



Kitchens

Universal design

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

Everyone appreciates having a kitchen that is safe, spacious, easy to use and beautiful. The successful design of a universally accessible kitchen starts with identifying potential users and anticipating their needs.

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 13.

Kitchen design

People are demanding functional, usable and flexible kitchen designs that will work for their families. Core universal design concepts are being incorporated into many aspects of kitchen design, including appliances, cabinets, lighting and flooring.

Also gaining in popularity is the concept of **aging in place**. By providing design features that follow the principles of universal design and by incorporating flexibility and adaptability into kitchen design, families, couples and individuals are able to stay in their homes and neighbourhoods as they grow and age. Planning for individuals’ changing needs and abilities allows for periodic kitchen customizations based on changing requirements and reduces the need for future costly renovations (see figure 1).

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 is not a new way of designing, simply a more focused one.



Figure 1: Large accessible kitchen
Photo by Ron Wickman



Design considerations

A universally designed kitchen is comfortable and safe for all family members, however, it is the most difficult space to make universal. Countertop heights cannot possibly be in one position that accommodates one individual sitting in a wheelchair and another standing at 1,980 mm (78 in.). Adjustable height counters, sinks and cooktops will solve this problem. However, this solution can be costly.

Upper cabinets offer great storage space, but cannot be reached by persons in wheelchairs or who are of a shorter stature. Upper cabinets can be installed with hardware that can pull shelves out and down, allowing persons in wheelchairs to access items located otherwise out of reach.

A best practice in a universal residential kitchen is to separate the stove cooktop and oven. The cooktop must be designed to be open underneath, so as to allow for a seated person's legs. The wall oven must be positioned at a height accessible to all users.

A flexible residential kitchen must ensure ease of approach to and use—even from a wheelchair—of the sink, worktop, equipment, all appliances and their controls, and all storage essential to kitchen operation.

The greatest challenge in the creation of a universal design kitchen is typically in its execution. The easiest way to ensure that a kitchen gets built correctly is to use detailed drawings completed by an architect or experienced kitchen designer.

Important considerations that will help you identify your kitchen design requirements include the following factors:

- Kitchen layout
- Kitchen size
- Minimal effort
- Adaptability
- Ease of cleaning
- Safety

Kitchen layout

The key to effective kitchen design for all users, especially those who use wheelchairs, is a layout that provides the right balance between countertop area, manoeuvring space and storage space. The layout should avoid compromising working areas with cross routes, limit travel distances and reduce the needs to lift items from one counter to the next. Especially for persons in wheelchairs, the kitchen layout must reduce the need for excessive manoeuvring and positioning. Maximizing the range of operations from one location is key.

Traditionally, kitchen designers have focused on a compact **work triangle** formed by the sink, stove and refrigerator. The conventional rule of thumb is that there should be no more than 7,925 mm (26 ft.) measured from centre to centre of the major appliances. No distance is less than 1,200 mm (4 ft.) or larger than 2,743 mm (9 ft.) for maximum efficiency. In today's reality, we must expand the triangle to include all work areas as well as separate cooktop and wall oven, garbage



disposal and the dishwasher. If your ability to move around the kitchen while carrying things is limited, it is even more important to consider these additional elements within the traditional work triangle.

An efficient kitchen that maximizes independence and convenience is the cornerstone of good design. Designing an efficient kitchen also involves keeping the work triangle compact. Logical, sequential, routine movements will define the way your family uses the kitchen and will help you design a kitchen with a work triangle that meets your needs.

A U-shaped kitchen (see figure 2) may be the most convenient layout for one or two people working in a kitchen, but having a work area that is accessible from outside the “U” is also advisable.

A galley-style kitchen requires less space and sometimes provides people with more than one entry and exit point (see figure 3). However, a galley-style kitchen usually limits a person using a wheelchair to a side approach to counters and appliances and can limit the amount of turning space.

An L-shaped kitchen, with or without an island, provides several work surfaces, including some outside the primary work triangle, which means people can work without bumping into each other (see figure 4).

All kitchens have various routes, some that everyone uses and others that are only occasionally used. Primary throughways should be designed outside the expanded work triangle. Remember that dishwasher and refrigerator doors may be open when the family is racing through the kitchen.

An island creates alternate work areas. A sink and an electrical outlet in the island can maximize usability and convenience for everyone.

Appropriate size and location of both garbage and recycling bins in the kitchen makes clean up efficient. Consider using containers within a cabinet system (one that slides out) to maximize usage of space.

For people with limited agility or mobility, a wheeled trolley can be useful for carrying food from the kitchen to the dining area.

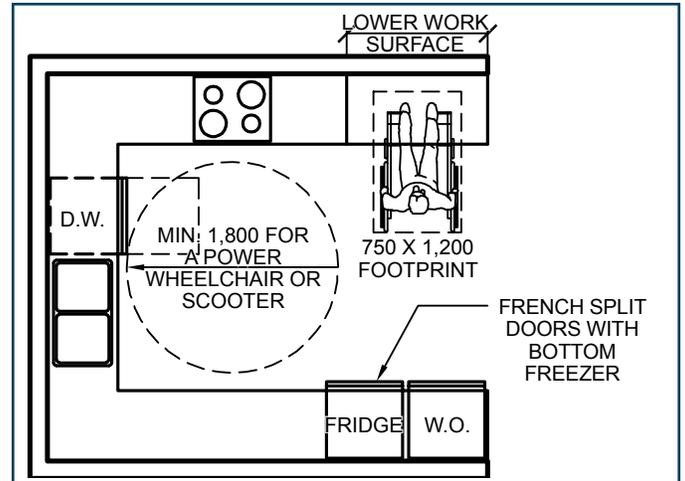


Figure 2: U-shaped kitchen
Diagram by Ron Wickman, Architect

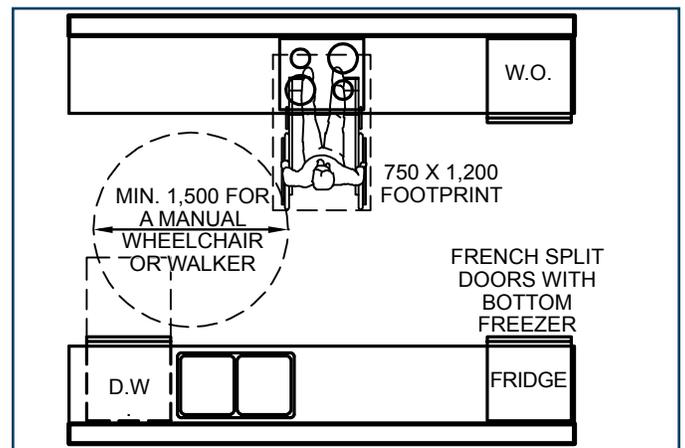


Figure 3: Galley-style kitchen
Diagram by Ron Wickman, Architect

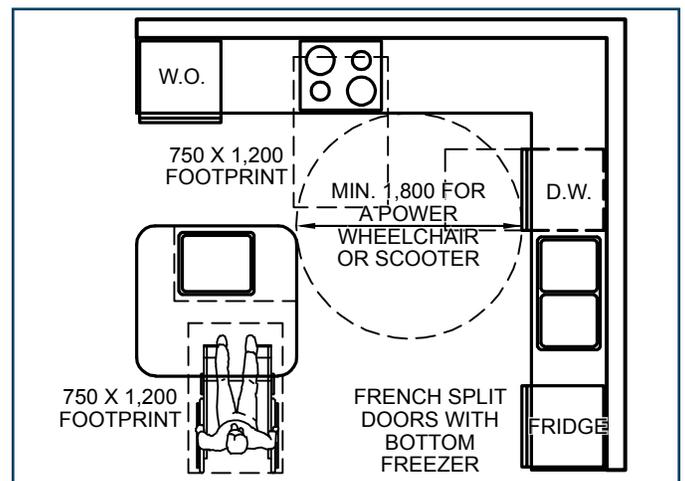


Figure 4: L-shaped kitchen with an island
Diagram by Ron Wickman, Architect



Also remember to consider window height. People should be able to see through windows when sitting and there should be easy access to window controls.

It is a good idea to reduce the number of doorways that open into a kitchen. If a door is necessary, it should provide at least 810 mm (32 in.) of clear passage width when it is open, but a clear space of at least 860 mm (34 in.) is better. It is highly recommended to install a 915 mm (36 in.) wide door. Door hardware should be operable with one hand that does not require fine finger control, tight grasping, pinching, or twisting of the wrist.

Kitchen size

A design for someone who uses a walker or wheelchair should allow manoeuvring space of 750x1,200 mm (30x47 in.) in front of controls, work areas and appliances. This work area can be part of the overall required minimum manoeuvring space of 1,500x1,500 mm (59x59 in.) in the work triangle.

Power wheelchair and scooter users need a larger turning radius and the required minimum manoeuvring space is 1,800x1,800 mm (71x71 in.).

Minimal effort

Designing for minimal effort is an important principle of universal kitchen design. Planning for efficiency considers the location and relationship of all major elements within the kitchen. This will result in the placement of similar or related items in the same location within the kitchen.

Emptying the dishwasher is easier if the dishes and glasses are stored nearby. Baking is easier if baking supplies are close to a work surface and the oven. Meal cleanup is easier if the table is located close to the sink, dishwasher and garbage.

Flexibility and efficiency of effort can be achieved through such design considerations as providing storage options at a variety of heights.

Planning for efficiency of effort and ease of use incorporates features, such as more lighting, a place to sit down to work, a lower workstation and storing materials where they can be easily seen and reached.

Other kitchen design components that increase usability include the following:

- Persons who use wheelchairs can benefit from continuous countertops allowing pots, dishes and so on to be slid along
- Hands-free faucets
- Pot faucet at cooktop
- Wall-mounted oven at countertop height
- Countertop convection/microwave oven
- Open shelving rather than cupboards with doors
- Space for using a wheeled trolley
- **Resilient flooring** rather than a hard surface



Adaptability

Kitchens may be used by both a user in a wheelchair and others who are ambulant. Finding an effective countertop height for all users is very difficult. A flexible kitchen design offers an adjustable height sink, cooktop, worktop and upper cabinets. There are both low-tech and high-tech ways to provide for height adjustable counters and cabinets. Cost will typically dictate the design approach. The most cost-effective, low-tech design is to build into the supporting structure with a series of support points so that the counters or cabinets can be manually removed and repositioned in a more accessible position (see figure 5). Care must be taken with this design strategy so that exposed surfaces are finished when the counters are lowered. Sinks and plumbing must also be strategically specified to maintain leg room when the counter with sink is lowered.

The most universal method, in terms of persons with disabilities, is high tech. This involves the installation of motorized guides to move counters and cabinets up and down with the flip of a switch. The adjustable height counters should be in different sections to allow for shared use. Care must also be taken in the design of a countertop backsplash so it works with the adjustable height counters and cabinets.

Another good idea is to have rolling base cabinets complete with a finished top. These base cabinets can be moved out so the counter is open underneath; they could also be used as a small tabletop for use in the living area. This can be useful for people who use a wheelchair and wants to roll items along with them to another location, similar to a walker with a basket concept (see figure 6).

Where space is limited or a dining room is not required, a kitchen island tabletop can be used for both food preparation and dining (see figure 7).



Figure 5: Adjustable kitchen countertops
Photo by Ron Wickman

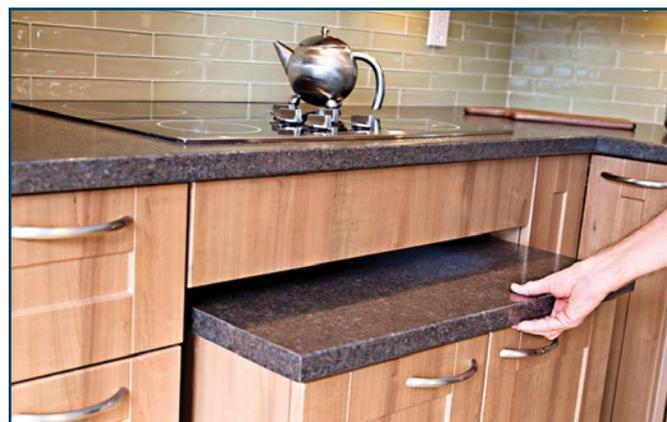


Figure 6: Accessible kitchen with rolling cabinet
Photo by Ron Wickman



Figure 7: Accessible kitchen with island-dining table combination
Photo by Ron Wickman



Ease of cleaning

When making decisions about new appliances, floors and countertops, remember to consider surface finishes that are low maintenance.

For example, glass cooktops tend to be easier to clean whereas stainless steel appliances show fingerprints and may require specialized cleaning products. Some countertop surfaces need yearly maintenance with a sealer to protect them from staining and harbouring bacteria.

Kitchen cleaning products should be stored in easy-to-reach locations, preferably in drawers or baskets that slide out. If family members include children, people with Alzheimer's, people who are very forgetful or who have developmental disabilities, give careful thought to the storage and security of these products.

Safety

Safety in the kitchen deserves the highest consideration. Small rugs and mats in the kitchen should be avoided because they are a tripping hazard and an obstacle for many people who use mobility devices and persons with dementia.

There are situations where it is safest to limit access to appliances in the home, for example, when a member of the household has Alzheimer's disease or dementia. If this is the case, consider installing an **override switch** that must be activated before using an appliance or outlet in the kitchen. Install the switch in a place that is inaccessible to those who might be at risk of injuring themselves.

Consider providing wall space in the kitchen for a notice board. Although a notice board is a useful feature for everyone, it is of particular benefit to people whose cognitive abilities are changing or who are losing their memory. Post reminders and safety notes on the board.

Plan for easy access to water, a fire extinguisher and the gas shut-off valve in case of emergency.

Design elements

The major design elements of a universal kitchen are:

- countertops;
- cupboards, drawers and pantries;
- sinks and cleanup areas;
- food preparation areas;
- switches and controls;
- interior finishing;
- lighting; and
- audibility.



Countertops

Countertops are traditionally 915 mm (36 in.) high, but a countertop 860 mm (34 in.) high is more convenient for children, people of a shorter stature and people who use a wheelchair. If the person who uses the wheelchair is a child or a shorter person, they may find a counter and work areas set to 730 mm (29 in.) a suitable adaptation.

The key to proper height placement of the countertop is to keep the counter to a minimum thickness. This maximizes the ability to keep the countertop low enough for those users in wheelchairs to reach into the sink; the countertop can also be high enough to allow the same users in wheelchairs to get underneath the counter. A bar located in front of the counter could assist those individuals with balance issues standing at the sink.

Installing counters at a variety of heights (see figures 8 and 9) is a universally accessible approach to meeting the needs of people of different heights and reach abilities, but remember, a traditional dishwasher requires a minimum counter height of 915 mm (36 in.) so the height of the counter should be carefully considered in that location. However, this approach is not always recommended for persons with dementia. Adaptability can also be achieved by installing counters with electrically adjustable heights, which are available from a number of innovative kitchen designers.

A toe space of 150 mm (6 in.) under the cabinets will enable a person who uses a mobility device to approach the counter more closely. A high toe space has the added benefit of raising the height of the bottom shelf in the lower cabinet or drawer, reducing the reach range.

Clear counter space should be provided beside all major appliances for food or dishes as they are taken out of the refrigerator, oven or cupboard.

There should be multiple work surfaces in the kitchen, at least one with a minimum size of 800 mm (31 in.) wide x 600 mm (24 in.) deep, at a height of 730 mm to 860 mm (29 in. to 34 in.), with a minimum footprint in front of 750x1,200 mm (30x47 in.) to accommodate someone who is seated.

People with reduced vision or dementia should avoid countertop surfaces with busy patterns and many prefer to have a solid colour that will provide some contrast with their appliances and dishes. Some people select contrasting edging on the countertop to help in identifying the edge (see figure 9).

A backsplash in a contrasting colour can also help people with low vision better identify the extent and configuration of the counters.

Rounded or bull-nose edges on counters increase safety by eliminating the danger of sharp corners.

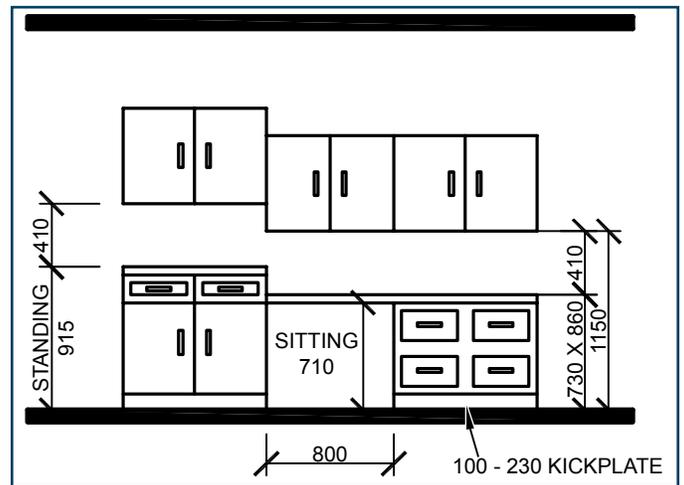


Figure 8: Lowered work area
Diagram by Ron Wickman, Architect

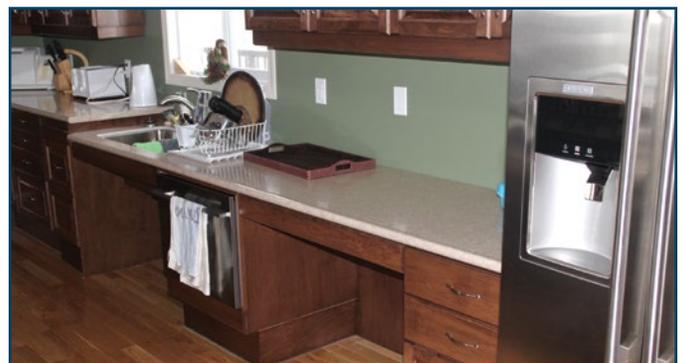


Figure 9: Lowered work area
Photo by Ron Wickman



Cupboards, drawers and pantries

Storing related things in the same cupboard where they are easy to find is especially important for people with limited mobility and a visual impairment.

A large pantry with swing-out doors or large drawers allows food and condiments to be stored where they can be easily reached at a variety of heights (see figure 10).

Upper cupboards should be installed with the bottom edge 410 mm (16 in.) above the countertop, instead of the more traditional 460 mm (18 in.), to ensure that the lower shelf is within reach of someone seated. Cupboards should not be installed less than 410 mm (16 in.) above the counter, as this reduces storage space for appliances on the counter.

Upper cupboard systems are available that can be electrically raised or lowered. In addition, there are shelving and rack systems that can be installed in existing cupboards, which enable the entire rack to be pulled out and down, increasing the usability of the upper cupboards for everyone (see figure 11).

Installing lower cabinet drawers that pull out fully to display their contents for easy retrieval is an excellent approach (see figure 12).

Another strategy for providing accessible storage is using a series of small and large drawers instead of cupboards. Cupboards and drawers should have D-type pull handles, which are easier for people with reduced mobility or agility to use (see figure 13). These pull handles should also contrast in colour so they are easier to identify for persons with limited vision.

Touch-and-release drawers and cupboards are universally accessible to everyone, including people with limited dexterity. Other hardware includes full extension drawers, soft-close fittings, silent-closing fittings, door shock absorbers, bumpers and push button controls.

A contrasting colour for the interior of drawers and cupboards may also increase visibility for people with limited vision. Labelling drawers with content inside also helps persons with dementia.



Figure 10: Pantry with swing-out doors and pullout shelving
Photo by Ron Wickman



Figure 11: Upper cabinets feature pull-down-and-out shelving to provide access to contents for people that cannot reach high
Photo by Ron Wickman



Figure 12: Lower cabinets feature drawers to provide access to contents
Photo by Ron Wickman



A drawer or shelf that pulls out beneath a wall oven or microwave with a side-opening door can be used as a **heat-resistant surface**. This reduces the necessity of carrying hot pans and can provide a place for hot items to cool before they are moved. These drawers or shelves can also provide an additional work surface in smaller kitchens (see figure 14).

Pantry cupboards with doors that open fully, using **180-degree or swing-clear hinges**, allow everyone to easily see the contents and to reach the shelves. In addition, internal lighting adds greater visibility for people searching for items in pantries and cupboards.

Household members with food sensitivities should have dedicated pantry and work areas for their preferred foods.

Consider using open-shelf storage or cupboards with glass doors if someone in the household is experiencing changes in cognitive ability or memory loss. The ability to see the contents of the shelves and cupboards can make the kitchen easier to use for many.

Sinks and cleanup areas

Two sink areas should be considered in busy kitchens and in kitchens where there are people working at various heights.

Locating an accessible sink in a corner location is not recommended as it restricts access to the surrounding area and limits the usability of the counter areas.

When a sink will be used from a seated position, a shallow sink with the drain offset to the rear is recommended. This will allow sufficient knee space and will result in the drainage pipes being out of the way, eliminating the hazard of someone burning their legs (see figure 15). Alternately, the drainage pipes can be insulated rather than offset.

An accessible sink should provide knee space clearance—750 mm (30 in.) high, 800 mm (31 in.) wide and 600 mm (24 in.) deep—to allow someone using a wheelchair to wheel under the sink.

Plumbing should be flexible to suit adjustable sink heights.

Single-lever, pullout spray type faucets are the easiest to use by most people. Faucets should also permit easy control of water temperature, flow and direction. Faucets located at the side of the sink are easier to reach. Having instant hot water is also a good idea.



Figure 13: Cabinet and drawer handles are D-shaped for easy grasping
Photo by Ron Wickman



Figure 14: A pullout shelf positioned below the oven can be used to place utensils or items that are going into the oven
Photo by Ron Wickman



Figure 15: Accessible kitchen with space open under the sink and pipe protection to prevent someone from burning his/her legs
Photo by Ron Wickman



A faucet controlled by a single lever or a motion detector is the most convenient. However, separate hot and cold lever handles help avoid confusion for those users with dementia. A lever faucet and a pullout hose with a spray nozzle provides convenience for everyone, particularly if there is a soap dispenser incorporated into the faucet design (see figure 16). This provides flexibility and ease of use for all family members.

Food preparation workstations

An accessible workstation integrated into the design of a kitchen is most advantageous for people who work from a seated position. A workstation where someone can prepare food and have easy access to accessories in that same area is efficient and convenient.

An accessible workstation is equally appreciated by a child who wants to participate in kitchen activities.

The workstation should have at least one accessible counter or pullout shelf, accessible storage within easy reach, as well as an electrical outlet and sink.

Switches and controls

All switches and controls should be easy to operate. Also, switches and electrical outlets must be strategically located to be within reach of persons in a seated position and to suit adjustable worktops. Switches located below the countertop provide easy access to operate the cooktop overhead light and fan and electrical access to plug in a kettle or toaster (see figure 17). However, careful consideration should be given to locating outlets out of the reach of children. For added safety you could consider installing an **override switch**.

Other controls and switches, should be located at a maximum height of 1,200 mm (47 in.) from the floor. Controls and switches can also contrast in colour to be easier found by persons with low vision.



Figure 16: Pull-down sprayer faucet in the kitchen island
Photo by Ron Wickman



Figure 17: Switch located below the countertop
Photo by Ron Wickman



Interior finishing

Colour and texture contrast around the kitchen aids all users, especially those with visual limitations. Flooring that is firm, level and non-slip creates a safer environment for all users. Flooring should also be non-glare and non-pattern to better accommodate persons with visual limitations and dementia. The use of a contrasting colour on the front edges of countertops and around switches, electrical outlets and other controls again better accommodates persons with visual limitations.

Durability, ease of cleaning, comfort and a safe, non-slip surface are some of the prime considerations when selecting flooring. Slip-resistant flooring should be assessed both dry and wet.

Avoid marble or waxed floors as they are slippery, especially when wet. Cork provides an interesting alternative as it is **resilient**, comfortable and easy to wheel on. Vinyl flooring is available in sheets and tiles and is low maintenance. However, it must be installed on a plywood surface and, as a result, there will be some emissions from the glue, vinyl and plywood. Low-emission glues are now available.

A ceramic tile or hardwood floor is a harder surface, which is positive for persons who use wheelchairs.

If someone in your house is prone to dropping things or falling, be sure to choose a resilient flooring material, such as cushioned vinyl or cork.

Whatever type of flooring material is selected, ensure the flooring is installed so that it is level with adjacent flooring to avoid having a lip or rise where the different flooring materials meet.

Having a central vacuum system with a toe kick vacuum makes it easier for everyone to keep the kitchen clean (see figure 18).



Figure 18: Central vacuum system located in kitchen cabinet toe kick

Photo by Ron Wickman

Lighting

The universal approach to lighting design is to address the needs of people as they age. It should be noted that people over the age of 60 typically require two to three times as much light for reading compared to people 20 years old. Three basic issues to consider for aging eyes include the need for increased intensity, uniformed, balanced lighting and controlled glare.

Increased intensity is often straightforward, however we still need to consider the other goals of providing uniformed, balanced lighting and minimizing glare. Fixtures and light sources should be positioned such that “islands” of brightness with dark shadows are not created. Look for a mix of **ambient**, task and accent lighting that works in harmony with the users of the space. It is also possible to install a light that gradually adjusts the rate of illumination. During a middle of the night kitchen visit, a motion detector activates the light, which slowly brightens so one is not overwhelmed. Dimmer switches are also an option. Adjustable directed or **task lighting** also allows one to have extra illumination in key areas of the kitchen.

Uniform, balanced lighting is important because changing eyes do not adjust to changing light conditions as quickly. This is an important consideration when moving from one space to another. Try to balance lighting throughout the room and compensate for extra-bright areas, while eliminating dark corners.



Where possible, take advantage of opportunities to maximize natural lighting, but be careful to avoid glare. Glare-free surface treatments and a soft matte paint finish are preferred, especially by persons with visual limitations or dementia. These finishes reduce glare and complement illumination levels, creating a more relaxing atmosphere.

Glare can be controlled through the proper selection of fixtures and by locating light sources so the bulbs are not exposed to view. **Ambient lighting** should be provided to maintain an even level of illumination throughout the kitchen; directing lighting at the ceiling and reflecting it into the room can be quite effective. Indirect lighting over wall cabinets and toe kicks provide illumination without ceiling glare.

Light fixture choices include recessed lights, under-cabinet fixtures, bulb strips, cove lights, wall sconces, pendants, spot lights and ceiling fixtures. Where possible, light fixtures should come complete with two long-lasting bulbs; in that way the fixture still produces light if one bulb burns out, which benefits those persons who cannot easily change a bulb.

Audibility

Special thought should be given to the ways that people who are hard of hearing or deaf will be alerted to timer buzzers and smoke alarms. Appliances that provide information in two different formats (visual and audio signals for example) are widely available. This also helps people who are blind or with vision loss. See CMHC's *Accessible Housing by Design—Appliances* for more information.

Efforts should be made to limit sources of noise, especially when the kitchen is used by people who are hard of hearing. Soft, absorbent surfaces such as cork flooring can reduce noise in the kitchen.

In accessible kitchen 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 kitchen layout and best placement of countertops and appliances.



Glossary

180-degree or swing-clear hinges: Door hinges that permit full-door opening by enabling the door to lie flat against the adjacent surface.

Adjustable height counters: Countertops, sinks, cooktops and cabinets that can be raised or lowered at the touch of a button, making them accessible to people who are seated or who are taller or shorter.

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.

Ambient lighting: The overall illumination of an environment through the use of lamps, overhead light fixtures, sunlight or any previously existing light.

Heat-resistant surface: A material that strongly resists the flow of heat through itself and is resistant to burning.

Override switch: A lock-out feature that prevents accidental activation or entry into an appliance. Deactivating the lock-out feature does not, in and of itself, activate the device—it simply enables the user to take the normal steps for activation or entry.

Resilient flooring: Flooring that has a relatively firm surface, yet can reshape itself back to its original surface profile after it is compressed.

Task lighting: This type of focusable lighting is typically employed to increase illumination above ambient levels.

Work triangle: Space that connects the three major work areas of a kitchen: the cleaning area (sink), the cooking area (range and cooktop) and the cold storage area (refrigerator).



Additional Resources

Books

Barrier Free Environments Inc. *The Accessible Housing Design File*.
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Behar, S., and C. Leibrock. *Beautiful Barrier-Free: A Visual Guide to Accessibility*.
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Websites

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

Barrier Free Architectural Inc. (January 2016)

<http://www.barrierfree.org/accessible-kitchen/baselift-adjustable-counter-lift>

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>

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.

