they often have opening systems that are difficult to operate.

***Height***

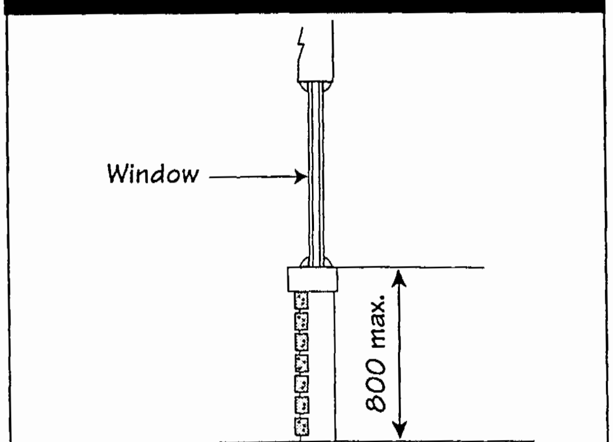
*Recommendations*

Lower or install longer windows with sills approximately 800 mm from the floor (Fig. 87). This height will allow a person in a wheelchair to see outside and to operate the windows easily

*Considerations*

Lowering or installing a longer window may require repairs to the interior, as well as the exterior. If wider windows are installed, the strength of the existing lintels must be investigated.

**Figure 87**
**Lowered window sill to allow view while seated**

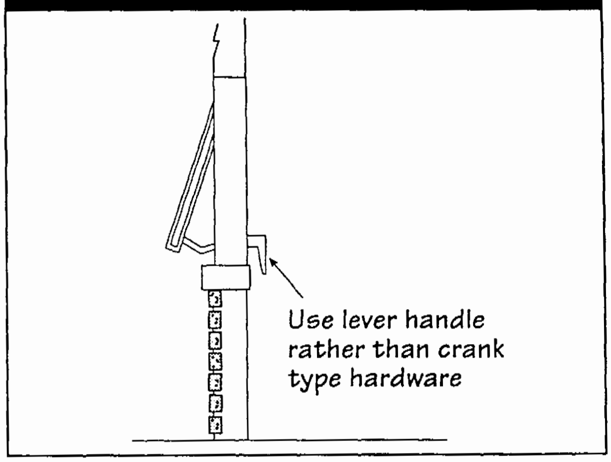



***Controls***

*Recommendations*

Locate window hardware not more than 1,200 mm from the floor, so that it is easily reached by a wheelchair-user. Install lever-type hardware; avoid using crank or slider styles (Fig. 88) Remote controlled openers for windows are also available.

**Figure 88**
**Lever-type handle to open and close windows**




*Considerations*

Slider windows are often economical but are also very difficult for wheelchair-users to operate. People with arm, wrist or hand limitations also find slider windows difficult. Windows that open with scissors-type lever handles offer better value. The addition of a small operable window under an existing window will leave the original window intact.

## Closets

### Introduction

Most closets are of little value to wheelchair-users. Closet doors are often too narrow to allow a wheelchair-user to enter the closet, and the closet rods and shelves are typically too high and not adjustable.

*Door Size*

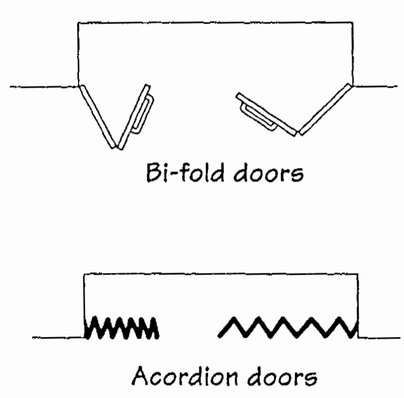
*Recommendations*

Provide closet doors that are easy to operate with at least 900 mm of open, unobstructed access space (Fig. 89). Bi-fold or accordion doors work well. Provide a clear space of at least 750 mm by 1,200 mm in front of the closet.

*Considerations*

If closet space is limited, it may be necessary to remove existing closet doors completely or replace them with a drape or bi-fold door.

**Figure 89**
**Types of doors for closets**

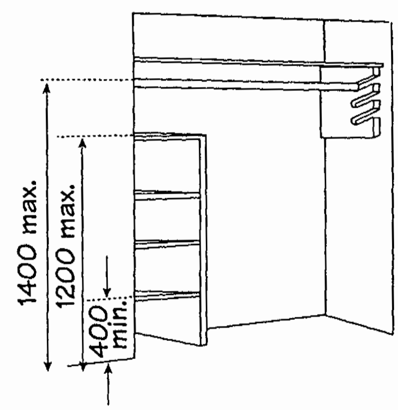



*Closet Rods*

*Recommendations*

There are three options: install the rods a maximum of 1,400 mm from the floor; install an adjustable bracket to allow the rods to be moved up and down; or design a closet with two or more rods, one set lower than the other (Fig. 90).

**Figure 90**
**Adjustable shelving with variable height closet rod**




*Considerations*

Closet organizers are useful and offer an almost infinite range of design options. Consider custom designing the closets.

*Shelves*

*Recommendations*

Locate a minimum of three shelves between 400 mm and 1,200 mm from the floor. Adjustable shelving is convenient, and pull-out shelving makes for easier access to the backs of the shelves. Wheelchair-users require accessible and usable storage space and storage rooms or the tops of closets are not available to them. Provide storage space that is appropriate for the occupant.

*Considerations*

Extra shelving is not only costly but diminishes the amount of space available for hanging clothes.

## Laundry

### Introduction

Typically, there is insufficient floor space in front of washers and dryers for a wheelchair-user to approach the appliances, even from the side. Accessible shelving or work surfaces tends to be non-existent. Many older walk-up buildings have a central laundry room that is often inaccessible for users of wheelchairs or walkers. Elevation differences at thresholds are barriers for wheelchairs and, from a seated position, top-loading laundry equipment is unusable, especially with the controls at the back.

*Size and Shape*

*Recommendations*

Provide a clear floor space of at least 750 mm by 1,200 mm in front of each laundry appliance to allow parallel access to the machine (Fig. 91). Where equipment is placed side by side, the clear space for each appliance can overlap.

Install shelving 750 mm from the floor and provide knee space under the shelf.

**Figure 91**
**Space required for washers and dryers**

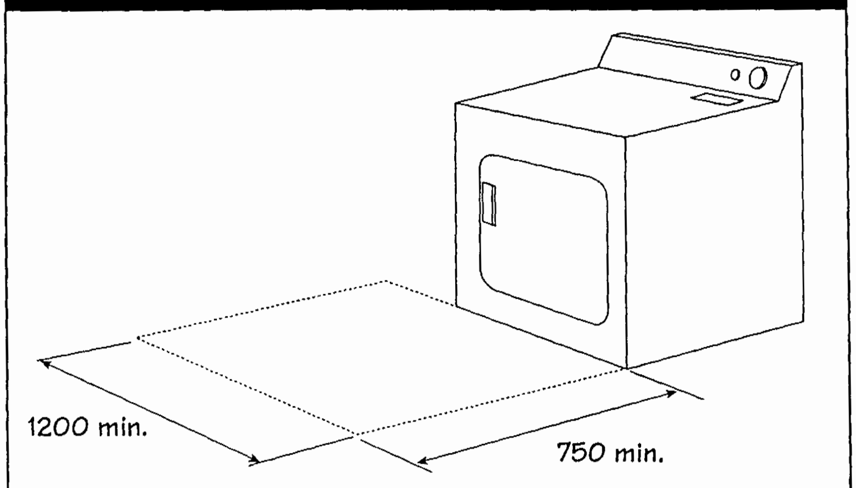
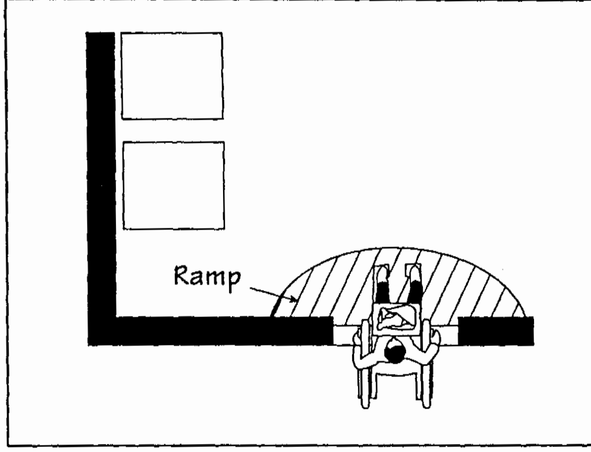



**Figure 92**
**Ramp at entry to sunken laundry room**




*Considerations*

In-suite laundries often lack adequate space for access to the machines, and the top appliance in a stacked pair cannot be reached from a seated position. Doors to laundry rooms may need widening to provide access.

***Floor Surface and Elevation***

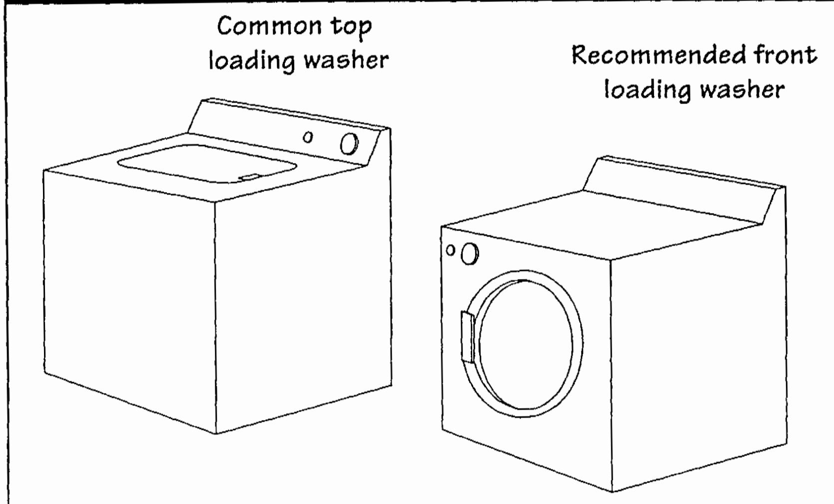
*Recommendations*

Install ramps to accommodate elevation changes in laundry rooms, where ledges and drops have been constructed to control water spills (Fig. 92). Ramps permit safer and easier movement for wheelchairs and walkers and also help people with sight impairments.

*Considerations*

Door thresholds to laundry rooms may need to be changed.

**Figure 93**
**Front loading washer**




*Appliances*

*Recommendations*

Provide front-loading washers for the convenience of wheelchair-users (Fig. 93). They are not as common as top-loading models, and may be more expensive but they are more accessible. Choose dryers with lint traps situated at the front of the machine. Select appliances with their controls at the front.

Where coin-operated machines are provided, ensure that some of the appliances have coin slots located at the front.

*Considerations*

Front-loading laundry equipment with front controls are uncommon and may require special ordering.

## Garbage

### Introduction

Even the most able-bodied person has difficulty carrying out the garbage. In most walk-up buildings the garbage facility consists of large metal bins in the parking lot. Such bins are typically too high and are often surrounded by fences and doors. The users of wheelchairs or walkers cannot easily manage this type of garbage disposal system.

***Location***

*Recommendations*

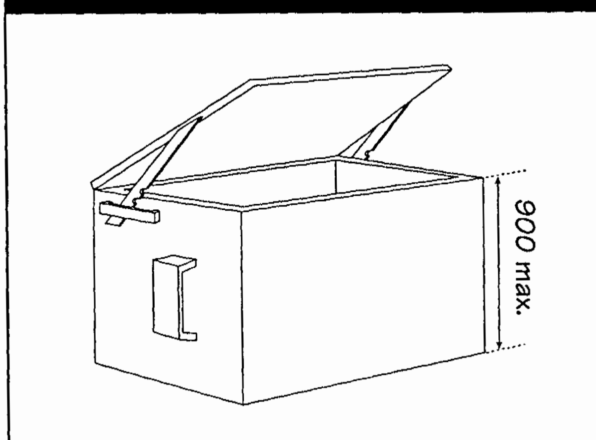
Provide a garbage room that is reserved for tenants with mobility, sight and hearing impairments. Ensure special access to the area for tenants who need it.

Where an exterior garbage drop-off is required, bin heights should not exceed 900 mm, and the covers and lids must be easy to open (Fig. 94). Light the pathways to the garbage area, and keep the area clear of snow and ice.

*Considerations*

Decide whether the inside garbage area will be open to all tenants or only to people with mobility and sight impairments. A second special garbage drop-off will take up space and involve additional work and expense to transport garbage to the exterior garbage bins..

**Figure 94**
**Maximum garbage bin height**



## Service Room

### Introduction

People with sight impairments need to be able to distinguish the door to the service room from those that lead to the laundry room or to other suites.

*Signage*

*Recommendation*

Identify service room doors with a sign marked by a danger symbol.

## Looking Ahead

### Introduction

All these issues are illustrated on pages 47 – 57.

As the owner of an existing low-rise building, the challenge facing you is how to modify your property in an affordable way so that you can tap into the growing market of people with mobility, sight and hearing impairments. This section gives you answers. It offers a range of simple, inexpensive ideas which, when combined with regular maintenance and repair activities, can improve the accessibility and functionality of your building.

The costs presented here are for general information only. Cost estimators with experience in renovation have worked out approximate costs, basing them on typical material and labour rates in Winnipeg. These estimates do not include mark-ups for overhead, supervision or taxes, but they will allow you to calculate the relative incremental costs of improving accessibility as part of a larger repair or replacement activity.

*When replacing carpet within the suite,* consider using an alternative type of flooring, such as sheet vinyl or tiles. This makes it easier for wheelchair-users to move around.

Cost: None, depending on the flooring selected.

*When replacing carpet within the suite,* consider installing a smooth transition between different types of flooring. The moulding used at transition points may be difficult for wheelchairs to cross and a bevelled, relatively low moulding should be selected.

Cost: None, depending on the moulding selected.

*When repairing drywall or painting a suite,* consider lowering controls on thermostats or intercoms to allow a wheelchair-user to reach these devices.

Cost: Materials, $25 per control
Labour, 0.5 hours per control
Repair wall at old location, included in drywall repairs.

*When repairing drywall or painting a suite,* consider installing a separate circuit and outlet for charging a wheelchair battery. This should be located where the wheelchair can be parked safely and conveniently.

Cost: Materials, $50
Labour, 1.5 hours

*When replacing windows,* consider window units with lever-style hardware. This hardware is easier to use for those with limited hand mobility to use.

Cost: None, depending on the manufacturer of the window.

*When replacing windows*, consider lowering the sill height of the windows to allow someone in a seated position to see through them.

Cost: Exterior finish repairs, $75
Drywall repairs, $30
Frame materials, $25
Framing labour, 3 hours

*When replacing windows*, consider selecting windows with controls at or near the sill. These will allow someone in a seated position to open and close the windows.

Cost: None, depending on the manufacturer of the window.

*When replacing laundry equipment,* consider selecting units with controls at the front. These allow someone in a seated position to use the controls without reaching over the unit.

Cost: None, depending on the manufacturer; however these units may not be readily available.

*When replacing laundry equipment,* consider redesigning the laundry space to permit someone in a wheelchair to approach the appliance from the side and to reach the doors and controls.

Cost: Minimal, if space is available and if plumbing and electrical wiring is accessible.

*When replacing laundry equipment,* consider selecting units that are front-loading. This makes access easier for people in wheelchairs.

Cost: None, depending upon the manufacturer selected.

*When replacing balcony guardrails,* consider changing the uprights to provide maximum visibility. Minimum thickness of uprights in combination with maximum space between them will provide a better view for someone who is seated.

Cost: Minimal, the only cost being a few extra uprights.

*When replacing or repairing a balcony,* consider raising the level of the balcony to that of the patio door threshold. This would allow a wheelchair-user easy passage from the deck, over the threshold and into the suite.

Cost: Costs will vary greatly depending on how much the level of the balcony must be raised, whether or not the guardrails must also be raised and what modifications must be made on the interior.

*When replacing a bedroom door,* consider widening it. A wider door with a larger clear opening will provide easier access for someone using a wheelchair or a walker.

Cost: Wider door and frame (assuming no structural alterations), $40
Labour, 1.5 hour

## Innovative Idea

In many suites, the hallways are narrow and the doors to the bedrooms have been designed at minimum code widths. In these situations, there is insufficient room to maneuvre a wheelchair. Where there is closet close to the bedroom door, remove part of the closet and install a wider entrance (914 mm or wider). This would allow the wheelchair to turn when partially in the doorway. Alterations to bedroom closets and walls is usually easier than widening the hallway.

Another option is to install a new bedroom door from an adjoining room, such as a living room so that the wheelchair-user can enter the bedroom directly without using the hallway.

* * *

In many suites, the patio doors are raised approximately 200 mm above the floor to allow for the installation of radiant heaters below them. This ledge makes it impossible for a wheelchair to pass on to the patio. A solution is to remove the unit and install it in the floor under the door. This would allow the patio door to be lowered to floor level thus reducing the barrier. The resulting small threshold could be managed easily with a very short ramp.

* * *

Shelving that is installed more than 1,400 mm above the floor is inaccessible to people in wheelchairs and prevent them from using the upper third of their closet. Adjustable spring-loaded hardware is available (similar to that used for installing adjustable sinks and counter units) that allows shelving units to be moved up and down as required. A shelf can thus be raised up and out of the way, providing usable floor space, yet remain in easy reach. A flexible strap or cord is used to pull the shelving unit down, and a pusher rod is used to raise it. These units must be light enough for easy use.

* * *

Most suites have a closet beside to the entry door. This limits the space beside to the door handle, making it difficult for users of wheelchairs or walkers to open the door as they must pull it open while backing up. A solution is to remove the closet doors and the door jamb on the return wall thus enlarging the space by 600 mm. The closet does not have to be entirely abandoned, as it can be redesigned with open-shelving to provide some storage and coat-hanging space.

If the closet is located behind the entrance door, when it is open, the swing of the door may have to be reversed so that the closet can be used.

## Decision Flow Chart

If, as the owner or manager of a low-rise apartment building, you are considering renovations that will make your building barrier-free, you probably have three basic questions:

- Is there a market for accessible suites and buildings?
- How much will the modifications cost?
- How will these changes increase the revenue?

The answers to some of these questions are found in the pages of this guide. Among the References, you will also find the names of community groups and agencies that can provide specific information on your local marketplace.

A decision flow chart is provide here to guide you through the process of gathering relevant information.

By following the flow chart and acquiring the appropriate information, you will be able to make an informed decision regarding building remodelling.

## Market Size and Demand

How much demand is there for barrier-free rental housing? This question must be examined from two perspectives. The first is price. There may be little or no demand for a barrier-free rental unit priced significantly higher than a standard rental unit. Of course, the same barrier-free unit may be in strong demand if the rental rate is significantly lower than the market rate. On the other hand, if the rate for a barrier-free unit is the same as for a standard rental unit, how will demand be affected?

The second perspective is the features the barrier-free unit is offering. People in the marketplace have a wide variety of needs depending on the type and severity of their impairment. Barrier-free suites equipped to satisfy the needs of one type of occupant might not be suitable for someone with different needs. For example, a person who is wheelchair-dependent and living with someone who is not may not require the same level of accessibility as a person who is wheelchair-dependent and living alone.

For information on the demand for barrier-free suites priced at or near the market rent for standard suites in your area:

- contact public housing agencies that own or manage barrier-free rental units to ask for information about their experiences with not for profit units;

- contact agencies and groups that represent people with various impairments, such as the Canadian Paraplegic Association, the Canadian National Institute for the Blind, the Abilities Council, seniors groups, etc., and ask about their housing registries and the housing needs of their members; and

- advertise in the local newspaper to offer barrier-free suites and invite inquiries or expressions of interest.

Approximately 13 percent of the Canadian population has some degree of physical impairment, and that proportion is growing quickly as the average age of the Canadian population continues to increase.

People with mobility impairments form the largest part of that group, although most of these are not wheelchair-dependent. However, people who require the assistance of a cane or walker often need many of the same building modifications as someone who is wheelchair-dependent.

The average income of most people with physical, visual or hearing impairment is somewhat lower than that of the other citizens. Thus, if barrier-free suites are priced significantly higher than market rents for standard units, ability to pay will have a major influence on the demand.

The location of the barrier-free building plays an important role in determining market demand. Barrier-free buildings located in an area close to basic services and amenities will experience a stronger demand than out-of-the way buildings. Buildings that are located close to health centres or clinics, pharmacies, shopping malls, bus or other public transit, parks and recreation areas and facilities will experience strong demand from those who put a premium on being close to these basic facilities.

## Remodeling Component Costs

The following costs are for common remodelling activities associated with making buildings and suites barrier-free. The list of items, material costs and labour time estimates have been gathered from the *Means ADA Compliance Pricing Guide* the product of collaboration between the Adaptive Environments Center, Inc. and R. S. Means engineering staff. It contains cost data for 75 different projects. The cost data is based on national averages for materials and installation for Canada and the U.S. Adjustment factors are provided that allow costs to be adjusted for most locations in Canada and the U.S.

The *Means ADA Compliance Pricing Guide* is available from R.S. Means Company Inc., Construction Publishers and Consultants, 100 Construction Plaza, P.O. Box 800, Kingston, MA 02464-0800, telephone (617) 585-7880. The *Pricing Guide* is a valuable resource when used in conjunction with this design guide.

These component costs give a sense of the approximate costs of typical modification activities. However, consider local conditions, special constraints, weather, material costs and labour rates when preparing actual cost estimates.

The projects that follow are:

- Painted wood ramp (straight)
- Concrete ramp (switch-back)
- Elevator (on building exterior)
- Wider doorway (replace door)
- Pocket door
- Visual alarm to complement existing audible alarm
- 5-alarm boxes (lower)
- Shower (replace tub)

**PAINTED WOOD RAMP (STRAIGHT)**
**Install new painted wood straight ramp (36" between rails, 60' long)**

| Item | Material ($) | Labour (hours) |
|---|---|---|
| Hand excavating for post footings | | 6.0 |
| Conc. forms (16 – 12" dia. tubes 4" deep) | 202 | 13.6 |
| Hand backfill around post footings | | .7 |
| Concrete, material | 110 | |
| Place concrete for footings | | 1.7 |
| Install two-piece galvanized steel post foot | 52.8 | 1.0 |
| 4" x 4" post framing | 176 | 5.3 |
| 2" x 8" joist framing | 221 | 4.2 |
| 1" x 8" board decking | 239 | 4.4 |
| 2" x 6" railing enclosure | 299 | 7.1 |
| Handrail stock | 122 | 13.6 |
| Drill bolt holes | | 7.3 |
| Bolts, nuts, washers | 89 | 5.8 |
| Handrail brackets | 544 | 8.5 |
| Anchor layout and drilling | 1 | 1.3 |
| 1/2" anchors | 7 | .4 |
| Painting (2 coats) | 345 | 23.8 |
| **Totals** | **$2,408** | **104.7** |

| CONCRETE RAMP (SWITCH-BACK)<br>Install new concrete below-grade switchback ramp (36" between rails, 60' long) | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Excavation | | 17.0 |
| Remove concrete wall at existing stairs | | 21.3 |
| Concrete forms, footings | 91 | 15.8 |
| Concrete forms, walls | 432 | 70.6 |
| Reinforcing | 291 | 6.4 |
| Place concrete | | 12.8 |
| Concrete | 1,320 | |
| 2-coat bituminous damp-proofing | 33 | 5.8 |
| Backfill | | 4.6 |
| Gravel under slab | 21 | .3 |
| Slab for ramp (4" thick) | 345 | 5.3 |
| Aluminum pipe rail (2) | 1,089 | 18.0 |
| Aluminum wall pipe railing | 945 | 22.5 |
| Haul excess material | | 5.6 |
| **Totals** | **$4,567** | **206.0** |

| ELEVATOR (ON BUILDING EXTERIOR)<br>Add new elevator and shaft to building exterior | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Saw cutting exterior walls | 83 | 19.8 |
| Exterior wall demolition | | 2.6 |
| Excavation | | 2.2 |
| Footing formwork | 20 | 3.4 |
| Wall forms | 81 | 12.3 |
| Reinforcing | 73 | 1.6 |
| Concrete | 330 | |
| Placing concrete | | 3.2 |
| Backfill | | 2.9 |
| Slab on grade, 4" | 74 | 1.4 |
| Structural steel frame, plates, angles, fasteners | 2,745 | 23.8 |
| Shaft wall, including light-gauge framing | 1,554 | 81.0 |
| Face brick, running bond | 2,419 | 202.0 |
| Scaffolding | 260 | 15.9 |
| Elevator pit ladder | 100 | 1.5 |
| 3" deep, 22-gauge metal decking | 52 | .6 |
| 6" aluminum gravel stop | 81 | 2.4 |
| 2" thick polyisocyanurate roof insulation | 33 | .5 |
| EPDM roofing with ballast | 50 | .5 |
| Roofing | | 4.0 |
| Hydraulic passenger elevator (3-stop) | 20,800 | 800.0 |
| **Totals** | **$28,755** | **1,181.6** |

| **WIDER DOORWAY (REPLACE DOOR)**<br>**Widen existing stud wall opening and replace with hollow wood door** | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Remove interior door | | .4 |
| Remove door frame | | .6 |
| Remove stud wall partition | | .3 |
| Interior door frame | 58 | .8 |
| Interior wood door, birch face, 3'-0" x 6'-8" | 65 | 1.2 |
| Hinges | 69 | |
| Lever-handled lockset | 80 | |
| Threshold | 28 | .4 |
| Paint door | 5 | .9 |
| Painting | 12 | 1.2 |
| **Totals** | **$317** | **5.8** |

| **POCKET DOOR**<br>**Install hollow core wood pocket door in wood stud wall** | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Remove interior door | | .4 |
| Remove door frame | | .6 |
| Remove stud wall partition | | 1.0 |
| Pocket door frame | 79 | 1.0 |
| Gypsum board finish on pocket door frame | 13 | 1.1 |
| Cased opening jamb and header | 5 | .4 |
| Door trim set | 22 | 2.7 |
| Interior wood door, birch face, 3'-0" x 6'-8" | 65 | 1.1 |
| Lever-handled lockset | 80 | |
| **Totals** | **$264** | **8.3** |

| **VISUAL ALARM TO COMPLEMENT EXISTING AUDIBLE ALARM**<br>**Add visual alarm to existing audible alarm** | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Fire alarm light | 96 | 1.5 |
| #18 fire alarm conductor | 6 | .1 |
| **Totals** | **$102** | **1.6** |

| 5-ALARM BOXES (LOWER) Lower 5-alarm fire boxes (surface-mounted conduit) | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| No 700 wire-mould raceway | 6 | .8 |
| #8 fire alarm conductor | 6 | .1 |
| Labour | 2 | |
| **Totals** | **$14** | **.9** |

| SHOWER (REPLACE TUB) Replace tub with accessible fibreglass shower | | |
|---|---|---|
| **Item** | **Material ($)** | **Labour (hours)** |
| Remove tub | | 2.0 |
| Disconnect plumbing | | 4.0 |
| Remove partition finishes | | .6 |
| Fibreglass shower, corner seat and grab bars | 570 | 8.0 |
| Bar-mounted hand-held shower head | 137 | .4 |
| Rough-in supply, waste and vent | 77 | 7.8 |
| **Totals** | **$784** | **22.8** |

## Timing of Remodelling Costs

When do remodelling costs have to be incurred? The first expense will be in providing a barrier-free entrance to the building. Making the entrance barrier-free implies that the approaches to the barrier-free entry, loading and unloading areas and parking areas will also be suitable.

Once the building entrance and approaches are modified, the timing of individual suite modifications will depend on the specific needs of the occupants. You can determine these by asking applicants at the time of inquiry or application for rental. If the building is normally fully occupied, you may have to forego the rent on certain suites during the modification period. However, if the building has suites that become vacant from time to time, modifications designed to satisfy the tenants' needs can take place during vacancies. In this way, you do not have to modify your building "speculatively" thus incurring expenses for modifications that the occupants do not immediately require.

For example, a potential occupant may be prepared to establish a long term residence if they are confident that, as their health declines, their suite and common areas will be modified (within pre-determined limits) to meet their changing needs. Bathrooms and kitchens may require only minimal adjustments to accommodate someone who needs only a walker to aid mobility; however, if that person becomes wheelchair-dependent, the vanity, tub and kitchen counters must be adjusted too.

Unless you have market research information that indicates a strong demand for a certain type of suite modification, it makes sense to hold off and carry out the modifications only as they are required.

## Revenue Projections

Obviously projected revenues are just an important as costs to the owners or managers of rental properties. Ultimately this guide cannot precisely predict the benefits for every building, as they depend on the pricing strategy employed.

However, some guidance can be offered. The following charts provide revenue projections according to two systems of measuring financial performance. The first chart projects an annual revenue increase based on monthly suite rental rates. A number of suite combinations are included to reflect the rental of one, two or three floors of barrier-free suites in building sizes ranging from 18 to 54 suites. The range of extra revenue to be realized is from $10 per suite per month to $50 per suite per month. It is up to you to judge how much of a rental premium can be generated by barrier-free suites.

The second chart projects revenues generated by renting "additional" suites. In markets with higher vacancy rates, the provision of barrier-free suites may reduce vacancies. This chart covers the rental of one to five additional suites at rental rates of from $350 to $600 per month. You can judge how many normally vacant suites might be rented if they were made barrier-free.

**ANNUAL INCREASE IN REVENUE FOR BARRIER-FREE SUITES**
**(based on full occupancy)**

| Monthly Increase | Number of Suites 6 | 8 | 12 | 16 | 18 | 24 | 32 | 36 | 48 | 54 |
|---|---|---|---|---|---|---|---|---|---|---|
| $10 | 720 | 960 | 1,440 | 1,920 | 2,160 | 2,880 | 3,840 | 4,320 | 5,760 | 6,480 |
| $20 | 1,440 | 1,920 | 2,880 | 3,840 | 4,320 | 5,760 | 7,680 | 8,640 | 11,520 | 12,960 |
| $30 | 2,160 | 2,880 | 4,320 | 5,760 | 6,480 | 8,640 | 11,520 | 12,960 | 17,280 | 19,440 |
| $40 | 2,880 | 3,840 | 5,760 | 7,680 | 8,640 | 11,520 | 15,360 | 17,280 | 23,040 | 25,920 |
| $50 | 3,600 | 4,800 | 7,200 | 9,600 | 10,800 | 14,400 | 19,200 | 21,600 | 28,800 | 32,400 |

**ANNUAL REVENUE**
**(based on suites rented)**

| Monthly Rental | 1 suite | 2 suites | 3 suites | 4 suites | 5 suites |
|---|---|---|---|---|---|
| $350 | 4,200 | 8,400 | 12,600 | 16,800 | 21,000 |
| $375 | 4,500 | 9,000 | 13,500 | 18,000 | 22,500 |
| $400 | 4,800 | 9,600 | 14,400 | 19,200 | 24,000 |
| $425 | 5,100 | 10,200 | 15,300 | 20,400 | 25,500 |
| $450 | 5,400 | 10,800 | 16,200 | 21,600 | 27,000 |
| $475 | 5,700 | 11,400 | 17,100 | 22,800 | 28,500 |
| $500 | 6,000 | 12,000 | 18,000 | 24,000 | 30,000 |
| $525 | 6,300 | 12,600 | 18,900 | 25,200 | 31,500 |
| $550 | 6,600 | 13,200 | 19,800 | 26,400 | 33,000 |
| $575 | 6,900 | 13,800 | 20,700 | 27,600 | 34,500 |
| $600 | 7,200 | 14,400 | 21,600 | 28,800 | 36,000 |

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*Making Your Home Accessible: A Disabled Consumer's Guide*

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**Canadian Association of Independent Living Centre (CAILC)**
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**Canadian Injured Workers Alliance**
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**Canadian Paraplegic Association (CPA)**
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**Council of Canadians with Disabilities**
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