



## House Designs and Floor Plans

### Universal design

People who inhabit and visit the houses we live in come in all shapes and sizes, ranging 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.

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 house 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.

Home is the place where we all have choice, control, dignity and privacy and where we can socialize, entertain and welcome. We can take pride in owning such a home.

Universal house design is design that will accommodate everyone, including people with disabilities. Universal housing includes houses that are minimally accessible, houses that can easily be made accessible at a later date, and houses that are completely accessible with power door openers, large bathrooms, and so on. Here are some of the most common types of accessible house designs.

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 16.

**Bolded** terms throughout this fact sheet are defined in the Glossary on page 14.



## Visitable

A visitable house includes basic accessibility features that allow most people to visit, even if they use a wheeled mobility device. Three basic features make up a **visitable home**; they include a level no-step entry (either ramped or ground level), wider doors throughout the entrance level (see figure 1) and a minimum half bathroom (toilet and sink) on the main floor that is accessible to a user in a wheelchair.

The concept of visitability was first introduced in North America in 1986 by Eleanor Smith and a group of advocates for people with physical disabilities. The vision of the visitability movement was to create an inclusive community where people with mobility limitations could visit their families, friends and neighbours without barriers. Eleanor Smith is well known for the following quote: “When someone builds a home, they’re not just building it for themselves—that home’s going to be around for 100 years. [Accessible entrances] hurt nobody—and they help a lot of other people.”

## Adaptable

An adaptable house is one that can easily accommodate change and a variety of family types. It is also designed to be adapted economically at a later date to accommodate someone with a disability. Features include removable cupboards in a kitchen or bathroom to create knee space for someone in a wheelchair, or a knock-out floor panel in a closet to allow installation of an elevator, or a set of stairs designed to accommodate a future stair lift (see figure 2). This approach is also known as **FlexHousing™**.

## Accessible

An accessible house includes features that meet the needs of a person with a disability. Most accessible houses have open turning spaces within rooms, wheel-in shower areas and kitchen work surfaces with knee space below (see figure 3).

## Universal

Universal house design recognizes that everyone who uses a house is different and comes with different abilities that change over time. Universal design affords all persons the same choices for using the built environment. Features include lever door handles that everyone



Figure 1: Visitable home complete with no-step entrance  
Photo by Ron Wickman

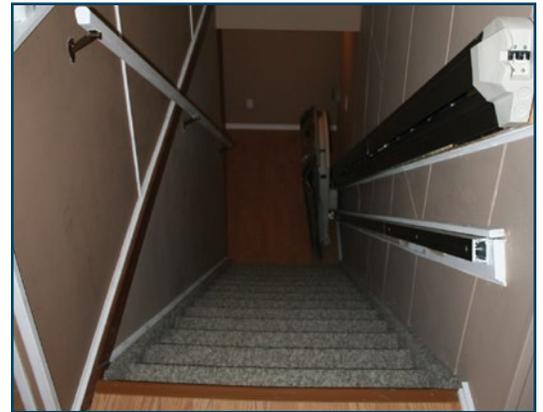


Figure 2: Adaptable home with stairway that is a straight run and that can accommodate a stair platform lift  
Photo by Ron Wickman



Figure 3: Accessible home complete with two levels of kitchen counters  
Photo by Ron Wickman



can use (see figure 4), enhanced lighting levels to make it as easy as possible to see, stairways that feature handrails that are easy to grasp, and easy-to-use appliances.

### Assessing your needs

First, think of why you are interested in making your house more accessible and what is required to successfully complete your accessible housing design project. First-time homebuyers of smaller homes should consider visitability and adaptable design. It should be noted that it is difficult to make accessible and universal homes affordable for first-time homebuyers, because these homes need to be slightly larger.

### Planning for emergencies

The design of an accessible home, whether it is a renovation or a new construction, should take into account the need to evacuate in an emergency. At least one accessible exit should be available from each floor level. An accessible exit on the ground floor level would likely be an exterior door; on an upper or a lower level, an **area of refuge** such as a balcony or exterior patio should be considered. (See the fact sheet *Accessible Housing by Design—Fire Safety in the Home*.)

A good starting point is listing what works well for you and your family in your existing home and what does not. Although targeted more specifically at the needs of seniors, the checklist provided in CMHC's *Maintaining Seniors' Independence Through Home Adaptations: A Self-Assessment Guide* can help all family members identify problem areas. On the basis of your list, decide what are the key elements of your accessibility improvement project. Working from big issues down to smaller details will help you, and the designer or contractor you are working with, to clearly understand the design requirements of your project.

For example, using the kitchen sink might be identified as a problem. The reasons could be many—no knee space below the sink for someone who uses a wheelchair, a faucet too far away from the front of the sink for a person of shorter stature or a person using a wheelchair to reach, a faucet that is difficult to grasp and turn, a sink too deep to reach the bottom, or not enough space in front of the sink to “park” a wheelchair. The more specific you can be about why the sink is not usable, the easier it will be to design a solution.

Once you have developed a comprehensive list of your needs, it is time to assess how to best meet those needs. Are there technologies available to address the problems? Is there a need for personal assistance or attendant care? Would the problems be alleviated by redesigning your house?

A homeowner can tackle a simple design project, such as regrading a front yard to provide level entry into the house or relocating a vanity to create more space in a bathroom. More complex projects will likely require the services of a design professional, such as an architect, interior designer, architectural technologist or homebuilder.



Figure 4: Universal home complete with lever door handles on all doors  
Photo by Ron Wickman



## Where to start

Some homes are simply easier to modify for accessibility than others. There are three key areas that will best help to determine the degree of difficulty, and obviously cost, for an accessible retrofit.

1. The home entrance
2. Vertical circulation within the home
3. The bathroom

### The home entrance

It is best to look for a home where the main floor is as close as possible to the ground level. If the main floor is even two or three feet above ground level, which is normal in Canada, a rather long ramp will be required (see figure 5). The alternative to this is a mechanical vertical lift to substitute for a ramp. The problem with either of these solutions is that, often, space does not allow for easy installation. Not only that, both are costly items and often difficult to blend esthetically with the existing building. If the budget allows for an addition to the home and an elevator becomes an option, then a split-level or two-storey home could be considered.

### Vertical circulation within the home

This is the first issue to deal with once inside an existing home. For a bungalow, look for a straight run of stairs from the main floor to the basement; a 915-mm (36-in.) wide staircase is typically wide enough. At least 1,500x1,500 mm (59x59 in.) of space should be at the top of the stairs and at least 1,500x2,400 mm (59x96 in.) of space should be at the bottom of the stairs. This will allow for the installation of a wheelchair-accessible stair platform lift (see figure 6). Homes with sunken living rooms or four-level split homes are also very difficult to work with. Split-level homes, however, as well as two-storey homes or larger bungalows, may allow for the installation of an elevator. But keep in mind that few existing homes were ever planned around the need for a future elevator. Finding an effective location within an existing home for an elevator may be very difficult and very costly. Again, if the budget allows for an addition to the house, an elevator may be a very good option.

### The bathroom

If an existing bathroom is too small for individuals in wheelchairs, then major modifications are often required. Constructing a larger accessible bathroom requires plumbing, electrical and often structural changes. It also means that other spaces, such as bedrooms, are compromised to make room for the larger bathroom. Sometimes there is simply no space to allow for this to happen. One good option for a smaller bathroom is to remove the bathtub and convert it into a shower area; this shower area then would become the turning space for someone in a wheelchair (see figure 7).



Figure 5: Single-family home complete with a long ramp leading to the front door  
*Photo by Ron Wickman*



Figure 6: Straight run of stairs complete with stair platform lift  
*Photo by Ron Wickman*



Figure 7: Wet room bathroom complete with curbless shower  
*Photo by Ron Wickman*



## What are the options?

When extensive accessibility improvements are required, the question often arises whether it is better to renovate or build a new, custom-designed home. Unfortunately, there is no simple answer. Another option is to find an already accessible home. Although there are some builders and developers beginning to include accessibility features, there is still very little choice out there.

Many factors can determine the feasibility of either strategy. They include the location of structural walls within an existing house, the available space on a lot for constructing an addition, how often existing spaces in the house are used, and the availability of a serviced lot to build a new home.

The feasibility and effectiveness of renovation versus new construction is one area where you should call on a qualified design professional to investigate and determine costs.

### Pre-designed accessible housing

There are few sources of pre-designed accessible housing available in Canada today. However, some builders are starting to realize that there is a potential market for accessible housing that incorporates some universal features, such as larger bathrooms complete with curbless shower areas, and can accommodate “add on” accessibility features, such as residential elevators and extra-wide garages. Other evolving trends in new house design include housing that is visitable and housing that supports aging in place (see figure 8). Your local and provincial homebuilders’ associations should be able to direct you to local builders who offer accessible design housing choices.

In many provinces, public housing corporations typically provide a percentage of accessible housing units in their developments. Similarly, non-profit housing associations and housing co-operatives often include accessible units. Check with your municipality for public, non-profit and co-operative housing projects.

### Altering a builder’s plan

Another strategy for achieving appropriate accessible housing is to find a builder who offers house styles that can be adapted to include accessibility features before construction. Changes, such as wider doors, lever door hardware instead of knobs and regrading to avoid steps at the front door, are often easy and inexpensive. Some builders allow purchasers to customize the interior layout of their base models. Widening hallways, enlarging foyers (see figure 9), reorganizing bathroom layouts, and so on, can improve accessibility.



Figure 8: Visitable home complete with a no-step entrance  
Photo by Ron Wickman



Figure 9: Accessible home complete with large entrance foyer and large change bench  
Photo by Ron Wickman



### Custom-designed accessible housing

If you are considering a custom-designed accessible home, you should use a design professional who is knowledgeable and experienced in the design of accessible homes (see figure 10). It is also a good idea to involve an occupational therapist in the design process to help you determine your current functional needs and provide guidance on future requirements.

Finding a designer who is experienced in accessibility issues can often be a challenge. Possible sources of information include local architect and interior design associations, some disability support organizations and searches on the Internet (see “Additional resources” on page 14). Be sure to do your research, interview a short list of potential designers and ask for—and check—references.



Figure 10: Custom-designed accessible home  
Photo by Ron Wickman

### Case studies

Case studies of accessible house designs are provided on the following pages. Each case study provides details on the type of house, the profile of its residents and the design features that make the house “visitable,” “adaptable,” “accessible” or “universal.” In each scenario, design features are a direct reflection on the present and future accessible design needs of the residents.

### The visitable house

#### House profile

This two-storey house with a basement features open living spaces on the main floor, as well as a home office and a visitable powder room. Stair access is provided to the upper level, which incorporates four bedrooms, a bathroom and ensuite (see figure 11).

#### Resident profile

The residents are Mr. and Mrs. Singh and their three teenage sons. The family entertains a lot and frequently has visits from the Singh grandparents.

#### Features

The main floor of the house is designed to be visitable by everyone in the family, including their aging grandparents. Specific features include:

- a no-step, level entry at the main entrance;
- doors and other openings throughout the main floor that are at least 915 mm (36 in.) in width;

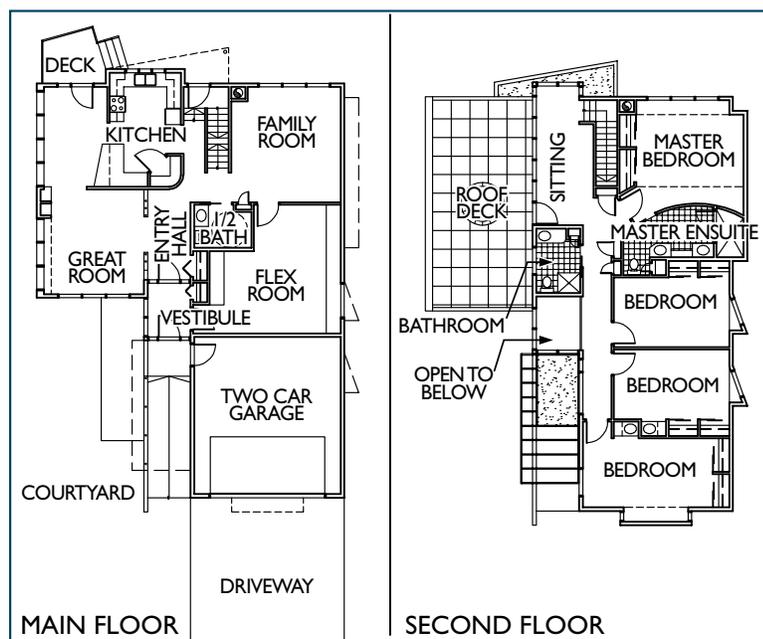


Figure 11: Main- and second-floor plans of a visitable home  
Diagram by Ron Wickman, Architect



- wider hallways throughout the main floor to reach all of the living spaces, as well as the main-floor bathroom; and
- a main-floor bathroom that is large enough to accommodate a person using a device, such as a walker, a wheelchair or a scooter.

## The adaptable house

### House profile

This house has been designed for an empty-nester couple who do not want to ever move again. The three-level home sits on a narrow lot and comes with an attached car garage at the front and a walkout basement (see figure 12).

Adaptable housing incorporates CMHC's FlexHousing™ guidelines, which allow homeowners to adapt the interior space of their homes more economically.

The original house was designed to be easily and inexpensively subdivided into two units by having a secondary suite in the walkout basement. A two-unit configuration may make the home more affordable, by allowing the homeowners to supplement their income by renting out part of the home. Alternatively, it could allow people who require a significant amount of personal care assistance to remain in their home by providing caregivers with rental accommodation in exchange for personal care assistance.

Note: Remember to check local zoning bylaws before subdividing a single-family residence.

### Resident profile

The same family as in the visitable house case study, but later in life, now live in a new home. The three sons now live in different cities. Mr. Singh is having some difficulty walking—he now uses a walker but may eventually need to use a wheelchair.

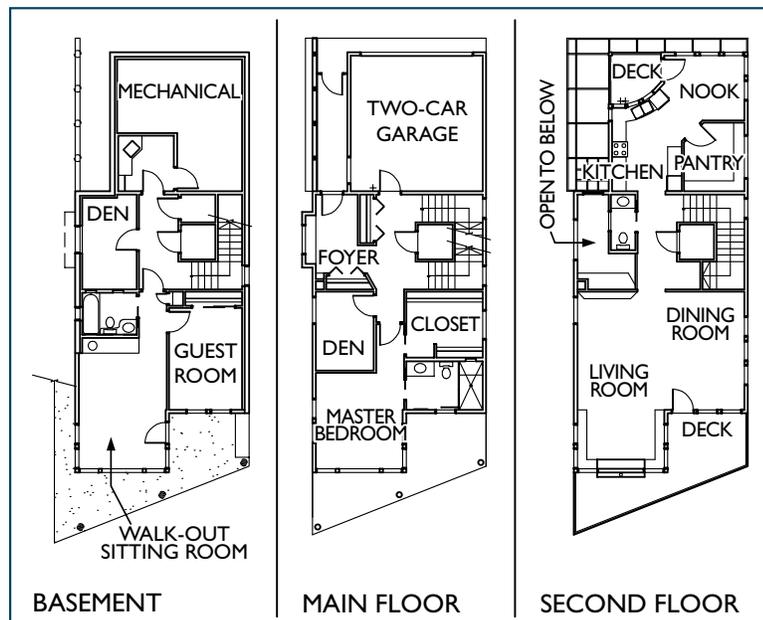


Figure 12: Basement and main- and second-floor plans of an adaptable home

Diagram by Ron Wickman, Architect



## Features

The main and second floors are occupied by Mr. and Mrs. Singh. The lower floor is rented out to supplement the couple's pension income. The tenants, Mr. and Mrs. Wong, have a baby. Mrs. Wong is a stay-at-home mom and supplements the family income by providing housekeeping and care assistance to Mr. and Mrs. Singh. Adaptable house features include:

- a level no-step entry at the main entrance;
- a garage floor that is level with the main floor;
- a secondary two-bedroom unit on the lower level;
- secure entrances for both living units;
- a residential elevator to access all levels of the home;
- an accessible bedroom on the main floor;
- accessible floor finishes;
- wider hallways;
- doors with lever hardware that are 915 mm (36 in.) wide;
- a wheelchair-accessible kitchen;
- a wheelchair-accessible bathroom;
- an emergency exit to an exterior area of refuge at the rear deck;
- lower switches and controls, and higher electrical outlets throughout; and
- rocker-style light switches.

## The accessible house: renovation

### Existing house profile

This is a two-storey, three-bedroom house with a detached two-car garage. The house features a large covered porch at the front, and a sunroom and deck at the rear. The main floor includes open plan living spaces, kitchen, dining room and bathroom. The second floor houses three bedrooms and two bathrooms (see figure 13).

### Resident profile

The house is owned by Simon Jones and his partner Colin Chow, a couple in their late 60s. Simon was recently injured in an accident and now uses a manual wheelchair.

Since his accident, Simon has been restricted to the main floor of his home. The sleeping area, bathroom and hallways are small and inaccessible, and there is no space for the exercise equipment that Simon requires for rehabilitation. Simon also requires personal care assistance 24 hours a day.

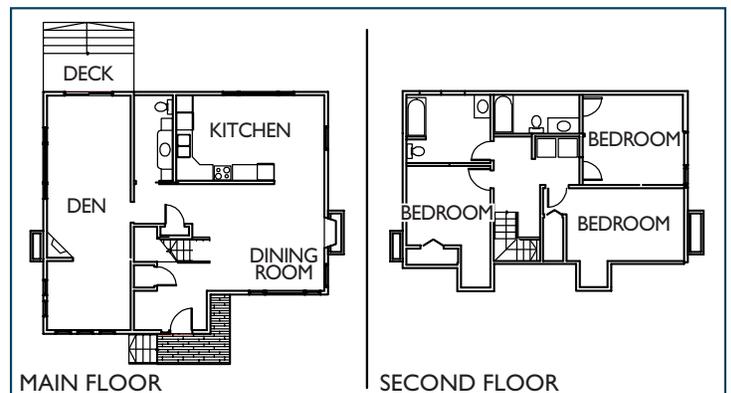


Figure 13: Existing home floor plans before the accessibility renovations

Diagram by Ron Wickman, Architect



### Assessing your needs

The assessment of client needs, a critical part of the design process, showed that Mr. Jones required an 1,800-mm (71-in.) diameter turning space for his wheelchair—which is larger than the typical wheelchair turning space specified by most accessibility codes and standards. If you use assistive equipment such as a walker, a wheelchair or a scooter, be sure to measure the space you need, and design accordingly.

With an intensive addition to the back of the home and complete revamping of all the floor levels, the project was as much a new build as a renovation. The renovation reorganized the main- and second-floor spaces to make them wheelchair-accessible and installed a residential elevator for access to all levels of the home. An exterior balcony was added to the second floor as an area of refuge, which can be used in case of fire (see figure 14).

Other significant changes included creating an accessible back entrance, altering the interior to make the main-floor hallway more accessible, incorporating a wheelchair-accessible bathroom and kitchen, creating a large accessible master suite on the second floor and providing a separate space for a personal care attendant. Specific features include:

- a level no-step entry at front door;
- an 1,800-mm (71-in.) diameter wheelchair turning space at critical locations throughout the house;
- an accessible kitchen with:
  - lowered counters,
  - dishwasher drawer,
  - countertop-mounted cooktop with open knee space underneath,
  - wall-mounted oven with side-hinged door and pullout shelf below,
  - shallow sink with knee space below, accessible faucet and insulated hot water pipes and drainline, and
  - accessible appliances such as a wall oven and cooktop,
- doors that are 915 mm (36 in.) wide and come complete with lever-type hardware;
- an accessible second-floor laundry area with raised washer and dryer with front-mounted controls;
- an accessible powder room on the main floor;
- a three-stop residential elevator;
- ceramic tile and hardwood floor finishes;
- a caregiver’s room and three-piece bathroom;
- a secondary exit from the ground floor to the deck at the rear of the house;

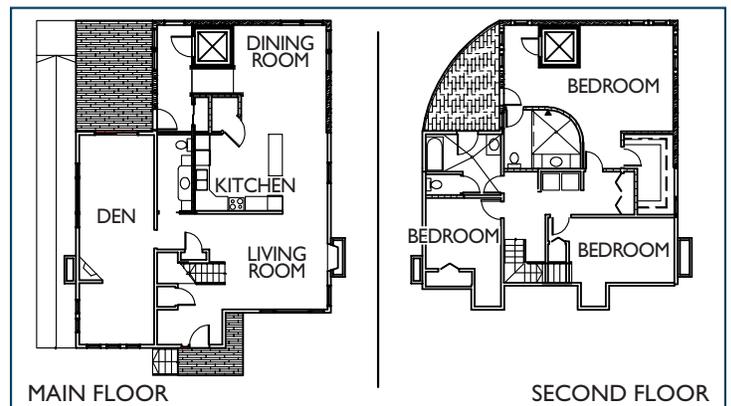


Figure 14: Main- and second-floor plans of home after the accessibility renovations  
Diagram by Ron Wickman, Architect



- an exit on the second floor to an exterior area of refuge;
- a wired-in, interlinked smoke detector system;
- a carbon monoxide alarm system;
- electrical outlets, switches and controls mounted 400 to 1,200 mm (16 to 47 in.) above the floor that are easy to operate using one hand;
- an accessible second-floor suite incorporating sleeping, exercise and work areas; and
- an accessible second-floor bathroom with:
  - raised toilet fixture,
  - curbless shower area with accessible controls and shower head on a flexible hose,
  - vanity with knee space and accessible faucet, and
  - grab bars for toilet and shower area.

## The accessible house: new construction

### House profile

This is a newly constructed, three-bedroom bungalow with a basement and an attached two-car garage. The open plan main floor includes three bedrooms, two bathrooms and a laundry area (see figure 15).

### Resident profile

Jenny Giocametti is a successful lawyer in her early 30s who lives in her own home. She rents one of the bedrooms to a tenant. Jenny can stand and walk short distances but generally uses a scooter for mobility. She drives a converted minivan, which is equipped with a side lift for her scooter. Jenny has contracted with a builder to construct her house from the floor plan of an accessible home she found on the Internet.

### Features

Jenny worked with the builder to customize the design to meet her specific needs. The customized features include:

- a no-step level front entrance;
- a garage floor that is level with the main floor;
- a kitchen that incorporates work surfaces for both standing and seated use—Jenny prefers to stand for kitchen activities but can become fatigued at times, requiring the use of her scooter;
- a kitchen that maximizes storage options within Jenny’s reach. Storage cupboards feature pullout shelves to make it easier to reach items;

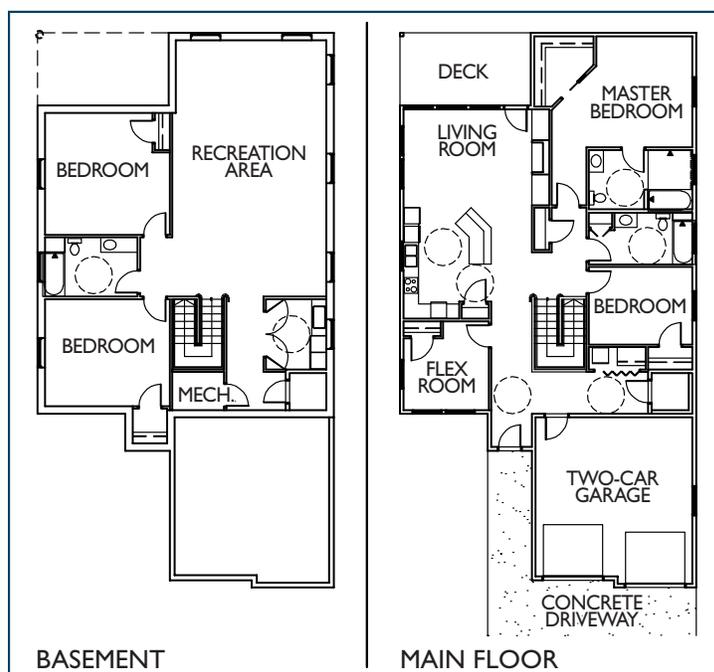


Figure 15: Basement and main-floor plans of an accessible home  
Diagram by Ron Wickman, Architect



- lower windows to provide unobstructed viewing from a seated position;
- raised, front-loading laundry appliances;
- a two-stop residential elevator; and
- an accessible main floor bathroom with:
  - a raised toilet fixture,
  - a curbless shower area with accessible controls and shower head on a flexible hose,
  - a vanity with knee space and accessible faucet, and
  - grab bars for toilet and shower area.

To reduce fatigue and conserve energy, Jenny also installed a central environmental control system that allows her to control her environment from a central panel located in the living room. She can control lights, wall outlets and the thermostat, as well as the TV and the entertainment system. The system also incorporates a video connection to the main entrance, to allow Jenny to remotely answer and unlock the door (see the fact sheet *Accessible Housing by Design—Home Automation*).

## The universal garden suite

### House profile

This is a modest, single-storey secondary unit, built as a separate house on a lot with an existing house (see CMHC’s fact sheet *About Your House “Garden Suites”*). The suite features an open living area, two bedrooms and a bathroom with integrated laundry facilities (see figure 16).

### Resident profile

Mrs. Rafsanjani, a woman in her 70s, lives in the universal garden suite, which is located at the rear of her son’s home. She is dealing with the effects of macular degeneration, resulting in poor vision. Otherwise, Mrs. Rafsanjani’s abilities are excellent.

### Features

The unit incorporates numerous features to assist Mrs. Rafsanjani to make the most effective use of her limited vision, including:

- significant use of contrasting surfaces and finishes to make them easier to see. Specifically, contrasting coloured baseboard and door trim are used to better define room perimeter and door locations;
- a light-coloured countertop with a dark-coloured front edge and backsplash is used in the kitchen—the light colour helps define the location of objects on the countertop and the colour-contrasting front edge and backsplash help define the extent of the surface;
- colour-contrasting hardware on doors and cabinets;
- wall switches and outlets that are a different colour from the wall finish;

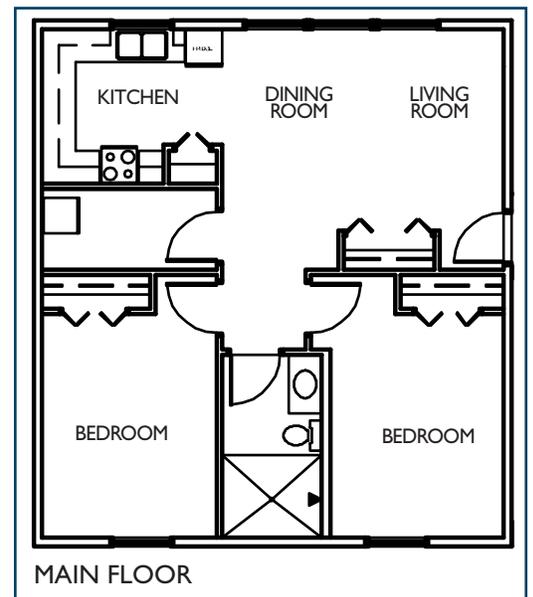


Figure 16: Main-floor plan of a universal garden suite  
Diagram by Ron Wickman, Architect



- functional zones within the open plan living area—seating area (low-pile carpet), kitchen/eating area (ceramic tile) and circulation/hall area (hardwood);
- finishes and window coverings that minimize direct sunlight and reflective glare. Matte surfaces are used throughout and adjustable blinds are used on all windows;
- enhanced levels of lighting. Lighting has been increased in key areas, such as kitchen work surfaces and reading areas;
- appliances featuring large, colour-contrasting controls and displays. Some of the controls provide sound cues to the user; and
- many electrical outlets that minimize the need for extension cords and the potential tripping hazard caused by appliance cords.

The design of the universal garden suite also features a no-step level entry, wider doors, easy-to-use switches and controls, and sufficient space to accommodate a walker or a wheelchair in the future.

## The universal house

### House profile

The universal house is a large, two-storey, three-bedroom house with a full basement and an attached two-car garage. Main-floor accommodation includes open plan living space, an office and a visitable bathroom. The second floor incorporates three bedrooms, one with an accessible ensuite bathroom (see figure 17).

### Resident profile

A busy family of five lives here. Mr. and Mrs. Lambie and their three children, aged 4 to 10. Mrs. Lambie uses a wheelchair and one of the children, Sarah, is hard of hearing.

### Features

The house features many basic elements that contribute to universal accessibility and are of benefit to everyone. Examples include:

- entrances that are free of steps and stairs—providing greater safety;
- floor finishes that are level, smooth, slip-resistant and glare-free—providing enhanced safety and comfort;
- colour and texture flooring contrast at places where users need to change direction in movement (hardwood to tile floor for example);
- doors that are 915 mm (36 in.) wide—wide enough to negotiate while carrying grocery bags or a child;

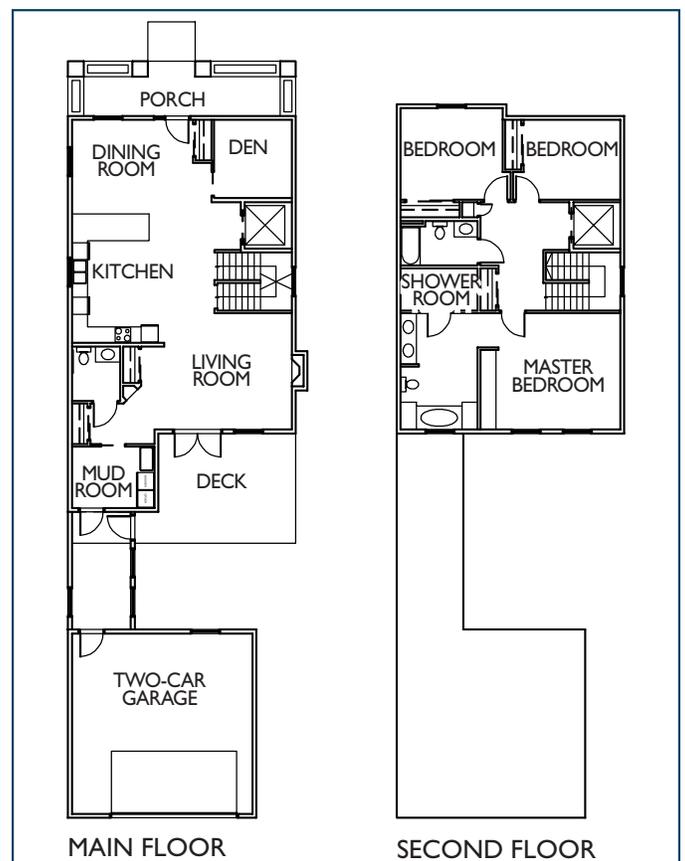


Figure 17: Main- and second-floor plans of a universal home  
Diagram by Ron Wickman, Architect



- lever-type door hardware that is easy to open with minimal strength using one hand or an elbow—which is good for small children or when carrying objects;
- windows that feature easy-to-operate opening and locking systems, as well as shades or blinds to adjust interior lighting;
- enhanced levels of lighting throughout—easy to adjust to suit all needs and preferences;
- additional lighting where it is most needed—under upper cupboards in the kitchen, illuminating the work surfaces;
- kitchen cupboards and work surfaces with contrasting colours, making doors, door handles, counters, and so on, easier to see and use;
- kitchen cabinets that incorporate lots of drawers and pullout shelves. This brings items closer to the user, eliminating the need to reach to the back of cupboards;
- a tactile flooring change at the top of the stairs;
- stairs that feature steps that are deeper and shorter, as well as safety-designed nosings (the front part of a step that hangs over the step below). Stair nosings are shaped to guide the foot over the front of the step;
- stairways that feature continuous handrails on both sides that are easy to grasp for small and large hands;
- appliances that feature large, easy-to-read controls that are comfortable to reach;
- faucets and other controls that can be operated with minimal strength—such as hands-free faucets and motion-sensing light switches.
- a three-stop residential elevator;
- walls in bathrooms that are reinforced to accommodate grab bars anywhere they are needed in the future;
- bathrooms that feature enough space to accommodate a walker or a wheelchair;
- bathrooms that incorporate larger, spa-type, curbless shower areas, capable of accommodating a seat or stool and featuring easy-to-use controls; and
- appliances with front-mounted controls that are easy to reach and operate.

The house also has a number of features that will particularly benefit Sarah Lambie (who is hard of hearing):

- a smoke alarm system that provides audible alarm sounds as well as visual signals (flashing strobe lights);
- an intercom, a door bell and a telephone system that feature visual signals as well as sounds;
- enhanced levels of evenly distributed, glare-free lighting, to facilitate lip-reading and the use of sign language;
- a quiet mechanical systems and appliances that reduce background noise and provide the best environment for people with limited hearing ability; and
- extra insulation in all the walls to provide for better acoustics;



## Glossary

**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.

**Area of refuge:** A fire-rated area where a person, unable to evacuate independently, can safely wait for assistance. Some building codes require an area of refuge served by an exit or firefighters' elevator. Balconies are sometimes considered acceptable areas of refuge.

**FlexHousing™:** A practical approach to designing and building housing that allows residents to convert space to meet their changing needs (CMHC).

**Visitable home:** A home that includes basic accessibility features that allow most people to visit, even if they use a wheeled mobility device.

## 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.

Covington, G. A., and B. Hannah. *Access by Design*. New York: Van Nostrand Reinhold, 1996.

CMHC. *Housing Choices for Canadians with Disabilities*. Ottawa, ON, Canada: CMHC, 1995.

Dobkin, I. L., and M. J. Peterson. *Gracious Spaces: Universal Interiors by Design*. New York: McGraw-Hill, 1999.

Frechette, L. A. *Accessible Housing*. New York: McGraw-Hill, 1996.

Goldsmith, S. *Universal Design: A Manual of Practical Guidance for Architects*. Oxford, England: Architectural Press, 2000.

Jordan, Wendy A. *Universal Design for the Home*. Beverly, Massachusetts: Quarry Books, 2008.

Leibrock, C., and J. E. Terry. *Beautiful Universal Design: A Visual Guide*. New York: John Wiley & Sons, 1999.

Mace, R. *Residential Remodeling and Universal Design: Making Homes more Comfortable and Accessible*. Darby, PA: Diane Publishing Co., 1996.

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

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.

Young, L. C., and R. J. Pace. *Accessible Multifamily Housing*. Raleigh, NC: The Center for Universal Design, 2000. Retrieved October 13, 2010, from <http://www.nchfa.com/forms/Forms/AccessibleMultifamilyHousing.pdf>



## Websites

**AARP—Livable Communities** (May 2016)

[www.aarp.org/livable-communities/](http://www.aarp.org/livable-communities/)

**ABLEDATA—Informed Consumer’s Guide to Accessible Housing** (May 2016)

[www.abledata.com/abledata\\_docs/icg-hous.htm](http://www.abledata.com/abledata_docs/icg-hous.htm)

**American Association of Retired Persons—AARP** (May 2016)

<http://search.aarp.org/everywhere?Ntt=universal%20design&intcmp=DSO-SRCH-EWHERE>

**Ball State University:WELLComeHome—Universal Kitchen Design** (May 2016)

[http://wellcomehome.iweb.bsu.edu/friendly\\_kitchen.html](http://wellcomehome.iweb.bsu.edu/friendly_kitchen.html)

**Barrier Free Architectural Inc.** (May 2016)

<http://www.barrierfree.org/>

**Canadian Abilities Foundation** (May 2016)

[www.abilities.ca](http://www.abilities.ca)

**Canadian Centre on Disability Studies—VisitAble Housing Canada** (March 2016)

[www.visitablehousingcanada.com](http://www.visitablehousingcanada.com)

**Concrete Change** (May 2016)

[www.concretechange.org](http://www.concretechange.org)

**Disability Services Commission—Access and Universal Design** (May 2016)

[www.disability.wa.gov.au/](http://www.disability.wa.gov.au/)

**Home for Life** (May 2016)

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

**IDEA Center for Inclusive Design and Environmental Access** (May 2016)

<http://idea.ap.buffalo.edu/>

**Institute for Human Centered Design** (May 2016)

<http://humancentereddesign.org/>

**Livable Housing Australia** (May 2016)

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

**NC State University: College of Design** (May 2016)

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

**Universal Design** (May 2016)

<http://www.universaldesign.com>

**Universal Design Products** (May 2016)

<http://universaldesignproducts.com>

**Virginia Tech—Center for Real Life Kitchen Design** (May 2016)

<http://www.ahrm.vt.edu/about/ahrm-spaces/center-rlkd/index.html>

**Vision Australia Accessible Design for Homes** (May 2016)

<http://www.visionaustralia.org/living-with-low-vision/learning-to-live-independently/living-at-home/making-the-best-of-your-vision>



## 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.

