Building Circulation

Design considerations

Canadian building codes have evolved greatly over the years relating to vertical and horizontal circulation in and around buildings, including low-rise, multi-family social housing projects. The needs of persons with disabilities have had a great impact on building code changes. Ramp, stair and handrail designs have changed drastically in the last 20 years. More safety features have been added to better accommodate persons who are blind or have low vision.

This chapter focuses on the following building circulation features:

- Ramps
- Stairs
- Handrails
- Landings
- Corridors
- Elevators and lifts

Ramps

A ramp can be used to overcome changes in level, either on the inside or outside of a building, as an alternative to using stairs.

A ramp is ideal for people who have difficulty negotiating stairs for various reasons, be it the need to carry heavy objects between levels or move a child in a stroller, or because of a disability. Providing both stairs and a ramp at changes in level will allow people to choose the option that best suits their needs, resulting in a flexible and more universally accessible design (see figure 1).

Figure 1: Ramp and stair combination
Photo by: Ron Wickman

Ramps are particularly useful for overcoming changes in level up to about 760 mm (30 in.), from the ground level to the entrance level, for example. Using ramps for greater changes in level requires a great deal of space—which may or may not be practical. If you are faced with a big change in level, installing a lift may be a better strategy than constructing a ramp. The physical and monetary costs associated with both options should be fully explored when deciding which option will accommodate the greatest number of users.

There are typically two strategies used for ramp design: a landscape approach and a structural approach.

This first approach incorporates landscaping, gently sloping walkways and grading to overcome changes in level (see figure 2). A safe path with a gentle slope can be built without railings (unless there are abrupt drop-offs on either side, or users need them), resulting in an integrated, low-key design that does not look like a traditional ramp.

Figure 2: Concrete sloped ramp
Photo by: Ron Wickman

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The landscape approach is generally limited to smaller changes in level. If you are considering a landscape approach, try to achieve slopes no steeper than 1 in 20.

The second approach involves building a ramp structure—usually using wood-frame construction (see figure 3). This results in a more noticeable structure, although its visual impact can be minimized through creative design, landscaping and finishes.

Ramps generally require a lot of space, particularly if they are used to overcome significant changes in level. In addition, landings, which are required at the top and bottom of a ramp, at all changes in direction and where the run is longer than 9 metres (30 feet), further increase the space requirements for ramps (see figure 4).

The run (length) of the ramp will depend on two primary factors: the overall rise (vertical change in level) and the slope used. Building codes require a slope no steeper than 1 in 12 for public buildings. This means that, for every 25 mm (1 in.) of change in height, the ramp must be 305 mm (12 in.) in length. For example, if the entrance is 455 mm (18 in.) above ground level, the ramp would have to be 5,485 mm (216 in.) long—and that does not include any landings!

The clear width of the ramp should be 990 mm (39 in.)—this does not include the space required for any handrails, guards or other structural components that might be needed.

Ramp handrails are usually a building code requirement and are always required for ramps steeper than 1 in 20.

Handrails must be provided on both sides of a ramp located from 865 to 915 mm (34 to 36 in.) above the surface of the ramp (see figure 5).

If the change in level at the edge of a ramp or landing is more than 610 mm (24 in.), railings or guards at least 1,070 mm (42 in.) high are required for safety. Edge protection of a minimum of 50 mm (2 in.) is required where the edges of ramps are not at grade or adjacent to a wall, to prevent someone from wheeling off the edge of the ramp.

Figure 3: Wood ramp
Photo by: Ron Wickman

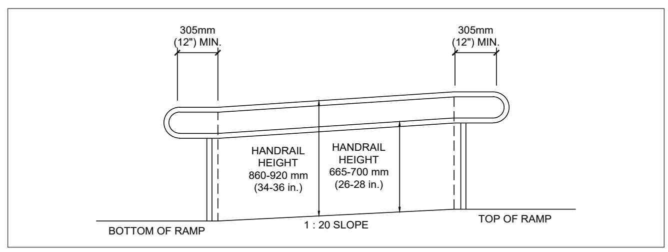

Figure 5: Handrail detail for a ramp
Diagram by: Ron Wickman Architect

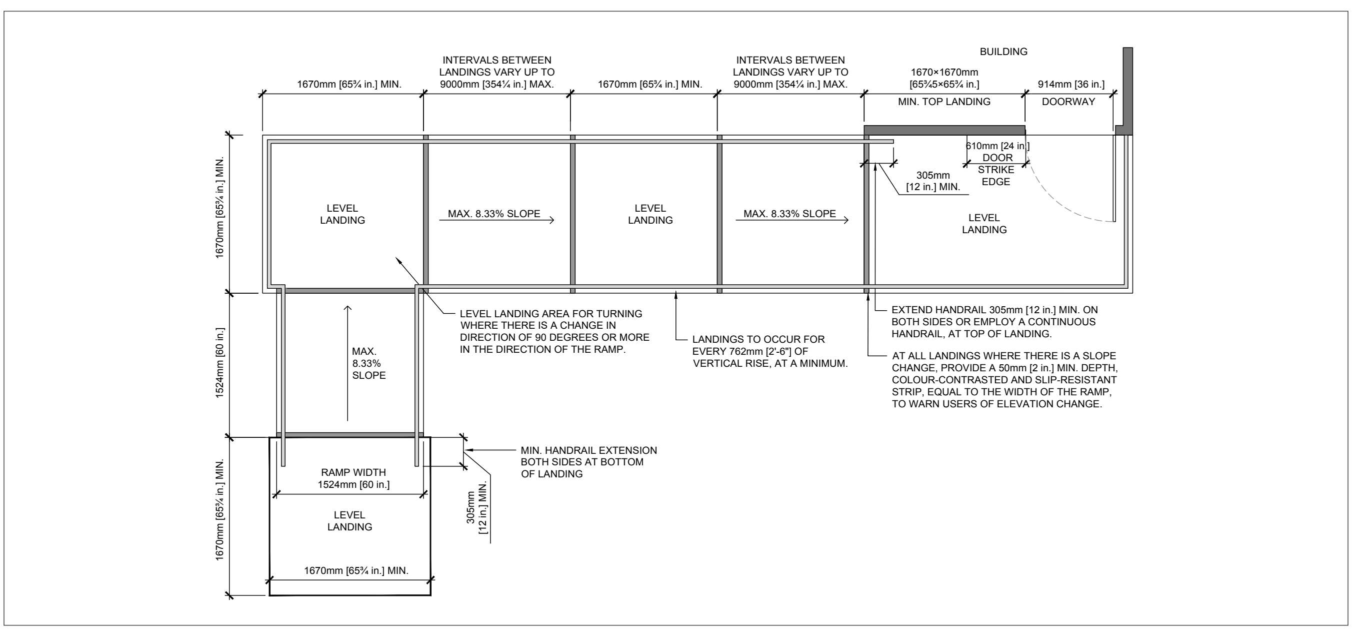

Figure 4: Ramp requirements
Drawing by: Alberta Parks

Stairs

People with mobility or visual limitations 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 rise and run blend visually. They normally lack tactile warning strips as a cue where the stairs begin. Handrails are an important safety feature and make stairs more usable for people with limited mobility. Motorized chair lifts or elevators are rare in older three-storey, walk-up buildings; however, inclined lifts or platform lifts allow persons in wheelchairs to access one or more floor levels.

Build stairs with risers not more than 180 mm (7 in.) high and non-slip treads not more than 280 mm (11 in.) deep, measured from riser to riser; the stair nosing should not project more than 38 mm (1½ in.) from the rake back. Install stair backs with proper rake and nosing on open stairs (see figure 6).

Install a warning surface, of a different texture and colour to the surrounding floor, at the top of the stairs. This surface should commence 915 mm (36 in.) from the first step and stop one tread width from the beginning of the stairs. 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 (see figure 7).

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 (see figure 8).

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

Ensure that the lighting level in stairways is not less than 100 lux.

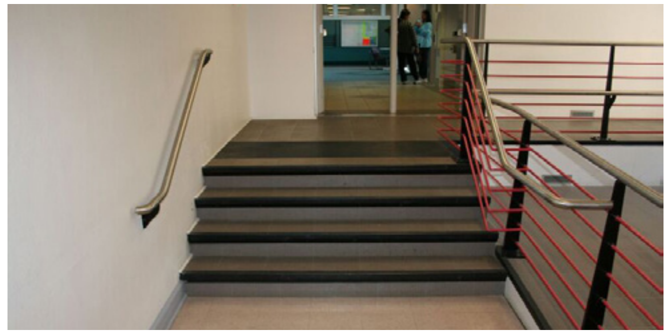

Figure 6: Accessible stairs complete with colour and texture contrast
Photo by: Ron Wickman

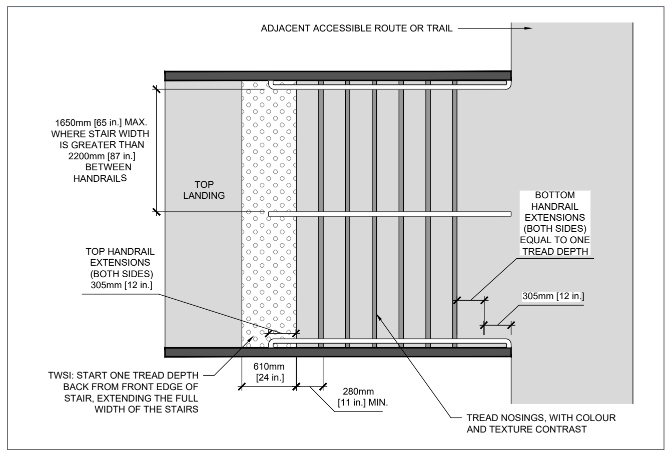

Figure 7: Accessible stairs—plan view
Drawing by: Alberta Parks

Position and direct new lighting to avoid reflections on stairs and landings.

Shadows and reflections on stairways and landings create 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; they can also create shadows and reflections.

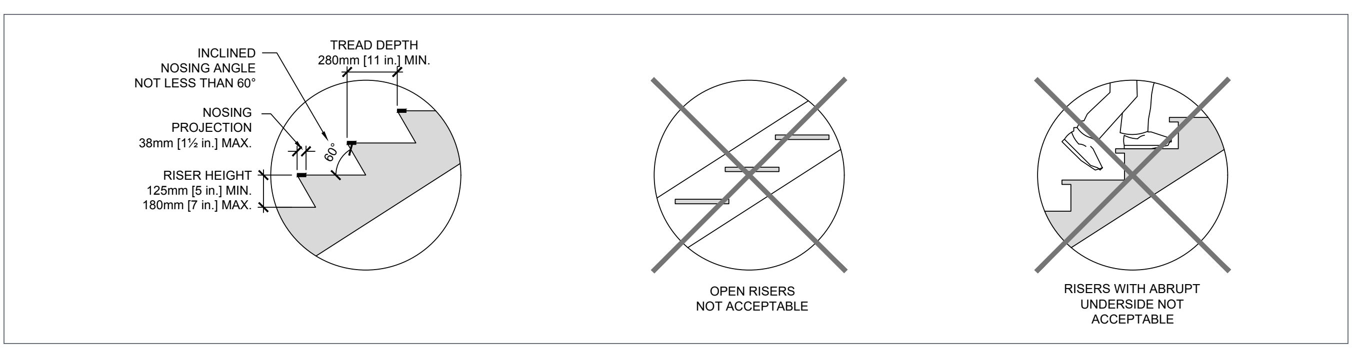

Figure 8: Stair detail enlargements
Drawing by: Alberta Parks

Handrails

Handrails should be of a comfortable size and shape for grasping. A circular shape of 30 to 40 mm (1¼ to 15/8 in.) in diameter is appropriate for most people, although children and other persons with small hands may prefer smaller sizes (see figure 9).

A handrail should be affixed in a way that allows a user to grasp it continuously along its entire length—the location of brackets or posts should not require a user to let go of the handrail at any time.

Some users with limited balance will want to steady themselves using the handrail before they move onto the sloped surface. Handrails should extend horizontally for at least 305 mm (12 in.) beyond the starting and ending points of any sloped surface. Handrails should also be terminated in a manner that does not obstruct users' travel or create a hazard (see figure 10).

Purchase circular or oval handrails with a circumference of 30 to 40 mm (1¼ to 15/8 in.) in a colour that contrasts with the wall. Install these 35 to 45 mm (13/8 to 1¾ in.) from the wall and 800 mm to 915 mm (32 to 36 in.) above the stair nosing on both sides of the stairs; one side should be continuous from the top to the bottom. Where a handrail is discontinuous, extend it 305 mm (12 in.) horizontally before the top step and 305 mm (12 in.) plus one tread width at the bottom. Ensure that the handrails return to the wall, the floor or a post; do not leave exposed ends (see figure 11).

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

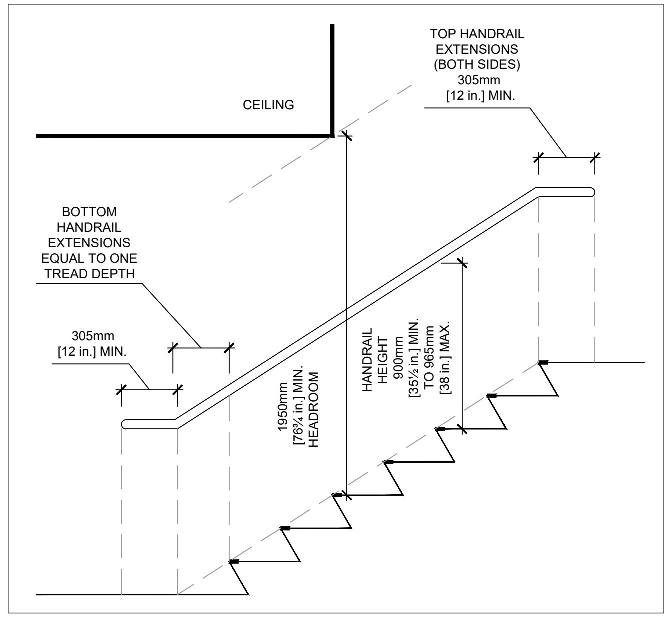

Figure 10: Handrail extensions
Drawing by: Alberta Parks

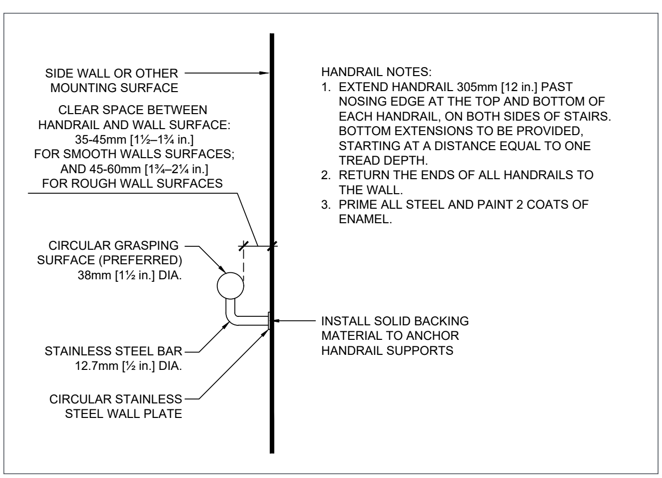

Figure 9: Handrail grasping surface dimensions
Drawing by: Alberta Parks

Figure 11 Handrail return to floor
Photo by: Ron Wickman Architect

Landings

Landings are located between and at each floor level in low-rise, multi-family housing projects. 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 manoeuvre. Since dwellings normally surround landings, modifications are not easy.

Construct landings 1,525 mm (60 in.) deep; this allows someone in a wheelchair to open the door. The following guidelines should be followed:

- Where the door swings into the landing, provide a 610 mm (24 in.) minimum on the latch side of the door.
- Where the door swings away from the landing, provide 305 mm (12 in.) on the latch side of the door.
- Where the landing is a porch (double set of doors), provide the door width plus 1,220 mm (48 in.).

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.

Build rectangular landings 2,000 to 2,500 mm (79 to 98 in.) wide and 1,300 to 2,000 mm (51 to 79 in.) deep; the minimum landing width to accommodate a turning wheelchair is 1,525 mm (60 in.). Enlarge interior landings by moving stairs or exterior walls.

If the exterior walls are moved, pay attention to ensuring structural support and protecting the site from the weather. There are potential structural consequences from moving stairs further into hallways, and you may be required to remodel the floor layout. There may be an impact on the location of fire doors and fire-rated compartments (see figure 12).

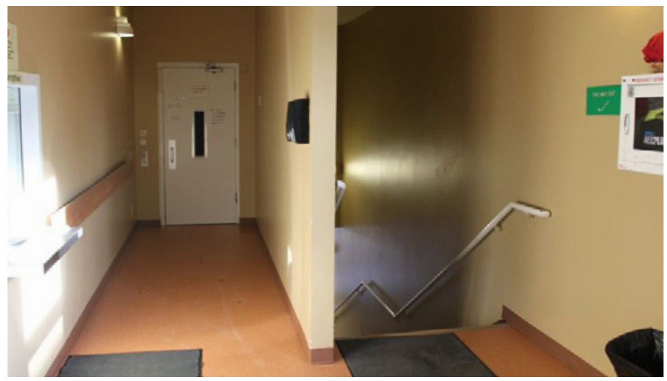

Figure 12: Large interior landing
Photo by: Ron Wickman Architect

Corridors

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.

Provide corridors with a minimum width of 1,220 mm (48 in.). This will permit a wheelchair to pass a person who is walking. Better yet, a width of 1,525 mm (60 in.) 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 1,070 mm (42 in.) for a length of 1,525 mm (60 in.); for a hinge side approach, provide a width of 1,070 mm (42 in.) for a length of 1,350 mm (53 in.). 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 (see figure 13).

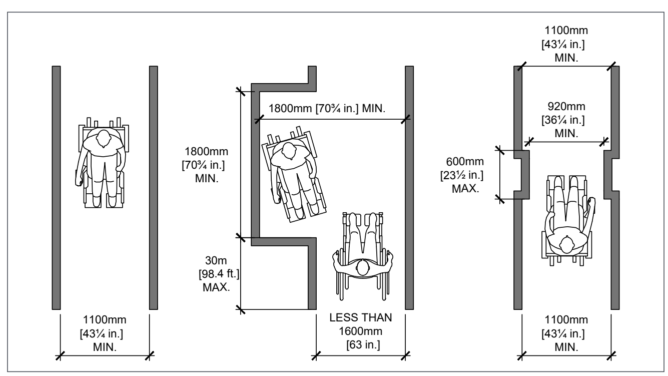

Figure 13: Typical width corridors
Drawing by: Alberta Parks

A minimum width of 1,100 mm (43 in.) 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 on to the corridor wall: 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 still have to be addressed. Differences in elevations between hallways and suites must be resolved.

Provide floor finishes that are slip-resistant to allow for the easy movement of persons in 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 in 12 where elevation differences occur in the corridor.

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

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

Each floor and individual suite must be identified. However, suite numbers placed on doors in the 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 visual limitations have difficulty locating the edges of openings, such as doorways.

Provide large, raised floor numbers in the stairwell at the door leading to the floor. Purchase suite numbers that are 25 mm (1 in.) high and 0.8 mm (1/32 in.) thick or raised and that are colour-contrasted to the background colour. Install these numbers at a height of 1,525 mm (60 in.) from the floor.

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

Paint frames of all suite entry doors and all exit doors in a colour that contrasts with the surrounding walls (see figure 14).

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

Figure 14: Colour-contrasting suite entry door frames
Photo by: Ron Wickman Architect

Elevators and lifts

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, visual and hearing limitations. Install the elevator at the entrance to the building, in an existing stairwell or in an exterior wall addition.

Elevators come in many sizes and capacities; some low-end models may not satisfy the needs of persons with visual and hearing limitations (see figure 15). The building must have more stairwells that are required by the building code if one is to be used for the installation of an elevator. Installation may require remodelling 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 (including fire sprinkler systems, smoke alarms and areas of refuge). Evacuation instructions must describe the procedures that apply to the uses 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 operator will use the elevator for the evacuation of persons who are mobility-impaired.

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

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

There are a 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 lifts are equipped with a fold-down seat); it may be unsafe for others, and people with mobility limitations may need to use the stairs.

Figure 15: Public elevator complete with accessible signage
Photo by: Ron Wickman Architect

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