



Fire Safety in the Home

Universal design

People who inhabit and visit the houses we live in come in all shapes and sizes, ranging in age from infants to seniors, with various ever-changing abilities and skills. As we grow up, grow old and welcome new people into our homes, our housing needs change. A house that is designed and constructed to reflect the principles of universal design will be safer and more accommodating to the diverse range of ages and abilities of the people who live in and visit these homes.

The philosophy of universal design is that your home should be comfortable, pleasant, safe, and usable by everyone in the family, be it your children, you or your spouse, aging parents or a relative with a disability. Planning for fire and emergency situations and minimizing the potential for accidents help ensure that your home and family are safe. A home designed for easy emergency egress is a safe home for everyone.

It is your responsibility to plan for your personal safety.

Effective universal design and construction can only occur when we truly appreciate how persons with disabilities engage the built environment. Universal design is only a subtle shift from what is typically done; designing for greater accessibility then is not a new way of designing, simply a more focused one. By providing flexibility in the selection of design features and incorporating adaptability into home design, the life and usability of a home is extended, which promotes the concept of **aging in place**.

This concept is increasingly popular with families and individuals who choose to stay in their homes and neighbourhoods as they grow and age. Planning for individuals' changing needs and abilities allows for periodic home customization based on changing requirements and reduces the need for future costly renovations.

Planning for future needs is good practice. Principles of universal design encourage flexibility, adaptability, safety and efficiency.

Meeting your needs

People are injured or put at risk every year because they have not taken the time to consider what they will do in an emergency. There are many quick and easy steps that you can take to prevent fires in your home. There are also measures you can take to prepare yourself in the event of a fire or emergency.

Universal design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size and ability. "The Principles of Universal Design" are found on page 12.

Bolded terms throughout this fact sheet are defined in the Glossary on page 9.



Unfortunately, people with disabilities and seniors are more likely to be injured in a fire than other members of the population. This is often because they are unable to exit their home quickly or independently, they cannot hear the alarm or they are not prepared with a fire safety plan.

Consider your needs when confronted with an emergency situation:

- Are you able to hear the fire alarm from all rooms in your house?
- Are you aware of what you should do if a fire occurs?
- Do you have appropriate smoke detectors and fire alarms?
- Are you able to evacuate independently?
- Have you made the necessary arrangements if you need assistance to evacuate?
- Do you and all of your family members know what to do in an emergency?
- Have you made a fire safety plan?
- Do you need backup power for an elevator or a ventilator?
- Are you able to communicate easily during an emergency situation?

Fire safety planning

Seniors and persons with disabilities should be especially aggressive in preparing a fire safety plan. The firefighting and security industry can provide valuable advice.

In emergency situations, first responders will gain access to a home in the most efficient ways possible. If this means breaking down a door, so be it—unless you have a Knox-Box®. This mini-safe works similarly to a lock box that a realtor might use when showing a home. The fire department has a key to the Knox-Box®, which stores your emergency house key inside, allowing them to open a door properly rather than breaking it down.

Consider your abilities

Consider the abilities of your family members and guests and how these abilities may impact their capacity to communicate and evacuate your home in an emergency.

Babies and children rely on adults for their safety. People with temporary disabilities such as broken limbs may not be able to move quickly.

People who are elderly may become less confident and more easily confused. We all experience changes during our lives, some of which may impact the way our fire safety needs are met.

Also consider the type of house you choose to live in. Someone who uses a wheelchair may not want to sleep on the second floor or in a basement. A bungalow-style home is easiest to escape from. If you are quadriplegic or need assistance to exit a home, consider an exterior door in the bedroom.



Install appropriate warning devices

Smoke alarms are necessary features in every home. Your local fire department can advise you on the best types to purchase and where they should be installed.

If you are deaf or hard of hearing, note that smoke and fire alarms are now available with combined audible and visual signals, which will flash a light and make a loud noise. These smoke and fire alarms are suitable for installation throughout your home. It is advisable to install strobe alarms, as they flash more brightly, or use vibrating alarm systems in areas where someone with hearing loss may sleep.

Make your home fire-safe

Consider what materials the home is constructed with. Wood-frame construction is most common in Canada, so it is important to choose fireproof materials to finish exterior walls with, especially exterior walls that are close to other homes. In most jurisdictions, there are fire rating codes; however, we can always build a home that exceeds the minimum requirements of the building code.

Your local fire department and provincial fire marshal's office have information on how to plan for an emergency situation. Standard advice includes:

- always having a fire extinguisher readily available;
- always keeping an eye on the stovetop and keeping a lid nearby;
- keeping stoves and fireplaces tidy and clean;
- keeping fire evacuation routes clear of clutter;
- planning two evacuation routes;
- drawing a floor plan of your home;
- choosing a family meeting place;
- refraining from overloading electrical outlets;
- keeping space heaters away from anything that can burn;
- inspecting electrical cords;
- keeping a working flashlight handy;
- smoking outside;
- not extinguishing cigarettes in potted plants near the home;
- keeping matches and lighters out of reach;
- being vigilant when using candles;
- testing smoke and carbon monoxide alarms; and
- scheduling a home fire drill.



If you have an activity limitation or disability, you may need to take the following extra precautions.

If you have low vision or are blind:

- Keep your cooking area well organized and free of clutter.
- Keep your hallways and corridors clear.
- If you are not able to evacuate independently, carefully consider alternate evacuation strategies, such as a safe holding area or a buddy. (Make sure to inform your buddy of proper guiding techniques.)
- Practise the plan. Make sure that you and your family practise your fire procedure, know the escape routes, and know where the fire safe holding areas are. Practise two escape routes.
- Have a safe place to meet outside.
- Keep the telephone number of your fire department near your telephone. Program the emergency number into your phone. Have a telephone beside your bed.
- Persons who are blind or have visual limitations should have an unobstructed and clearly marked fire route leading to a safe area or fire exit. This route should be practised regularly.

If you have a mobility disability:

- Design your kitchen so that you do not have to reach over the stove.
- Install a fire extinguisher where you can easily reach it.
- Install an electrical outlet at the front of the counter for easy access.
- Sleep on the ground floor.

If you are deaf, deafened or hard of hearing:

- Phone the fire department from a safe place.
- Make sure your 9-1-1 centre has and can use a TTY. If there is no 9-1-1 service in your area, make sure your fire department has and can use a TTY. Many persons who are deaf or hard of hearing now use text messaging with phones, and even 9-1-1 is now changing to meet the “text” need.
- Program the emergency number into your telephone and program your TTY to send a message to the fire department. Have a telephone beside your bed.
- Develop a fire safety strategy to warn you of smoke or fire, such as a visual alarm in your home, visual alarms or a vibrating pager at work and a vibrating pillow or flashing strobe light to wake you up.
- Make sure your home is equipped with smoke detectors with visual alarms.

If you have a poor memory or a cognitive limitation:

- Keep the telephone number for emergencies (often 9-1-1) or the fire department stored in your telephone.
- Prepare your fire safety plan, write it down and keep it where you can find it in an emergency.



Home fire sprinklers

Because fire sprinkler systems react so quickly, they can dramatically reduce the heat, flames and smoke produced in a fire. Fire sprinklers have been around for more than a century, protecting commercial and industrial properties and public buildings. What many people do not realize is that the same life-saving technology is also available for single-family homes.

A **home fire sprinkler system** works automatically at the earliest stage of fire growth, controlling the flames before they can build deadly heat and smoke. This gives families the time they need to safely escape—even very young children and older adults who may not be able to get out on their own—and limits the extent of damage to a single area of the home.

Automatic sprinklers are highly effective and reliable elements for fire protection in buildings. They greatly increase a resident's chance of survival.

Home fire sprinklers can control and may even extinguish a fire in less time than it would take the fire department to arrive on the scene.

Only the sprinkler closest to the fire will activate, spraying water directly on the fire. The cost of installing home fire sprinklers averages \$3.00 per sprinklered square foot. For example, a 1,000-square-foot bungalow with a basement needs 2,000 square feet of sprinklered space (it is never a good idea to only sprinkler one floor), which represents a total cost of \$6,000 (2,000 sq. ft. x \$3.00). Costs are a little bit more for home renovations. Residential fire sprinkler system installations are increasing every day thanks to growing buyer demand, lower costs and simpler installation.

The water supply for the sprinklers comes from the household water main (see figure 1). The city waterline will need to be large enough to feed the sprinkler system. When this becomes difficult or expensive to do, a large water storage tank can be installed in the home (see figure 2).

Plan to communicate

It is important to know in advance whom to contact in an emergency situation, and how you are going to contact them. Nearly all areas in Canada are now served by 9-1-1 emergency telephone assistance that connects directly with fire, ambulance and police services. However, if you do not have 9-1-1 service, post the emergency telephone numbers for the fire department near the phone. If you have difficulty dialling the telephone number, you may wish to consider purchasing a telephone with memory that allows you to pre-program numbers. Some telephones also have automated voice dialling features that enable you to dial using your voice if the number is programmed into the phone.

Sometimes in an emergency situation, it is more difficult to communicate quickly and efficiently. People who might have difficulties explaining details of an emergency or have speech impairments may need more time and should consider having a pre-recorded emergency message with their name and address. It is always a good idea to plan ahead. Pre-programmed telephones and portable



Figure 1: Water supply for sprinklers
Photo by Ron Wickman



Figure 2: Water storage tank in a home
Photo by Ron Wickman



telephones are helpful, as is a **home automation system** that automatically calls the fire department if the smoke alarm is activated. See *CMHC's Accessible Housing by Design—Home Automation* for more information.

Some telephones feature emergency call buttons. People who are hard of hearing should have telephones with sound amplification in all locations of their homes. People who are deaf or have trouble speaking should have a text telephone, a teletypewriter (TTY) or a text messaging system that will enable them to type their message or send a pre-programmed message to the 9-1-1 centre in the event of an emergency. Contact your local fire department to confirm procedures for TTY calls. Call the administrative number, not the emergency number, to inquire.

People with cognitive impairment may benefit from having a phone that allows photographs to be associated with numbers. Older people who need emergency communication in the event of a fall or emergency should consider obtaining a **personal monitoring system**, whereby they can press a button on a wireless pendant or bracelet to summon help. This is especially useful for older people who live alone.

Plan your evacuation routes

Evacuation is the most common fire safety strategy. It is important to plan your escape routes in advance of an emergency situation. Everyone must leave the home, including people with activity limitations. No single evacuation technique is suitable for everyone—people requiring assistance differ in their needs, capabilities, and endurance and tolerance levels. Before there is an emergency, you need to think about your abilities and limitations in terms of your ability to evacuate.

Your evacuation strategy should consider whether you live alone, whether there is help close by, what kind of home you live in and the degree of independence and mobility you have. The evacuation plan should be developed in co-operation with your family, friends and neighbours, including people with activity limitations.

Having at least two escape routes ensures that you will always be able to get out of your home safely (see figure 3). The routes should be located away from each other to ensure that at least one is usable in the event of a fire. One should be the main accessible entrance. The other should be an **accessible evacuation route** with elements that meet your individual needs, such as handrails or a ramp.

If you have a residential lift in your home, you should check to see if it can be used in an emergency situation. Also check whether it is possible to operate it with backup power in the event of a power failure. See CMHC's fact sheet *Accessible Housing by Design—Lifts and Residential Elevators* for more information.

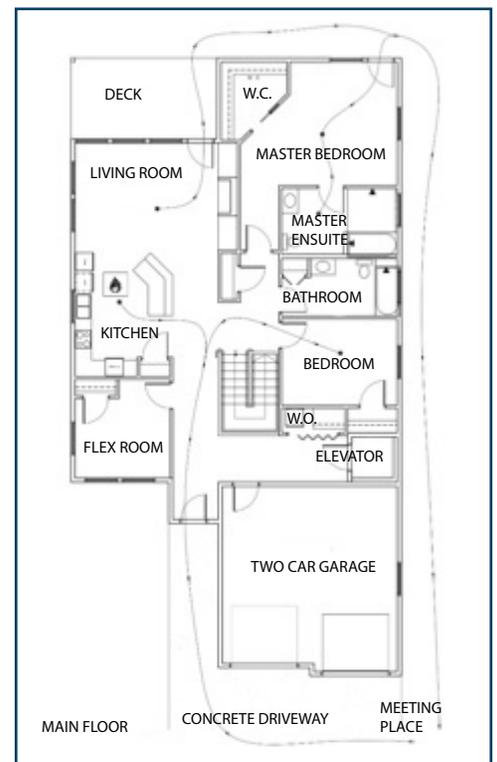


Figure 3: Fire evacuation routes
Diagram by Ron Wickman, Architect



Practise evacuating

Everyone should practise how they will evacuate their home in an emergency situation. It just makes sense. Make it an annual event as family members grow up, get older and welcome new members.

Discuss all aspects of your **evacuation plan**, including a meeting place outside of your home.

Strategies for evacuating your home

- Get out quickly and safely. When the smoke alarm sounds, immediately start your escape. Do not try to gather possessions or pets.
- Check the door. Stay low behind the door, reach up and feel the door and the door handle for heat.
- If the door feels cool, brace yourself against the door and open it slowly. If it is safe, leave the building and go directly to your meeting place. If you encounter smoke, crawl low under the smoke. Once you are out of the building, stay out. There is nothing more important in your house than you and your family. Go to the meeting place to make sure everyone is safe. Phone 9-1-1 or your local emergency number from a neighbour's house.
- If the door feels warm or you see smoke or flames on the other side of the door, shut the door, and use your second escape route. If you must escape from an upper storey window of a multi-level home, make sure you have a safe way to reach the ground, such as a fire escape ladder.
- If you are trapped, seal the openings around the door and vents with bedding or towels. Call 9-1-1 or your local emergency number and notify the fire department of your location. If it is safe to open a window and there is no smoke, open it to signal and yell for help.

If you are a person with an activity limitation and can walk, but cannot evacuate at the same rate as everyone else, your local fire department may advise you to wait until the majority of people have evacuated and then proceed. If you are not able to evacuate independently, you should consider how you will obtain assistance.

Some possible evacuation strategies are outlined below.

The “buddy system”

The “buddy system” matches an individual with family, friends or neighbours who volunteer to provide assistance in an emergency. Each person should have at least one or two backup “buddies” who will be available in emergency situations.

When there is an emergency situation, it is the responsibility of the person and the buddy to meet at a pre-arranged location. Depending on the nature of the emergency and location of the fire, the fire department or even the buddy may be responsible for assisting in an evacuation.

The “buddy system” is suggested for people with a wide variety of disabilities, as well as seniors and people with agility limitations.



Guiding

If you are elderly or have a slight agility or mobility limitation, or you are blind, you may wish to be guided out of your home.

Assistive and support techniques work well for people who have a mobility or agility limitation and require the arm of someone for stability. Your assistant may prefer to take your arm, providing additional balance and support to you. If you have crutches, a cane or walker, be sure that your guide or assistant brings them along when you evacuate.

If you are blind or visually impaired, good communication about how you wish to be guided is advised. This relates to what is termed as conducting oneself as “a sighted guide.” The sighted person should always lead and lend their arm as a true guide (one is actually guiding the person, and not directing the person). What is standard is how the person who is blind takes the sighted person’s arm and is able to follow the motions of the person’s body. The sighted person is always half a step ahead (and to the side, of course) as the two walk along any passageway. Then, if the two are walking through a narrow passageway, the person who is blind can step behind, switching arms or tagging onto the person’s back and walking behind until both reach an area where they can walk side by side again.

Also, the sighted guide can verbally describe the various barriers or built situations that one is approaching (“four stairs going down”—always important to describe either up or down—or “door opening toward us to the left”). However, persons who are blind with experience often do not need this, as they have the motion of the sighted guide who is walking half a step ahead and hence can follow the motion of the person’s body.

Using a wheelchair for stair evacuation

If you use a wheelchair and prefer to remain in your wheelchair, this may be the easiest evacuation method. However, this option is not practical with a person who uses a power wheelchair or scooter as it is too heavy and awkward.

If you wish to use your wheelchair as an evacuation device, it is extremely important to practise the technique you will use and to participate in drills with those who will be assisting you.

No one should attempt to carry a person on stairs, even as part of a team, unless they are sure that they can hold the weight of the person and the wheelchair. One person should be positioned at the back of the wheelchair and at least one other person should be at the front of the wheelchair. When tilting the wheelchair back, the person at the back should grasp the handles and tip the wheelchair slightly backward.

The person who will be guiding and supporting at the front of the wheelchair should grasp the parts that are securely attached to the main frame.

Good communication between the user in the wheelchair and the assistants will involve discussing which parts of the wheelchair are the safest to grasp as many parts of a wheelchair are removable.



Assistive devices for evacuation

If you have an agility or mobility limitation but do not use a wheelchair, if you do not feel safe using your wheelchair during an evacuation or if you use a power wheelchair or scooter, you may need to consider using an assistive device such as a **personal monitoring system** or an evacuation device. Some evacuation devices are designed to be used on stairs.

Transferring and carrying techniques

If you are unable to evacuate independently and do not have access to an assistive evacuation device, the person providing assistance may have to carry you. There are several lifts and carries that can be used.

A one-person assist should be used only in an extreme emergency, as a one-person carry may injure a person with a disability or a person such as a senior who may be more fragile; however, in an emergency it may be the only option available. The piggyback lift is frequently preferred, unless the person to be rescued has no arm strength or is very light and another lift can be accomplished more easily.

The cradle lift is preferred for small or light persons, and while it is often favoured in an emergency evacuation, it can be difficult and risky for the rescuer.

The blanket drag is easy to do in homes that are on one level. It is simple to do and requires only a blanket. The rescuer positions the person on a blanket and pulls the person along the floor surface.

In accessible home design, it is a good idea to consult with a professional, such as an occupational therapist. It also helps to consult with an architect, an interior designer or another design professional who is familiar with the design of accessible residences. During the design, work with the designer and occupational therapist to determine the most positive home layout and best strategies for fire safety.

Glossary

Accessible evacuation route: A route that is accessible and easy to use for people with activity limitations. It is flat and stable and has no stairs or steps.

Aging in place: The ability to remain in one's home safely, independently and comfortably, regardless of age, income or ability level throughout one's changing lifetime.

Evacuation plan: A plan for an emergency situation that you have practised to ensure your safety and that has at least two egress routes.

Home automation system: A system that can be used to control certain elements of your home environment, including lighting, mechanical systems, home security, entry system, appliances, telephones, computer systems and safety systems.

Home fire sprinkler system: A residential fire sprinkler system that typically operates off the household water main and uses piping that is installed behind walls and ceilings in finished areas.

Personal monitoring system: A system that enables users to notify an emergency monitoring company or emergency contact person of their emergency situation through the use of a one-touch button pendant or wristband.



Additional resources

Books

Barrier Free Environments Inc. *The Accessible Housing Design File*. New York: John Wiley & Sons, 1991.

Behar, S., and C. Leibrock. *Beautiful Barrier-Free: A Visual Guide to Accessibility*. New York: Van Nostrand Reinhold, 1993.

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Pierce, Deborah. *The Accessible Home: Designing for All Ages and Abilities*. Newtown, CT: The Taunton Press, 2012.

Province of Ontario. *Emergency Preparedness Guide for People with Disabilities/Special Needs*. ON, Canada: Queen's Printer for Ontario, retrieved December 15, 2009, from http://www.redcross.ca/cmslib/general/emergency_preparedness_guideforpeople_with_disabilities_special_needs.pdf

Richardson, K. *Fire Safety in High-Rise Apartment Buildings*. Ottawa, ON, Canada: Ontario Association of Architects and CMHC, 2009.

Wylde, Margaret, Adrian Baron-Robins, and Sam Clark. *Building for a Lifetime: The Design and Construction of Fully Accessible Homes*. Newtown, CT: The Taunton Press, 1994.



Websites

Fire Marshal's Public Fire Safety Council (May 2016)

www.firesafetycouncil.com

National Fire Protection Association (May 2016)

<http://www.nfpa.org/safety-information/for-consumers/populations/people-with-disabilities>

Office of the Fire Marshal of Ontario (May 2016)

http://www.mcscs.jus.gov.on.ca/english/FireMarshal/OFMLanding/OFM_main.html

U.S. Fire Administration—Fire Safety for People with Disabilities (May 2016)

<https://www.usfa.fema.gov/prevention/outreach/disabilities.html>

NC State University: College of Design (May 2016)

<http://www.design.ncsu.edu>

Home for Life (May 2016)

<http://www.homeforlife.ca/>

Institute for Human Centered Design (May 2016)

<http://humancentereddesign.org/>

Livable Housing Australia (May 2016)

<http://livablehousingaustralia.org.au/>

Home Fire Sprinkler Coalition (May 2016)

www.homefiresprinkler.org



The Principles of Universal Design

Principle 1: Equitable use

This principle focuses on providing equitable access for everyone in an integrated and dignified manner. It implies that the design is appealing to everyone and provides an equal level of safety for all users.

Principle 2: Flexibility in use

This principle implies that the design of the house or product has been developed considering a wide range of individual preferences and abilities throughout the life cycle of the occupants.

Principle 3: Simple and intuitive

The layout and design of the home and devices should be easy to understand, regardless of the user's experience or cognitive ability. This principle requires that design elements be simple and work intuitively.

Principle 4: Perceptible information

The provision of information using a combination of different modes, whether using visual, audible or tactile methods, will ensure that everyone is able to use the elements of the home safely and effectively. Principle 4 encourages the provision of information through some of our senses—sight, hearing and touch—when interacting with our home environment.

Principle 5: Tolerance for error

This principle incorporates a tolerance for error, minimizing the potential for unintended results. This implies design considerations that include fail-safe features and gives thought to how all users may use the space or product safely.

Principle 6: Low physical effort

This principle deals with limiting the strength, stamina and dexterity required to access spaces or use controls and products.

Principle 7: Size and space for approach and use

This principle focuses on the amount of room needed to access space, equipment and controls. This includes designing for the appropriate size and space so that all family members and visitors can safely reach, see and operate all elements of the home.

