



# Preventing Falls on Stairs

## ACCESSIBILITY

Accessible housing refers to homes that are designed or modified to enable independent living for all residents, including seniors or persons with disabilities. Accessibility can be achieved through architectural design and also by integrating accessibility features, such as lowered light switches, grab bars, walk-in bathtubs, lowered shelves and cupboards, modified furniture or by installing electronic devices in the home.

Stairs in the home can be dangerous and can be a barrier to accessibility unless they are designed or modified to reduce the risk of falls. If residents have limited mobility, it may be necessary to install ramps, home elevators or stairlifts to make the home safe and accessible.

A high percentage of Canadians who visit hospitals after a fall on or from stairs or steps in their homes are seniors (men and women 65 years or older). When seniors fall, the consequences can be severe and long-lasting.

Most falls on stairs can be prevented. Prevention starts by keeping in mind that there are risks in using stairs. Good planning and simple strategies can help prevent falls and injuries.

This document describes some of the ways to reduce the risk of falling on stairs.

## WHERE CAN PEOPLE FALL?

People can fall anywhere in the house where there are stairs, including entry stairs, stairs leading to another floor, the back doorstep or steps leading to another room. Falls resulting in serious injuries can occur even with a single step.

## WHY DO PEOPLE FALL?

Professionals who study why people fall on or from stairs have identified three main contributing factors:

**Environmental factors** including poor design, construction and maintenance of stairs, non-existent or dysfunctional handrails, poor lighting and other features such as poor tread surfaces.

**Health factors** including reduced vision, weakness, drowsiness, loss of balance or an inactive lifestyle.

**Behavioural factors** including lack of concentration, carrying something while using stairs, running, unsuitable footwear, unfamiliarity with the stairs (although most stair-related injuries occur on stairs that are familiar to the fall victim) and decisions whether or not (and how) to modify or maintain the stairway environment.

## WHAT ARE THE CONSEQUENCES OF FALLING ON STEPS OR STAIRS?

Falls on stairs can be a major threat to health, independence and confidence. The physical consequences can be serious, including soft-tissue damage and broken bones, especially hips. Traumatic brain injuries can occur from falling on stairs. Other serious consequences, particularly for older people, include psychological effects, such as lowered confidence and loss of the feeling of safety, which further reduces health, mobility and activity. Many people never fully recover from the consequences of a fall.

## SHOULD PEOPLE STOP USING STAIRS?

There can be health benefits from using stairs. Climbing stairs can significantly contribute to the 30 minutes of daily physical activity people need. Stair climbing also increases leg power and may be important in helping elderly people or people with disabilities reduce the risk of injury from falls.

While a doctor can best advise if there are special health problems that might limit or even prevent people from safely using stairs, everyone should be aware that stairs can be risky and know how to reduce the risks.

## WHAT CAN BE DONE TO OVERCOME PROBLEMS WITH STAIRS?

There are several ways to reduce the health, environmental and behavioural risks associated with the use of stairs in or around the home.

People with health and/or mobility issues that impact their ability to use stairs safely should consult an occupational therapist. An occupational therapist can provide advice on the most appropriate changes to the home and personal behaviour to reduce the risk of falling on stairs.

Simple modifications can be made to increase the safety of stairs (for example, adding a second handrail, installing visual contrast strips at the edge of stairs for easier visual detection, etc.—see table 1 for detailed suggestions). If more major modifications are required to make stairs safer, residents could consider installing an elevator or stairlift (see CMHC fact sheet *Accessible Housing by Design—Lifts and Residential Elevators*) or creating a bedroom, bathroom and laundry room on the ground floor, if not already available. When considering renovations or modifications to the home, people should ensure they are using a reputable builder and obtain at least three quotes before signing a contract (see text box *Tips for Hiring Contractors*).

If renovations to the existing home are not possible or affordable, moving to a one-floor house or apartment may be the best option.



## TIPS FOR HIRING CONTRACTORS

### 1. Find a reputable contractor

- Ask family members, friends or neighbours for referrals.
- Consult with local building supply stores and local homebuilder or renovation associations for recommendations.

### 2. Obtain quotes

- Arrange for contractors to visit the home to discuss the renovations.
- Obtain written quotes from at least three contractors.
- Ask contractors to provide references from at least three previous customers requiring similar renovations.

### 3. Choose a contractor

- Check references—the best proof is satisfied customers.
- The lowest bid is not necessarily the best one.
- Obtain a written contract—even the smallest job should be in writing.



Tables 1 and 2 below provide recommendations for improving stair safety by modifying the stairway environment (table 1) and modifying personal behaviour (table 2).

Table 1 – Preventing Falls by Modifying the Stairway Environment

What Causes People to Fall?		Strategies to Prevent Falls
Difficult-to-see steps, especially when it is hard to distinguish one step from another		<ul style="list-style-type: none"> <li>• Avoid visually distracting patterns on the treads.</li> <li>• Mark nosings permanently (not with tape) if they can't be clearly seen. Paint a contrasting colour stripe on the nosing of each tread (unless the stairs are carpeted—do not paint a stripe on carpeting).</li> <li>• Improve lighting (see below).</li> </ul>
Poor lighting People may misjudge presence and exact location of each step		<ul style="list-style-type: none"> <li>• Improve lighting on steps and stairs. Stairs should not have lower illumination levels than adjacent areas.</li> <li>• Use lighting that makes tread nosings distinctly visible and does not cause glare or strong shadows.</li> <li>• Install a three-way light switch at the bottom and top of the stairs so the light can be turned on and off from either direction.</li> <li>• Provide low-intensity night lighting of stairs that does not need to be switched on.</li> </ul>
Step geometry	Steep steps with high risers and/or short treads	<ul style="list-style-type: none"> <li>• Keep tread coverings thin and tightly affixed to maximize usable tread size. This will usually require removing cushioning under carpets on steps. Soft treads, especially when short and with a large rounding at the nosing, should be avoided.</li> <li>• When renovating stairs in the current home, or building a new home that has stairs, consider the relationship between the rise, the run and the tread (see figure 1). The suggested best practice is a rise no higher than 180 mm (7 in.) with a run no shorter than 280 mm (11 in.) to provide increased comfort and safety.*</li> </ul>
	Non-uniform steps—an especially common cause of missteps and falls	<ul style="list-style-type: none"> <li>• Confirm that stair nosings or rectangular treads line up exactly. If they do not, consider partial or complete rebuilding of the steps to make them uniform in size and height. If all steps except the top step have nosings, the top step should be rebuilt to include a nosing. This is very important as non-uniform steps are a common cause of falls.</li> </ul>
	Winding, curved or spiral stairs	<ul style="list-style-type: none"> <li>• Provide handrails on each side of the stairway, especially where the stairway includes combinations of rectangular and tapered treads that require users to move from larger to smaller tread depths, depending on where they walk on the stair width.</li> </ul>

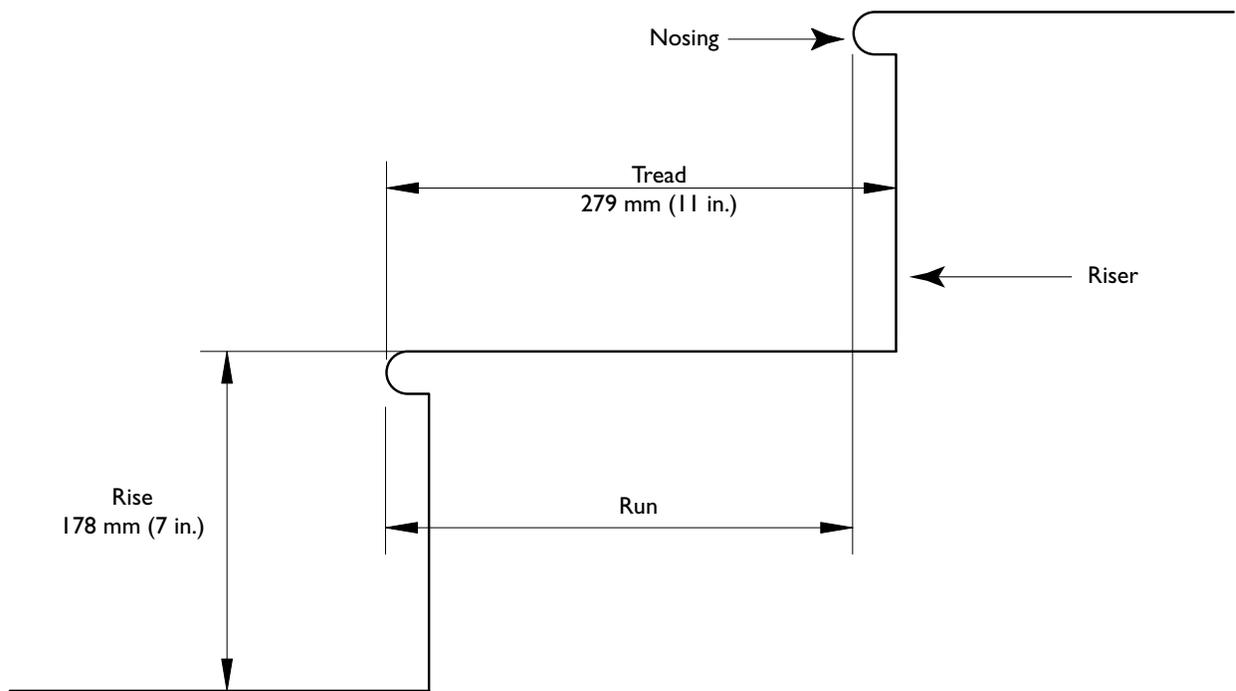
\* The National Building Code of Canada (2015) permits a maximum (200 mm [7 ¾ in.]) and a minimum (125 mm [5 in.]) rise; a maximum (355 mm [14 in.]) and a minimum (255 mm [10 in.]) run for rectangular treads; as well as a minimum clear height of 1,950 mm (77 in.) over the length of the stairway in homes.



What Causes People to Fall?		Strategies to Prevent Falls
Slippery or poorly maintained treads		<ul style="list-style-type: none"> <li>• Use a slip-resistant, rough finish on treads that are subject to wetting. Generally, for interior stairs, any slip-resistant surface material acceptable for normal floors will work on treads (see CMHC fact sheet Accessible Housing by Design—Living Spaces for more information about slip-resistant flooring).</li> <li>• Repair or replace tread surfaces.</li> <li>• Fasten tread coverings securely. The covering should be tight against the nosing. Resilient safety tread coverings must be carefully installed and maintained because they tend to crack at the nosing and become an additional hazard.</li> </ul>
Loose rugs		<ul style="list-style-type: none"> <li>• Do not place loose rugs on steps or at the top or bottom of stairways.</li> </ul>
Handrails	Missing or dysfunctional handrails	<ul style="list-style-type: none"> <li>• Handrails are strongly recommended regardless of the number of steps.** Where possible, install functional handrails on both sides of stairs.</li> <li>• If there are existing handrails that are decorative but not functional, these should be augmented or replaced by functional handrails.</li> <li>• Position handrails at about adult elbow height: 865 to 965 mm (34 to 38 in.) is the recommended height range (see figure 2), but the height may be increased to no more than 1,070 mm (42 in.).</li> <li>• Handrails should be round or oval. Adults should be able to wrap their hand around—and underneath—the handrails. If a measuring tape is wrapped around the railing, it should measure less than 160 mm (6 ¼ in.) for adult hands; 100 mm (4 in.) works well for children's hands.</li> <li>• Extend the handrails, without a break, the full length of the stairs, and beyond the top and bottom of the stairs (see figure 2).</li> <li>• Ensure handrails have a tactile indicator that warns users that the stair is coming to the end (for example, Velcro strip).</li> <li>• Make sure the handrails are easy to see, even in low light or at night.</li> <li>• Consider installing a handrail that is a different colour than the background wall to improve contrast between wall and railing (or paint an existing handrail a different colour from the background wall).</li> </ul>
	Loose or broken handrails	<ul style="list-style-type: none"> <li>• Attach handrails securely to walls and posts. People should be able to put their entire weight on the handrail without damaging the handrail, the wall or the post.</li> <li>• Repair loose or broken handrails.</li> </ul>

\*\* Occupational therapists recommend handrails be installed on all staircases, even short flights of three steps or less, for safety purposes.





**Figure 1: Suggested Dimensions for the Elements of a Step**

The illustration shows the suggested dimensions for the rise and tread of a step. The rise, or vertical height of a step, is 178 mm or 7 inches. The tread, or horizontal part of a step, is 279 mm or 11 inches. The graph also shows three other elements of a step: the nosing, the run and the riser. The nosing is the front or leading edge of a stair tread. The run is the horizontal distance between nosings. The riser is the vertical portion at the back of the step, which can be solid or left open.

Table 2 – Preventing Falls by Modifying Behaviour

What Causes People to Fall?	Strategies to Prevent Falls
Overstepping stair treads (the most common misstep on home stairs) or twisting the feet or body on relatively short treads or winding stairways	<ul style="list-style-type: none"> <li>• Be cautious, deliberate and not rushed.</li> <li>• Hold on to the handrails.</li> </ul>
Rushing, especially on steep, curved or cramped stairs	<ul style="list-style-type: none"> <li>• Take time and be extra cautious, especially where there is a transition between angled, shorter treads on winding stairways and rectangular treads.</li> </ul>
Wearing loose slippers or other footwear	<ul style="list-style-type: none"> <li>• Always wear shoes or “full back” slippers that fit properly and have a non-slip sole.</li> </ul>
Unintended use of stairs in the home, for example, by vulnerable users, such as small children or older persons with dementia	<ul style="list-style-type: none"> <li>• Install secure gates at top and bottom of stair flights, to prevent unintended use of the stairs.</li> </ul>
Unfamiliarity with the environment, for example, visiting a relative’s or friend’s home where there are one or more steps between floors that are at slightly different levels	<ul style="list-style-type: none"> <li>• Take extra time when using an unfamiliar stairway and be especially wary of all places where changes of floor level are possible—especially with only one or two steps in settings that are visually distracting.</li> </ul>
Lack of attention, for example, when going down stairs; some people fall at the second-last step because they think they have already reached the bottom of the stairs	<ul style="list-style-type: none"> <li>• Avoid being distracted when using a stairway.</li> <li>• Make sure that the perception of the stairway is accurate, especially at the beginning and end of the stairway.</li> </ul>
Low or reduced vision	<ul style="list-style-type: none"> <li>• Remove reading glasses when going up or down stairs.</li> <li>• If prescription eyeglasses are needed for distance vision, they should be worn when using the stairs.</li> <li>• Take extra care when wearing bifocal or progressive eyeglasses. Adjust the position of the glasses or the head in order to see the stairs clearly.</li> <li>• Refer to table 1 for suggestions for modifying the stairway environment to improve lighting.</li> </ul>



What Causes People to Fall?	Strategies to Prevent Falls
Unnecessary use of stairs, especially under pressing circumstances (for example, rushing up or down stairs to answer the telephone, use the washroom or answer the doorbell)	<ul style="list-style-type: none"> <li>• Don't rush when using the stairs, particularly when going down the stairs.</li> <li>• Install a telephone on each floor or carry a portable telephone.</li> <li>• Consider installing a bathroom on each floor.</li> <li>• Consider installing an intercommunication system that can be used from anywhere in the home.</li> </ul>
Side effects of medication or alcohol	<ul style="list-style-type: none"> <li>• Make sure the effects of medicines are known. If a medicine can cause dizziness, extra care should be taken in using stairs.</li> <li>• Even one alcoholic beverage can affect balance and perception: people need to be extra careful on stairs if they have had a drink.</li> </ul>
Not using lights	<ul style="list-style-type: none"> <li>• If stairs are darker than surrounding areas, turn on stair lights.</li> <li>• Refer to table 1 for suggestions for modifying the stairway environment to improve lighting.</li> </ul>
Not holding the handrails	<ul style="list-style-type: none"> <li>• When walking up or down stairs, always hold the handrails, or have at least one hand within easy reach of a handrail.</li> </ul>
Carrying objects on the stairs	<ul style="list-style-type: none"> <li>• Never carry objects (such as large laundry baskets) on stairs, especially if they require use of both hands or block the view of the steps. Instead, consider using a laundry bag, that can be carried in one hand, dragged or thrown down the stairs.</li> <li>• One hand should always be free to hold on to a handrail. For some more vulnerable stair users, both hands should be available for handrail use, especially when going down stairs.</li> </ul>
Cleaning the stairs without taking proper precautions	<ul style="list-style-type: none"> <li>• Use small, lightweight tools or equipment, such as a hand-held, cordless vacuum cleaner, and always keep one hand on, or available for, the handrail.</li> <li>• Non-glare, non-skid wax should be used if polishing uncarpeted stairs.</li> <li>• If necessary, have someone else clean the stairs.</li> </ul>
Leaving or storing objects on steps or landings (an important issue that is easily avoided)	<ul style="list-style-type: none"> <li>• Do not place any objects on steps and make sure that any objects on landings do not distract or obstruct.</li> </ul>



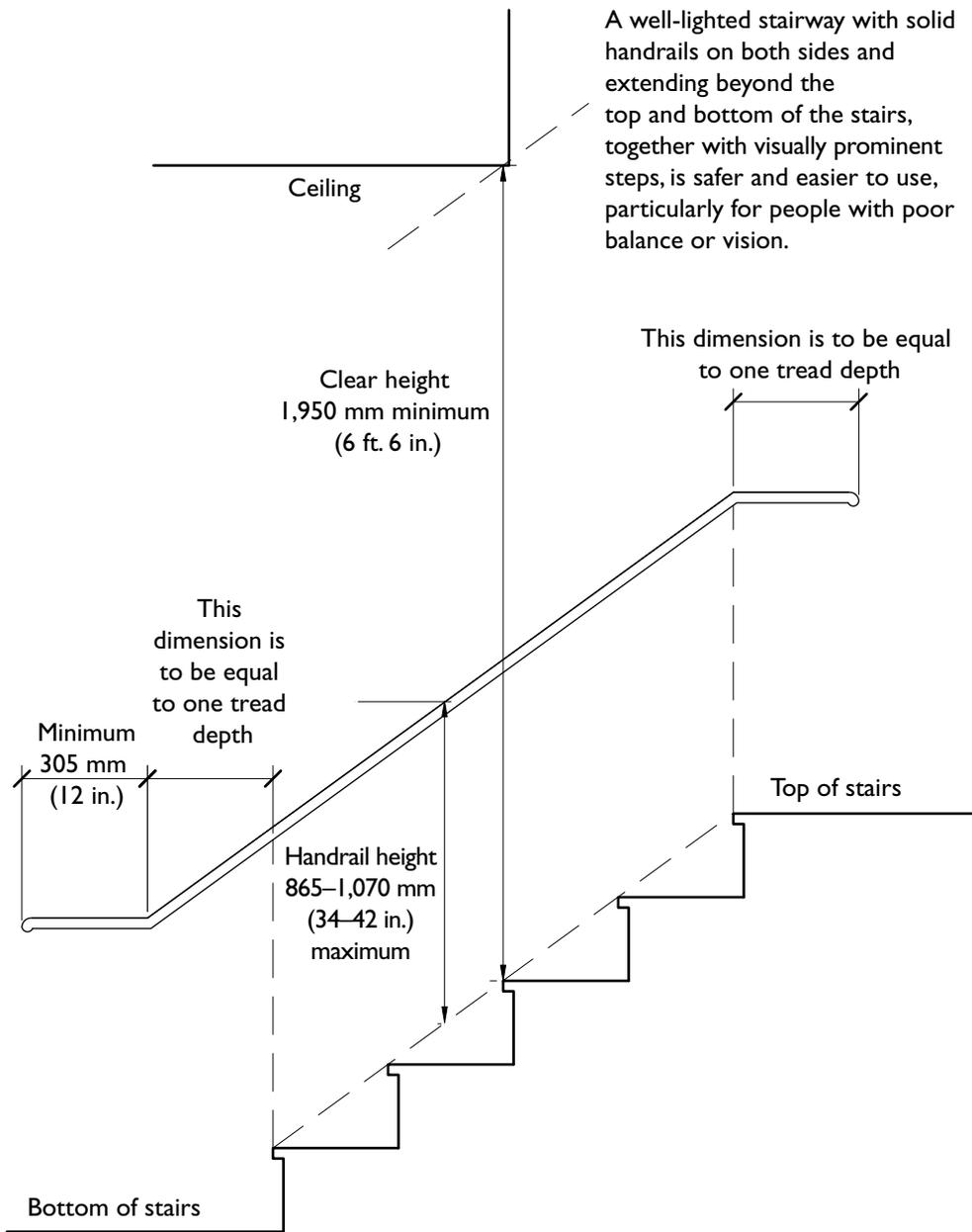


Figure 2: Suggested Dimensions for the Elements of a Stairway

The illustration shows the suggested dimensions for the elements of a stairway including the handrail. The distance between the handrail and the step should be between 865 and 1,070 mm or 34 to 42 inches. The handrail extends beyond the top of the stairs by a distance equal to the dimension of one tread. The handrail extends beyond the bottom of the stairs by a distance equal to the dimension of one tread plus an additional 305 mm or 12 inches. The vertical distance between the stair tread and the lowest point of the ceiling overhead is referred to as the “clear height” and should be a minimum of 1,950 mm or 6 feet, 6 inches.



## CMHC PROGRAMS – FINANCIAL ASSISTANCE

Seniors may be eligible for government assistance with the costs of some of the modifications to the stairway environment. In some areas of the country, funding for renovation programs is provided jointly by the Government of Canada and the provincial or territorial government. In these areas, the provincial or territorial housing agency is generally responsible for the delivery of the program. Program variations may also exist in these jurisdictions.

For information on renovation programs available by jurisdiction, visit the CMHC website:

<http://www.cmhc-schl.gc.ca/en/co/prfinas/index.cfm>

## CMHC PUBLICATIONS

*Maintaining Seniors' Independence Through Home Adaptations:  
A Self-Assessment Guide*

This guide identifies the types of difficulties seniors can experience in their homes and describes adaptations to overcome them. Checklists are provided to help seniors assess their own needs. Each checklist deals with an activity in the home, such as getting in and out of the home, using the bathroom and doing the laundry. The guide will be of interest to seniors, their family members and caregivers.

<http://www.cmhc-schl.gc.ca/odpub/pdf/61087.pdf?fr=1442318489140>

## GLOSSARY

**Flight:** A set of steps between landings in a stairway.

**Handrail:** A railing intended for grasping by the hand and located parallel to, and usually at the side of, the stair. A functional handrail serves several purposes including providing a visual indicator of the stair, assistance with normal balance and, most critically, the only reliable means to arrest a misstep and fall.

**Clear height:** The vertical distance from a straight line tangent to the tread and landing nosings to the lowest point above.

**Landing:** A platform between flights or at the beginning or end of a stairway.

**Nosing:** The front or leading edge of a stair tread. In most home stairs, the nosing projects over the tread below.

**Rise:** The vertical height of a step.

**Riser:** The vertical component of a step. There are two types of risers: closed risers (where the back vertical portion of the step is solid) and open risers (where the back vertical portion of the step is open). Closed risers are preferable because they prevent visual distractions.

**Run:** The horizontal distance measured from nosing to nosing.

**Stair:** A change of elevation consisting of one or more risers or steps.

**Stairway:** Includes stairs, landings, handrails and guards.

**Tread:** The horizontal part of a step.



## ADDITIONAL MATERIALS

### 12 STEPS TO STAIR SAFETY AT HOME

1. **Is there a light switch at the top and bottom of your stairs?**

Install lights and switches to ensure all of your stairways are well lit.

2. **Are all your steps in good repair?**

Make sure there are no uneven surfaces, cracks, bunched-up stair covering or protruding nails.

3. **Are the steps all of the same size and height?**

Have a carpenter correct uneven steps. They are a major hazard.

4. **Are you able to see the edges of the steps clearly?**

Paint a contrasting colour on the edge of wooden or concrete steps (or on the top and bottom steps), or apply special strips you can buy to enhance the visibility of each step.

5. **If you have a covering on your stairs, is it fastened securely?**

Stair carpeting can cause slips. Consider removing it or replacing it with well-secured rubber stair treading.

6. **Is the handrail well attached to the wall and easily grasped?**

Make sure that the handrail is well secured and that you can get your full hand around it.

7. **Is the handrail at a height of 34 to 38 inches (86 to 97 cm)?**

There should be a handrail on at least one side of all stairways. The height should allow you to use it comfortably when your arm is slightly bent at the elbow.

8. **Are your stairs free of clutter?**

Avoid storing things temporarily on your stairs. Always check the stairs as you walk up or down.

9. **Have you removed loose carpets or throw rugs from your stair landings?**

Loose floor coverings are a hazard. If you have rugs make sure they are non-slip or have a rubber backing.

10. **Do you take your time when going up or down the stairs?**

Go slowly with your hand on the handrail. Rushing is a major cause of falls.

11. **Do you make sure your vision isn't blocked as you go up or down your stairs?**

If you're carrying something, make sure it doesn't hide the stairs and that one hand is free to use the handrail.

12. **Do you remove your reading glasses when using stairs?**

Be sure to remove your reading glasses when walking up or down stairs. If you use bifocals, adjust your glasses so you can see the stairs clearly.

From: <http://www.phac-aspc.gc.ca/seniors-aines/publications/public/injury-blessure/steps-escalier/index-eng.php>

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