

AN A-Z GUIDE
TO
A Safe House
FOR ELDERLY



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- All floor plans that appear in this guide were taken from the Safe House Design developed in the context of the Pilot Project “Virtual modeling of a safe household environment for elderly citizens” and are designed by the architect Eva Toumpi. Note that they are indicative and that alternative but equally efficient designs are also possible.

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This guide was developed in the context of the Pilot Project “**Virtual modeling of a safe household environment for elderly citizens**”, assigned to the 3rd *Working Group of the European Network for Safety among Elderly* (EUNESE), a 36-month project coordinated by the *Center for Research and Prevention of Injuries* (CE.RE.PR.I), of the *Athens University Medical School* and co-financed by *DG SANCO* (Directorate C-Public Health and Risk Assessment, Health & Consumer Safety), aiming to address injury prevention and safety promotion among senior citizens through the development of an *EU Network*.

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Introduction

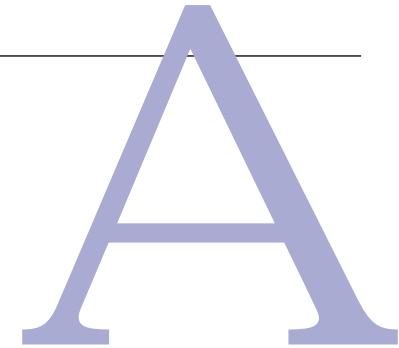
In every design project, there are thousands of decisions and choices a designer will make from project inception to completion. Those decisions range from site planning to building configuration, plan development, material choices, and building aesthetics. In considering what is important and what is not, we assume that general architectural sensibilities are at work in developing a plan and an elevation. The considerations to be discussed focus primarily on details that directly affect the quality of life of the senior resident or suggest strategies on making the building more attractive to his/her family members and friends.

In summary, the purpose of this analysis is to explore how to design a satisfying physical environment for senior, mentally and physically frail people - an environment that is more satisfying than the traditional nursing home. Moreover, with this analysis we seek to analyse the attributes of building designs and service interventions that allow residents to live a more independent and satisfying life. Finally, safety will be the main consideration in every room creating a secure environment for senior citizens.

The overall goal of interior design for seniors is to provide an environment that does not feel institutional. The current buzzword is “feeling”. Rooms should feel residential, with the style and quality of a hotel and the comforting details of a home. The design must incorporate a variety of spaces that support varying levels of contact, such as large-scale spaces for holidays or special events, and small cozy spaces for family gatherings and quiet times.

Generally the common goals should be:

- A safe, comfortable environment that is supportive of the resident's need to maintain independence.
- A design that seamlessly incorporates the necessary support devices (such as grab bars and handrails) in an unobtrusive manner.
- A design that addresses the six characteristics of aging that have the larger impact on senior adults' relationship to their environment: loss of balance; cognitive impairment; loss of strength; visual impairment; hearing impairment; and increased sensitivity to cold, drafts, and direct sunlight.



Acoustic control

Hearing loss is an important factor in the aging process. Poor acoustical design in senior housing can make it difficult for residents to hear and be heard, and may cause them discomfort, contributing to fear, embarrassment, depression, or isolation. Even those with hearing aids are affected by background noise. Although new developments in hearing-assistance technology have helped to minimise this problem, some older hearing aid models still may amplify background noises along with messages, making it difficult for hearing-assisted individuals to distinguish the message addressed to them. It is therefore vital that senior living spaces be designed to deal with the way sound will travel in interior spaces, to accommodate hard-of-hearing and hearing-assisted residents.



The best way to limit excessive ambient noise is to select **sound-absorbing materials** for walls, floors, ceiling, and even furniture and window treatments. Soft absorbent materials such as carpet, fabric upholstery, and drapery; linens on tabletops; absorbent wall surfaces; and acoustical ceiling tile can help attenuate unwanted noise.

Bathing areas by their nature have surfaces that reflect noise created by running water. One suggestion is to limit the use of ceramic wall tiles and use resilient flooring in lieu of ceramic floor tiles. Limited use of acoustic ceiling tiles, designed for high humidity above tub areas, can be an additional means of reducing reverberation. In addition to surface finishes, there are tubs and whirlpool baths designed especially to reduce noise. Polyvinyl chloride pipes and plumbing fittings that create noises when water runs through them must be avoided.

Mechanical rooms below and/or adjacent to acoustically sensitive rooms need a minimum structural density in the floor slabs and/or separating walls to act as barriers to airborne sound. Noise-producing mechanical rooms should not be placed near residential areas that require quiet.

The volume of **air circulation** in a space can produce noise. Insulation around ducts can be used to help reduce noise levels. In addition, use of insulation and staggering construction of solid walls may help to keep noise levels at a minimum.

Accessibility

Ramps are necessary if the resident is wheelchair-bound, but should otherwise be avoided. While ramps are permitted if they meet prescribed design criteria, seniors have difficulty maintaining balance on ramps because their center of gravity shifts as they lean forward or backward. Ramps can also be difficult to negotiate for persons using walkers.



Injuries that result from falls are one of the greatest concerns for aging persons, some of whom have serious vision or balance problems. A large number of falls occur due to tripping at locations where there is a transition in the flooring material. Also note that, while most accessibility codes and guidelines permit a 1.2 cm high transition strip between flooring materials, the **transition strip** becomes a barrier for a person using a walker or a wheel-chair.



Vision impairments are common among the aging. Such impairments limit independence and accessibility in ways that may include everything from difficulty in using a key to unlock one's apartment door to reading notices and the like. In addition to compensating

with higher **light levels**, particularly at critical places like entrance doors, the seniors or the care-givers may use a number of electronic options, like proximity card readers, to ease access for residents.

(see also Corridors, Staircases)

B

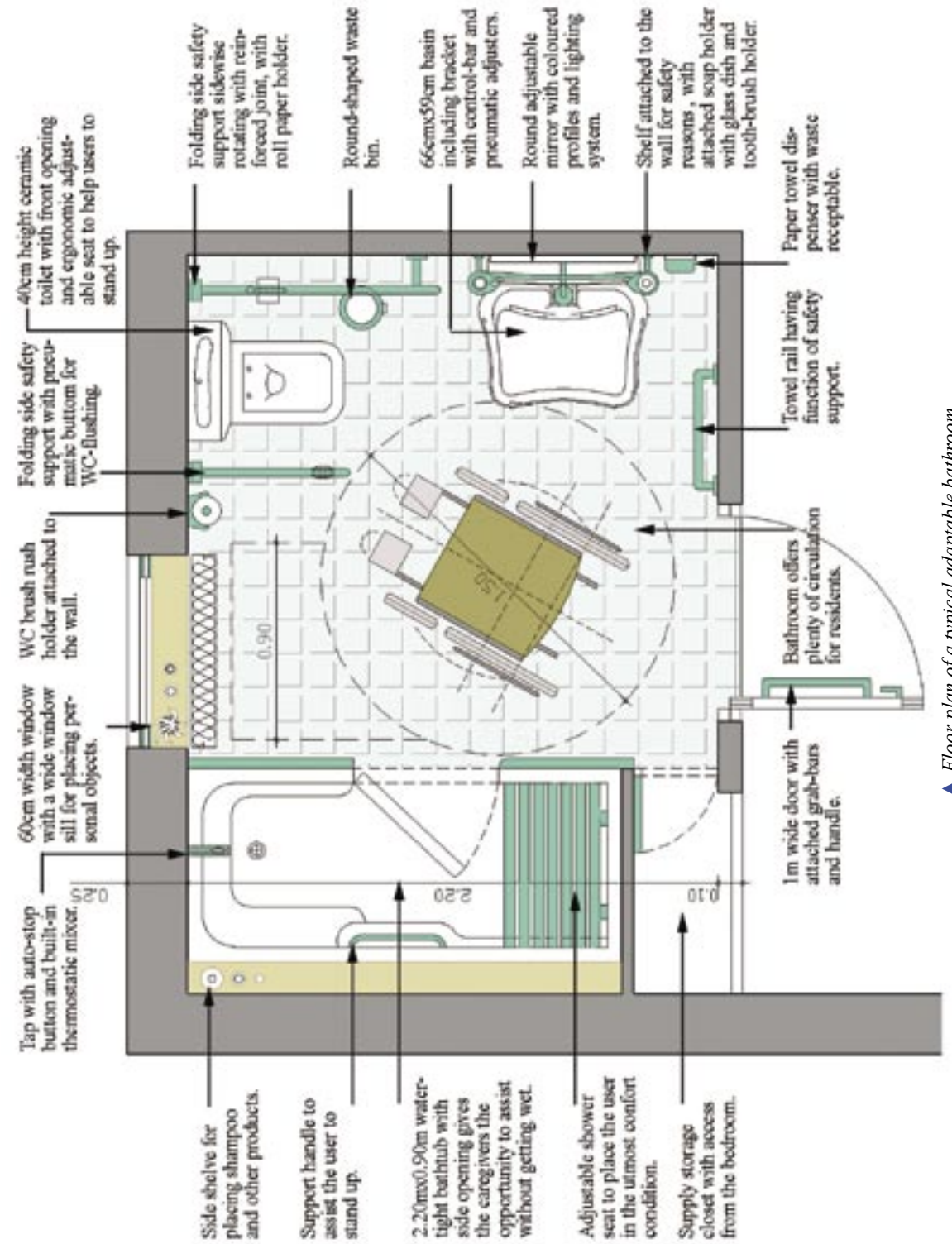
Bathroom

One of the most important spaces to design properly is the bathroom. This room clearly requires the most rigorous workout for residents, who must rotate, stand up, sit down, bend over, and move around. For these reasons, the bathroom is often the most dangerous space in the house. Falls in particular can be devastating, and residents using toilets and showers can easily lose their balance. The majority of seniors are not wheelchair bound, but many may be dependent on a walker, a four pronged cane, or a wheelchair to get around.

- An **adaptable bathroom** is one that can be adapted to the needs of a handicapped person. In an adaptable design, wide doors, knee space, switch locations, and grab bar reinforcements should be built in. Other items can be added or changed if necessary. For example, grab bars can be omitted and installed when needed, knee spaces can be concealed by a removable base cabinet, and countertops and closet rods can be installed on adjustable supports. The door to the bathroom should swing out or should be a pocket/barn door. There should be a 75 cm-1 m area in front of the lavatory (side approach) and a 75 cm-1m clear area in front of the bathtub /shower. The toilet should be placed in a space that is 1.20m wide and 1.65m deep.



▲ Example of an adaptable bathroom.



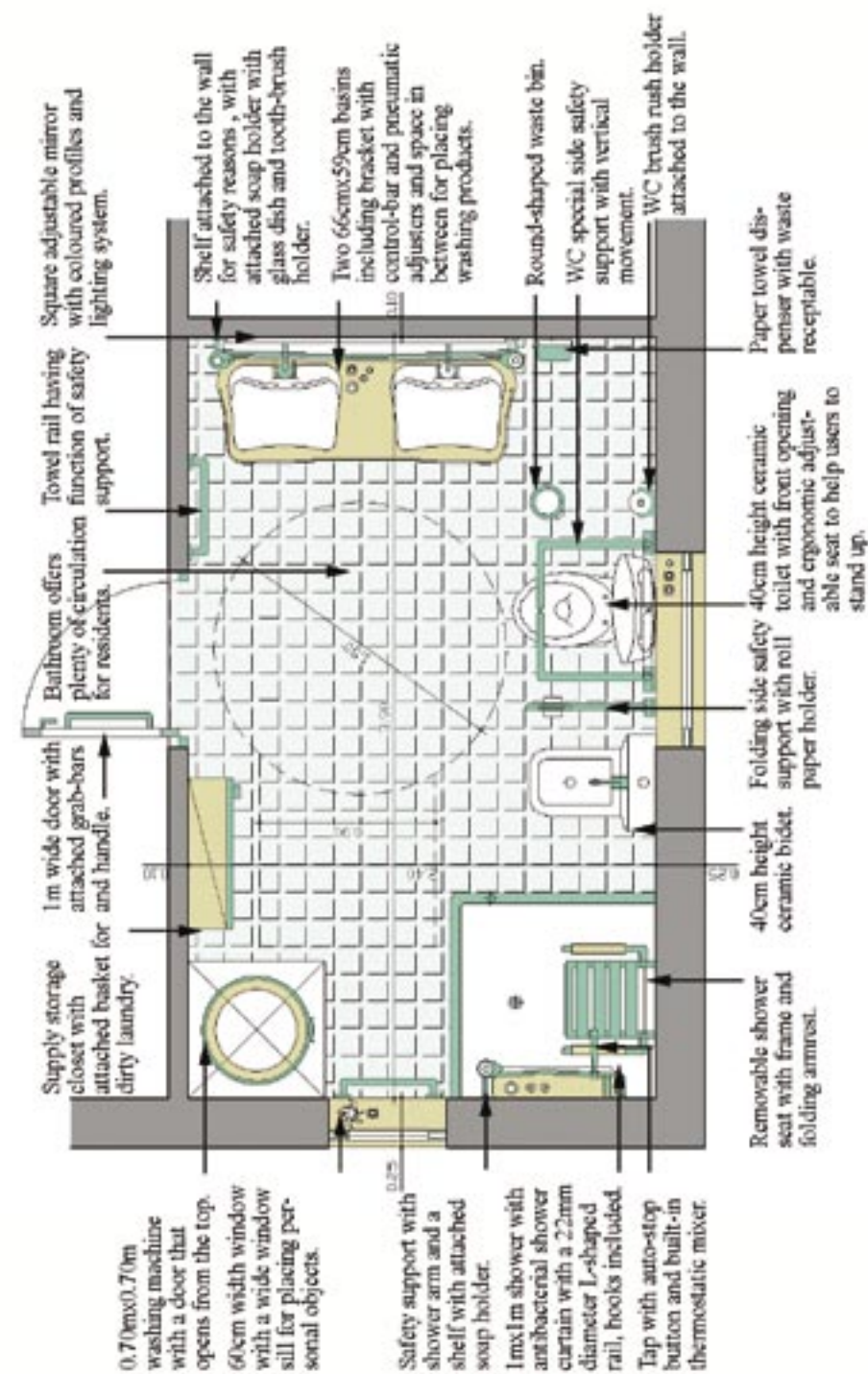
▲ Floor plan of a typical adaptable bathroom.

▪ An **accessible bathroom** is one that meets the requirements for accessibility by a handicapped person. Some of its main features include wide doors, a clear space for wheelchair turn-around, low countertops, lever and loop handles, seats at bathing fixtures, grab bars, knee space under counters, audible and visual signals, and easy-to-reach switches and controls. The bathroom should accommodate a 1.5 m distance between fixtures, with a door that swings out. Use a shower with a lip that is less than 1 cm. All these requirements mean that the bathroom will have to be large in size. Also note that designs are typically based on the requirements established for younger disabled people with excellent upper body. If the bathroom is to be used by a frail person, extra provisions must be taken, e.g., extra room for a care-giver.



▲ Example of an accessible bathroom.

One of the most important aspects of this kind of environments is the **treatment of bathing**. Sensuous experiences are relatively rare for frail seniors who have reduced sensitivity to tastes, aromas, and touch. Bathing, which is traditionally a relaxing, positive experience



▲ Floor plan of a typical accessible bathroom.

for many people, is often a disturbing and unhappy experience for them. Some people with dementia often display an aversion to water and the process of bathing. Some even consider it frightening. However, most bathing rooms are not designed to reassure residents or make them feel comfortable. The typical bathing room has a stall shower, a tub with a hydraulic lift, a toilet, a sink, and equipment storage. The space is usually a very large, hard, cold, and noisy ceramic-tiled space that rarely has the benefit of any natural light. To alleviate this problem, **heat** can be very effectively introduced through the use of heat lamps or supplemental wall-mounted radiant heating devices. White-coloured (rather than red infrared), 250 watt heat lamps allow the room to be quickly warmed. These fixtures also add in the inspection of skin contusions and abrasions.

Noise and reverberation are often problems because the room is covered with hard surfaces and has very few, soft, absorbent materials. For example, when the high-volume, laminar flow of water filling the tub makes contact with the fiberglass shell, it often creates a lot of noise. Because the bathroom is one of the loudest rooms in the building, it should be designed to mitigate noise. Using a moisture-repellant but sound-absorptive ceiling materials like tectum or heavy drapes can help. *(see also Acoustic Control)*.

Towels stacked on decorative open shelving are also effective. Side transfer tubs are excellent for an assisted living application but they can also cause a lot of noise. The collapsible side wall design requires the resident to sit in the tub while it is being filled.

(see also Tubs, Showers, Toilets and Washbasins)



▲ Attention to detail is particularly important in the design of bathrooms for the frail seniors.

Bedroom

If residents are using a **mobile hoist**, they must remember to leave sufficient space on both sides of the bed. In particular, they will need 200 cm on one side of the bed, and 85 cm on the other side for the care-giver. A **bed table** accommodating telephone, alarm clock, and books is a good solution. Bed tables with adjustable overbed tops are available. A range of bookstands, which rest on the bed or the users' stomach, is available.

Alarm clocks with large, clearly visible hands are available. Loudly ringing alarm clocks are available for persons who are hard of hearing. Clocks connected to light or vibrators to put under the pillow, are also available.



If someone finds it difficult to rise from lying flat to a sitting position or to turn around, a **lifting pole** or a bed rope ladder could prove good solutions. Alternatively, a solid bed rail or a wall-mounted hand rail comes in handy. Free-standing lifting poles for mounting on beds are available. All adjustable beds provide binding for lifting poles.

A **glide-cushion** or **glide-sheet** allows someone to turn from side to side without having to struggle. The gliding effect is achieved when two layers of smooth material glide against each other. Smooth bed linen or night-clothes made from silk, provide the same effect. If someone is struggling to get out of bed, bed raisers under each leg could provide better access and more comfortable conditions for the care-giver. If lying flat is uncomfortable, or if someone has breathing difficulties, the bed-wedge or the **pillow-raiser** could be a nice solution. If someone's feet and legs have a tendency to swell, the foot-raiser is very useful.

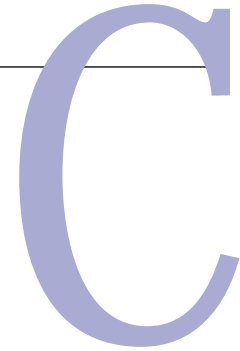


▲ Floor plan of a typical bedroom for seniors.

If the above mentioned solutions are insufficient, manually or electrically **adjustable beds** are available. In particular, there are beds of which only the height can be adjusted. Furthermore, there are beds that are adjustable in parts, allowing neck, back, lower back, thighs and legs to rest in a chosen position. Depending on whether residents or care-givers are going to work the adjustment gear, and on the residents' individual needs, one can choose between manual or electric adjustment or a combination of both. The most important benefit of an electrically controlled and fully adjustable bed is a large degree of independence.

A wide range of **mattresses** caters for all kind of needs. A few shops allow the testing of a mattress at home for a short period. To minimise the risk of pressure sores, special mattresses which allow the pressure to spread more evenly, are available in the shape of air or water mattresses, special soft and thick foam mattresses, or fiber mattresses. Before placing a water mattress in the bed frame, residents must be sure that the frame is built for the extra weight. Alternatively, a water bed frame could be used. If someone is incontinent, protect the mattress with a protective lining sheet or a fitted waterproof mattress cover. A number of protective linings and covers are fitted with an underlying, absorbent layer, making residents feel dry and safe.



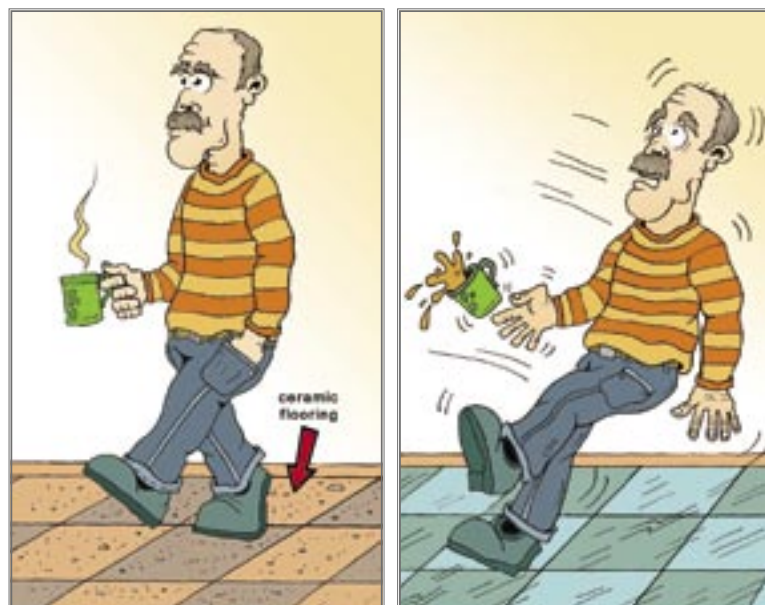


Ceramic flooring

Ceramic flooring is very versatile and can be used in a number of different ways. It can be used for decorative purposes at entrances, to form mosaic themes in living rooms and bedrooms, and of course it can be used in the kitchen and bathroom. However, particularly in the case of bathrooms used by seniors, many designers are choosing to use vinyl flooring because it is more hygienic, provides a softer surface, and is less cold to the touch.

In the case ceramic flooring is used in a house with senior citizens, the following are important considerations:

- **Grout colour and treatment options:** Because grout is porous, it readily absorbs urine. To overcome this, use grout with additives to make it less porous. Epoxy grout, though more expensive, is another option. Grout colour selected for floor installation should be darker, so as to avoid showing soil and traffic patterns.
- **Slope and size:** In floor areas with drains, be sure to use tiles that can accommodate floor slope. To accommodate the slope in shower stalls, 12cm x 12cm tile works best, while kitchen floors can accommodate larger tiles due to their more gradual slope.
- **Slip resistance and product selection:** For entryways and showers, pay attention to the slip-resistance information provided by manufacturers.
- **Slab treatment:** If ceramic tiles are to be used in a shower or wet area, a water-proof membrane should be installed.



Ceramic wall covering

Ceramic tiles provide a washable surface; however, the somewhat porous grout joints can be a **maintenance problem** and have a tendency to absorb liquids and odors. It is recommended that grout be sealed around toilets and urinals. The use of larger-size tiles helps to reduce the amount of exposed grout. In lieu of ceramic tile floors in bathing and toilet areas, **seamless sheet vinyl flooring** with an integral cove base is a common alternative.



Colours

Colour is more than a decorative tool. If used properly, it can be used as a visual identification system. For this, the correct **balance** of colours is needed. Select colours that are not so dark that they are perceived as black or so subtle that they appear dreary to the aging eye. For example, too many bathrooms are white on white, making it difficult to clearly see grab bars and the exact location of the toilet or the edge of the shower. Also, strong primary colours can be pleasing at first but eventually can become tiring. Therefore, strong colours should be used as accents. Too much colour can feel just as monochromatic as using neutral, similar colours.

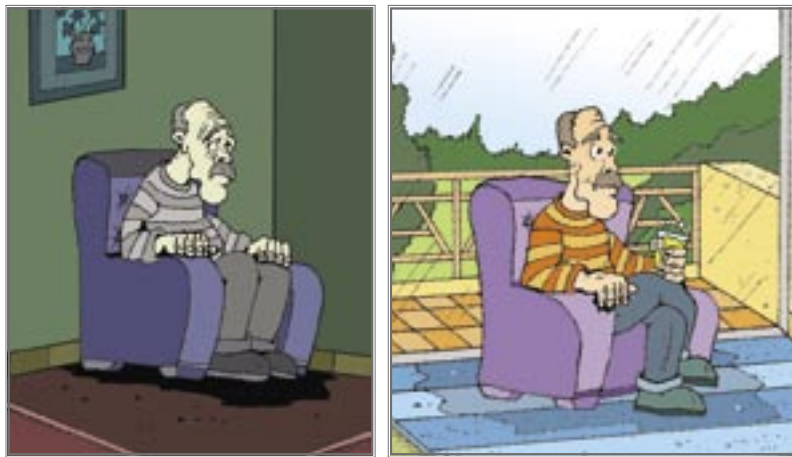
Selecting colours and patterns for the interior applications of assisted living environments should be influenced by taste and physiology. **Physiologically**, during normal aging, the lens of the eye yellows and the eye requires more light and greater contrast for visual clarity. Creating contrast is one of the easiest things a designer can do to help the eye. In general, lighter colours make a room appear larger, while darker colours make it appear smaller. Light-coloured letters on a dark background are generally the easiest to read. The yellowing of the cornea turns blues into grays and whites to yellows. Purple also appears grayer, and blue and green often become less distinctive and run together. Pastels are frequently harder to read, especially blues, lavenders, and pinks; therefore, brighter colours are sometimes best. The easiest colours to read are red, orange, and yellow.

Colour perception is also affected by the colour of **lighting**. Under incandescent light, fabrics appear more yellow. This is generally preferable to fluorescent light, which often has a blue-green cast. However, full spectrum fluorescent lighting creates a reflection that is more like incandescent and natural light. (*see also Lighting*)

Keep in mind that everyone perceives colours differently, not just because of their age, but also because of their **culture and background**. Colour and pattern have symbolic and cultural meanings that differ for everyone. Generally, warm colours in the red/orange/yellow range energise a space, while cool colours in the blue/turquoise/green

range are more soothing. Cool colours are often associated with tranquility and contentment.

Patterned fabrics and wall coverings can add variety to an otherwise bland environment, but they can also be overwhelming. Subtle patterns in wall coverings with colours in the lighter pastel yellow to light brown range are usually safe. Fabric patterns should be rich and should match the scale of a room. A large pattern for a chair back might do well in a large dining room but would be less successful in a small office space.



Contrast

The use of contrast can be highly useful in a number of different settings. For example, it is highly desirable to provide contrast between the horizontal and vertical planes to provide better visual discrimination that will **improve the sense of balance**. For example, a corridor whose floor and wall finishes have a similar colour and quality can be perceived by the residents as a muddy “river”. Also, sudden colour transitions from one flooring material can help in the **prevention of tripping**. Finally, contrast can improve seniors’ ability to **locate assistive devices** such as grab bars in the shower and doorways.



One way to **create contrast** is to select colours from the opposite sides of the colour wheel. For example, the designer who selects a green carpet might likely select furniture or fabrics with a red colouration. Ceilings should have high reflectance, in the 70–90 percent range. Walls should be on the light side, varying from 40 to 60 percent reflectance, while floors can be darker, in the 30 to 50 percent range, which is the reflectance of light wood.

(see also Colours)

Cooking

The preparation of food requires equipment and space, particularly when the kitchen is used by senior citizens with various types of impairments.

A senior citizen may find a kitchen with a **central island with a grill** very convenient, as food prepared here can be easily moved in any direction. **An interim shelf**, located between the countertop and the upper cabinet, can be used for convenience items that are left out for easy reference, and so minimise the need for opening drawers, stooping, etc. **Roll-out drawers** can be located below the counter to

ease the transfer of heavy cookware and reduce the need to stoop or bend. **Glass-faced cabinet doors** make it easier to identify equipment and food. **Under-cabinet lighting** can be used in combination with direct and indirect light fixtures to increase the light level so that it is easier to work. An **adjustable stool** and a **trolley** for transferring things could prove a good solution, when working in the kitchen. For people having visual impairments, **contrasting colours** make it easier to distinguish between food, dishes, and utensils.

Electric kitchen tools, such as the food-processor for chopping, blending, and whisking, are a great improvement, freeing the user from a number of minor working tasks. This is particularly important for people with reduced strength and dexterity. A number of electric kitchen tools are available, such as electric potato peelers, electric slicing machines, electric kettles, egg-boilers and lemon-squeezers. If it is difficult to remember to switch-off the electrical machines, different types of automatic switch-off devices are available.

While cooking, residents must make sure cooking pans are kept as steady as possible with the help of a **pan holder**. Pan holders are available in various types, such as the adjustable holder catering for pans of different heights, or the smaller holder clamped onto the hob by magnetic or suction pads. To avoid lifting heavy pans, residents can use a **cooking basket** when cooking vegetables etc. Adjustable **strainer lids** are useful when pouring water from the saucepan, using only one hand. In general, saucepans are easier to use if using only one hand; however, both saucepans and frying pans are available with two handles.

For residents that have visual impairments or are hard of hearing, put a **noise-maker** in the pan. This is a small metal plate, which makes bubbling noises when the liquid boils. **Kitchen tongs** are useful tools for turning and stirring meat in the frying pan. They are available with a spring handle, which returns to the open position automatically. To pour leftover liquid from the frying pan could prove a difficult or even impossible task, if you only have the use of one hand. Instead use a sucker, to suck up the liquid. **Long barbecue gloves** offer a good protection when carrying boiling food.

If residents only have the use of one hand or cannot grip things, special **preparation boards** are available. For example, cutting boards with spikes hold food such as bread, vegetables, meat in place. Other boards have suction pads or a non-slip rubber layer underneath, to prevent them from slipping. There are also cutting boards that achieve the same effect with the use of clamps.



Corridors

One of the most important forms of exercise for the seniors is **walking**. Because many residents experience mobility challenges, walking around the house once or twice can be a major workout. Residents should be encouraged to walk, and the outside of the house should be designed to encourage walking. The corridor system should be conceptualised as a series of paths and destinations so that residents will find it interesting to walk from one place to another. A walking-for-exercise pathway system could have interior corridors and exterior on-site path-ways.



It is important to encourage residents to walk as much as possible rather than rely on a wheelchair. However, a walker or cane can be very helpful for residents who need periodic balance control support. In case corridors are long (for example those leading to the garage), **benches** or places to rest in building corridors should occur periodically so that residents will be able to rest. Placing a bench on a stair landing can also encourage residents to use the stairs for exercise. Generally, it is safer for residents to walk upstairs rather than down. Corridors could also be designed with small alcoves where seating can be located.

*(see also **Walking Therapy and Design**).*

Cupboards

The cupboard for the storage of cleaning materials and tools should have provision for shelves, hooks etc. fitted at a comfortable height and easy to see and reach by people that can not overstretch. The cupboard containing the vacuum cleaner should be level with the adjoining floor to avoid lifting the vacuum cleaner. If the room is carpeted, attach sliding studs under the furniture. If the floors are bare, attach small felt pads.



D

Day lighting

The key to good lighting design is the **even distribution of light** and the provision of similar light levels from one space to the next. A brightly lit area adjacent to a dimmer area will make the two areas appear darker and lighter than if they were separated. The aging process slows down the eyes' ability to adjust to drastic changes in light levels. The integration of balanced lighting design and natural daylight is important to the health and well-being of the resident. When a naturally lit space during the day is adjacent to a windowless area, two levels of lighting design are required; one for day light hours and a lower footcandle level for night time – similar to the lighting at the entry of tunnels designed to ease the transition period between very bright sunshine and the darker tunnel. Window coverings are an essential part of controlling light levels and glare.

*(see also **Lamps and Lighting**)*



Dining room

The dining room is the most heavily used common space in the house. Typically, seniors take three meals per day here and probably spend more time in this room than they do in any other space. Furthermore, dining is one of the most pleasurable, sensuous experiences seniors have on a daily basis.



Views from the dining room to the outdoors are important. Ideally the primary view should be of landscape materials rather than a black-top parking lot. Although most residents do not find it very appealing, the option to take a meal outside is appreciated on special occasions. In the case of large or coop houses, a centrally located dining room that minimises the distance from the resident's room is important, especially for those with mobility difficulties. **Round tables** are easier to navigate around. If there are residents in wheelchairs, tables should be high enough to accommodate them.

Doors

Doors used by seniors must have a 90 cm minimum size, with a minimum clear opening of 80 cm and a 1 m minimum size, with a minimum clear opening of 90cm for wheelchair users. **Sliding barn doors** or **pocket doors** should be preferred inside the house.

Electrically operated doors, which are operated by foot or hand switch, pressure mat, or movement sensor, are available for seniors with poor strength in their hands. The house can be supplied with a complete system to open and lock doors.



Drafts

Many residents find drafts unpleasant, which is why outdoor spaces next to the building are preferable to spaces further away. In addition to controlling airflow by using the mass of the building, they allow residents to be near entrance and exit doors. When all else fails, **umbrella tables** often work well. They are movable and can be adjusted to conform to sun angles. The major problem is their tendency to be overturned by wind gusts.





Entries

Personalising the area adjacent to the entrance to one's house creates a very inviting atmosphere. In the case of seniors with memory problems and/or dementia, this can also be very useful. The effect can be achieved by the use of **shadow boxes** and **cases** where various personal items are prominently placed. Items that are varied in size, shape and colour are likely to attract more attention and be more effective. For example, a wreath on one door, twinkle lights on another, and a window box with plants on a third are more likely to be effective orientation devices because they are different from one another. Shadowboxes filled with meaningful memorabilia, although they may not be effective as orientation devices, serve to decorate the hallway.

Where the location allows, an **alcove** can be situated near the front door so that an important item or a personalised piece of artwork or furniture can be placed there. The entry to the house is a "first impressions" space that can benefit from built-in shelving where books or family photographs can be displayed. Also, the view from the entry provides an opportunity to preview the rest of the unit. Bigger houses can afford to have a larger entry place for galoshes, umbrellas, a raincoat, a clothes tree, or a clothes closet. A **convenient shelf** adjacent to the entry of the front door on which to set a small package while looking for the key to the house might be very useful.

Utilising a slightly **lower ceiling height** at an inside entry is one strategy for making the room appear more intimate. Placing a light that illuminates the resident's face and the face of the visitor can be useful for

safety reasons, especially in the case of seniors with reduced eyesight. Changing floor materials at the entry also marks the transition from the outside corridor (a public space) to the inside (a private place).

When the resident is bedridden or on a wheelchair, it may be necessary to have a **double-leaf front entry door**. Adjustable doorsteps, which are pressed flat when the wheelchair or bed passes over the doorstep, are available; however they need frequent cleaning to ensure they work properly. A **ramp** is a necessity for a wheelchair user if the entrance is not at level with the adjoining ground. If a built-in ramp is inadequate or cannot be installed, portable ramps, either folding ramps or telescopic ramps are available. Rails should be mounted at both sides and at two heights to cater for wheelchair-users as well as people walking.

Proper light is essential in the **driveway**, by the footpath, and the stairs. Sufficient light is needed by the front door to help find the keyhole, and the house number and name, however, the light must be shaded. Another possibility is sensor-operated security lights, which automatically switch the light on and off according to movements on the premises.

For a wheelchair user, an **automatic door opener** could prove a necessity, since opening the door and maneuvering the wheelchair simultaneously may prove difficult. Naturally, the door should be wide enough to accommodate the wheelchair.



F

Fabric wall covering

The use of fabric wall covering is usually limited, due to budget constraints, maintenance issues, seaming difficulties, and the time needed for wall preparation. If the process of cleaning the special wall covering is too complicated, it will very often not be maintained.



The inherent acoustic property of fabric is a positive aspect of the material. Fabric can be wrapped and glued to rigid panels and hung with Z-clips to improve the acoustic characteristics of a space. Another method, though higher in cost, is to stretch the fabric cover over soft or rigid acoustic material on a track system that permits easy replacement. An especially convenient fabric is **polyester**, which does not absorb moisture and therefore will not sag over time.

Fire safety

Fire safety is particularly important in buildings where seniors live, as their capabilities for fast action in case of an emergency may be severely limited. Some important issues in fire-safety, particularly taking seniors in mind, are:

- **Use of construction materials to reduce the likelihood of fire:** For example, wood-frame construction is limited in most European countries, and restrictions are often placed on the use of flammable interior finishes.



- **Reduction of the potential for fire-related structural collapse:** While this is more often an issue during fire fighting, many codes require structural assemblies that will withstand some period of exposure to fire or require buildings that are designed to permit collapse of one area of the building during a fire while other areas maintain their structural integrity.

- **Fire detection through smoke/or heat detectors** – particularly in high-hazard spaces such as kitchens and mechanical spaces- is now common. Senior residents and their caretakers should ensure that these systems are in good working order at all times, for example replacing the batteries of the smoke detectors on regular intervals.

- **Fire and smoke containment** through use of compartmentalisation is also common. If this is achieved by the use of fire doors, care should be taken so that the fire doors can be negotiated by seniors and frail people. High hazard areas, including mechanical rooms, storage areas, etc., should be enclosed with fire-rated walls, floors, and ceilings.

- **Fire suppression capabilities** through the installation of extinguishers and fire suppression systems in high-hazard spaces such as kitchens and the installation of sprinklers. If the senior is not capable of using the fire extinguishers, it is highly advisable that another person living near by be prepared to use them.



- **Evacuation** in case of fire or other emergency is the most universal concept built into the codes. Almost all European codes require that there be two means of exit from most spaces. The concept of having a choice of evacuation routes – in case one is blocked – is fundamental. Naturally, these exits should be usable even by people of limited mobility.

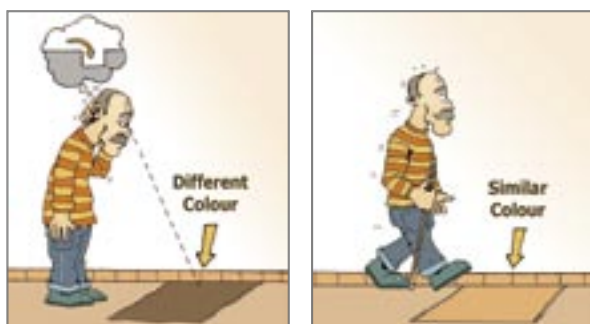
- Some European codes require **emergency and fire access** to all sides of housing. They usually also establish the location of a stand-pipe, hydrant, or other devices required for fire fighting. Typical requirements call for hydrants to be located such that any fire can be reached with 50 m of hose and provided with 2 m³ of water per minute.



Floors

Some floor patterns with strong contrast create the illusion of holes or steps, impeding mobility for those with restricted vision. Choose flooring products that have patterns without high contrast and with similar colours. Otherwise, there is the potential for vertigo and falls. Choose floor finishes that are not slippery or have a high-gloss appearance. Install carpets with fiber construction and moisture barrier systems appropriate for the aging population with incontinence. New **flooring materials** that are easier to maintain, more hygienic, and less cold in appearance continue to be introduced.

(see also **Soft finishes and Carpets, Ceramic flooring, Sheet vinyl/vinylised flooring and Stone/wood flooring**)

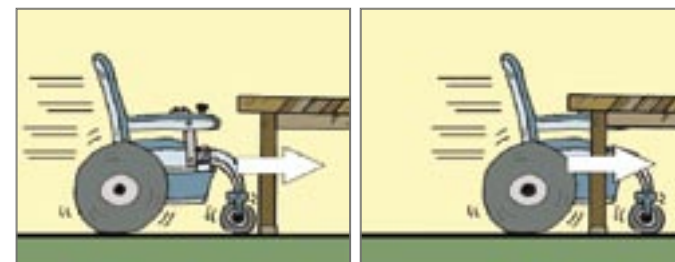


Furniture

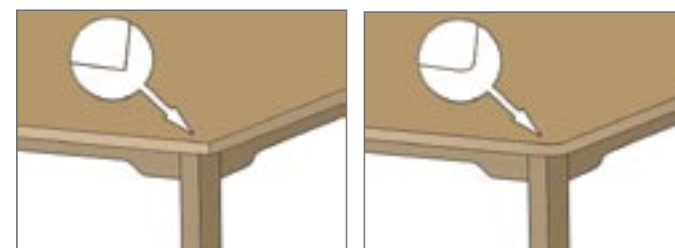
When selecting furniture for the home of senior citizens, their physical weakness must be kept in mind. Although the frailty of the residents will vary, it is better to err on the safe side by selecting for the frailest, keeping in mind that aging in place is a common aspect in many houses.

The physical effects of the aging process can be addressed by selecting furniture that meets the following criteria:

- Check the height of **tables** to determine if wheelchair accessibility is ensured. Adjustable-height tables are available, but in most cases the bases are not aesthetically pleasing. Some manufacturers have introduced wooden pedestals that are adjustable.



- Many **chairs and couches** are too deep or do not have arms that permit a frail person to rise from them without assistance. Avoid sharp corners or wood trim, furniture, hardware, and other interior elements. Limit use of **mirrors** on walls to create the illusion of space, as this can cause confusion and disorientation. Proper dimensions: seat height 45-48 cm, seat depth 50 cm maximum, arm height 63 cm-66 cm; style of arm: the arm must extend to the front of the seat so that they will support the weight of residents who lean on them in order to stand or sit unassisted.



- **Appropriate weight:** Furniture with multiple functions and flexibility, such as stackable chairs, need to be light enough for the occupant to move while still providing a safe stable frame with arms that will not tip over when the seated person tries to rise. Tables that fold need to have mechanisms that lock in place for stability without any sharp edges or movable parts that can cut and pinch when set in place.

- **Upholstery issues:** To address incontinence, the current trend in upholstery is a woven material known as Crypton, which is sealed to repel stains and prevent the passage of moisture through to the cushion. This can be an attractive alternative to stiff and sticky vinyl upholstery. There is upholstery material made out of nylon that has the same protective top layer as the traditional material but is soft and supple like leather.

- **Cushions** of chairs and couches must be supportive so that the bottom of the seat will not sink much lower than the height of the occupant's knees.



- **Rockers:** Studies have shown that rocking chairs have a positive effect on the well-being of senior populations. There are safety concerns associated with the standard rocking chair, however. They are a trip hazard, and there is the possibility of rocking over someone's foot. The safest way to provide the benefits of the rocking motion is a stable rocker that will not tip forward when the resident uses the

arms for support to stand. There are many manufacturers of this type of seating.

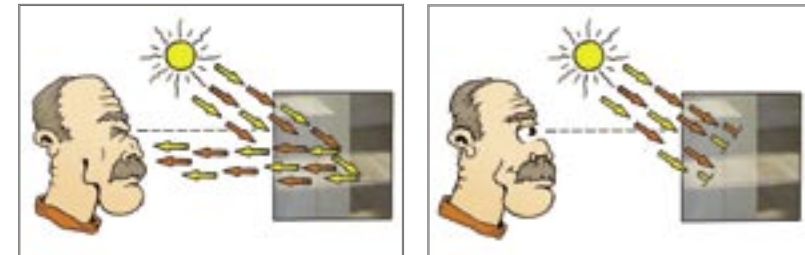
- **Durability of construction:** In order to minimise the risk of life threatening injuries, furniture designed for seniors must be particularly sturdy, with bracing and sturdy joinery. Chairs for dining should have cross support stretchers to prevent the legs from loosening due to the constant pushing and pulling from residents sitting at and rising from the table. Casters can be added to the front legs to reduce the stress on the structure of the frame and assist the resident when pulling up to the table. For safety reasons, however, casters should be placed on the front legs only.



G

Glare

The aging eye is more susceptible to glare because of changes associated with the hardening and yellowing of the cornea. Cataracts, which are common in old age, also exacerbate problems with glare. As a result, glare, especially from clear bulbs with visible filaments, is particularly troublesome to seniors. A **frosted light bulb or shade** reduces glare by spreading the intensity of light to a larger surface thus reducing contrast



Glare can often result from a contrast in light level from one room to another or from a dark wall colour against a window wall. Increasing the amount of light inside a room or lightening the colour of the wall covering can reduce glare by balancing the light more effectively. **Skylights** located in the darkest portion of a room can introduce a large amount of light that “balances” an exterior window wall.

Light from high windows allows light to penetrate deeper into a space, sometimes reducing glare. Indirect lighting sources are one of the best ways to avoid glare. **Pendant lamps** that provide direct light but also bounce light off a ceiling or wall are popular because they represent a good compromise between quality and cost.

H

Handrails

In general, most senior citizens, not surprisingly, prefer to stay at home as long as possible. As they age, they become frailer, and may also experience the insecurity of living alone. Therefore, modifications to their homes are needed, that often involve outfitting the rooms with better security hardware.

The most common modifications include **grab bars** and handrails that reduce the probability of falling. Some adjustments make tasks more convenient or easy to carry out. Overcoming the chronic pain of arthritis, for example, is the main reason for using lever knob turners for doors. Other changes are designed to increase the ability of residents to handle tasks like toileting, bathing, dressing, cooking, laundry, and cleaning more effectively.

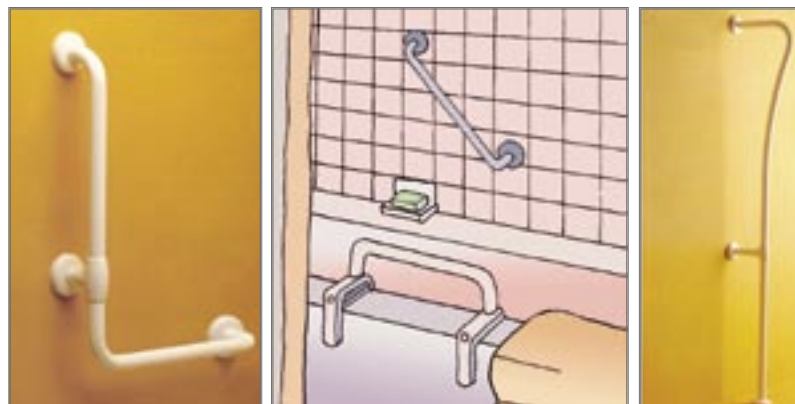


The wrong mounting height for an appliance or handrail can make it unusable. An incorrectly shaped handrail, especially one that is too narrow, can be hard for an arthritic hand to grasp.

When grab bar locations are positioned for younger handicapped people, they are often not very useful to seniors. For example, grab bar locations for toilet transfers often assume the wheelchair transferee has good upper-body strength. This is clearly not the case with many seniors (especially women), who, due to normal aging, experience major losses in muscle mass. Given their own physiology, these residents can find the grab bar location too high or too low. The best way to deal with this problem is to back the wall adjacent to the toilet with 70 mm plywood so that grab bars can be located in different places according to the wishes of each resident.

Some might prefer a **low horizontal bar** to push from, while others would do better with a **sloping bar** that allows them to pull up from several different locations. Occupational therapists who study these details can determine the grab bar that matches the physiology of a particular resident. The average size shoe doesn't fit everyone, just as the standard handicapped grab bar location doesn't fit everyone.

To make residents' transfer secure inside the house, **grab rails** are very useful. There are thousands of models to choose from: long, short, narrow or broad grab, different surfaces, fastened in different ways, specialised for corridors, kitchen, bath, toilet, sitting-room, and specialised for specific diseases.



K

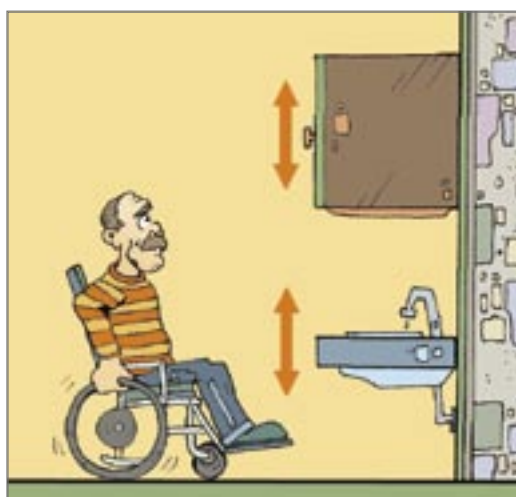
Kitchens

Here are a few recommendations for arranging the kitchen for senior users. It is important to contact qualified professionals in order to get the right solutions. The most important is to note that if a wheelchair bound person is going to work in a kitchen, it is necessary that there is a turning space of at least 1.70x1.70 cm.

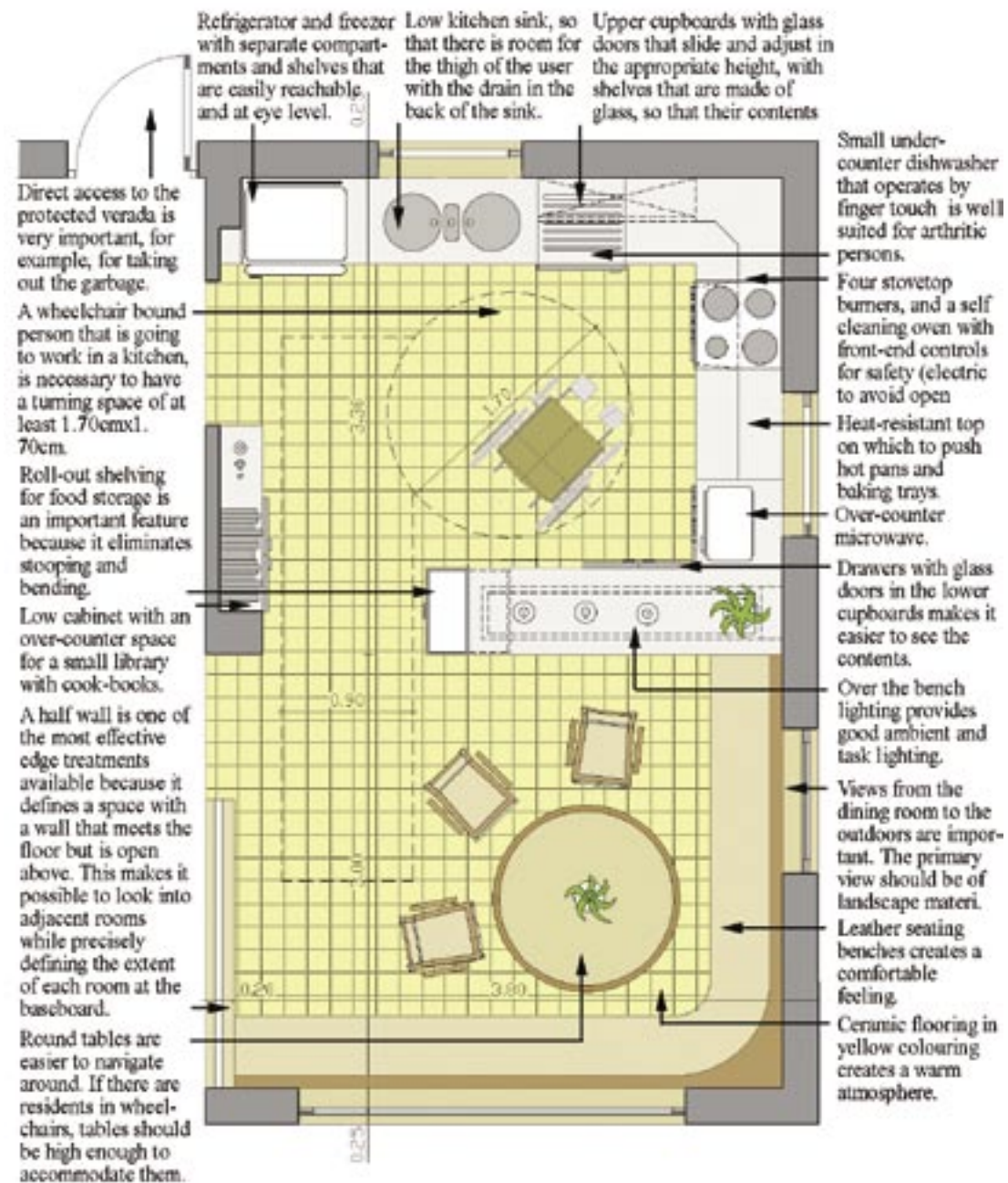


▲ *Example of a kitchen designed for the needs of a wheelchair user. The cupboards over the counter are sliding, so that they can be adjusted in the proper position for the wheelchair user to reach.*

Most functions in the kitchen take place at the hob, the sink and the preparation place in between the two. This workplace must be without lower **cupboards** so that a person can sit and work. A good solution will be four stovetop burners, and a self cleaning oven with front-end controls for safety (usually electric to avoid open flame). Between the hob and the oven there must be a heat-resistant top on which to push hot pans and baking trays. An over-counter **microwave** is also useful. The kitchen sink must be low, so that there is room for the thigh of the user and the drain ought to be in the back of the sink. There must be insulation underneath the sink, to avoid burns on the thighs of wheelchair users without tactile sensation in their legs. Side-by-side **refrigerators** so that both **freezer** and refrigeration compartments have shelves that are easily reachable and at eye level, are also recommended.



To the senior that can not overstretch, it can be an advantage that the shelves in the upper cupboards are made of glass, so that their contents can be seen from below, and drawers in the lower cupboards are preferable, because it is easy to see the contents. There are also available in the market cabinet accessories that glide out and turn, to maximise easily reachable storage space that doesn't require excessive bending, twisting, or extension.



▲ Typical floor plans of a kitchen and dining room.

A **dishwasher** could prove a good solution. However consider carefully where to put it, how high above the floor it should be fitted and which make would serve you best with regard to control panel, capacity, and use. Provide a trolley, pull-out working surface or something similar to simplify the process of filling and emptying the racks. Small table-mounted dishwashers are available, catering for only 4 place-settings, however, the racks are easier to handle. A few models of dishwashers operated by finger touch are available, which are well suited for example, for arthritic persons. Instead of protruding knobs to press or turn, all functions are selected with only a slight touch of a finger on a designated area.

In a kitchen, **light** is very important. Under-the-cabinet lighting provides good ambient and task lighting. Roll-out shelving for food storage is also an important feature because it eliminates stooping and bending. Shelves between the counter and upper cabinets are also popular for items that are used every day. Features like a roll-out stool at the sink, deep pantry storage, and lateral placement for the storage of pots and pans, and eye-level appliances are very useful.

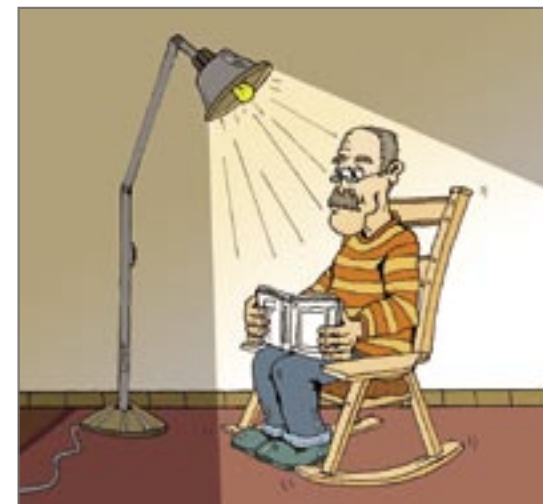
*(see also **Cooking and Dining Room**)*

L

Lamps

Table lamps should have a toggle switch located on the column rather than the customary knob at the bulb. There are table lamps that can be bolted to the bedside cabinet and are offset for mounting at the rear of the cabinet surface to provide a work area and space for personal belongings.

The use of **floor lamps** as a supplemental source is controversial. Many of these fixtures can easily tip over, so if this lighting option is considered, lamps with weighted bases are essential. Bulbs should be enclosed so that if the lamp tips, the bulb will not shatter.



Lighting

In the design of appropriate lighting for senior housing, a large number of issues should be kept in mind, and a large number of decisions should be made. A few of them are now discussed.

- An important issue is to decide on the number of **ceiling fixtures** that will be used. Also, whether **switched outlets** are preferable to ceiling fixtures. There is also a problem with switched outlets, in that residents will not always understand that the light must be turned off at the wall switch rather than at the lamp. If residents do not understand this, the switched outlets become pointless because the advantage of being able to switch them on upon entry is eliminated.

- An important issue is to decide on the use of **occupancy sensors** in bathrooms, and other periodic-use areas to turn-off lights when neither residents nor care-givers are present. Although these devices are very practical, they can appear complicated and distracting to seniors with dementia or similar conditions.

- Living spaces should be designed with the aim of maximising **day lighting**. Proper day lighting design, including glare control, can eliminate the need for artificial lighting during the most active periods of day. Care should be given to the orientation of glazing. Perimeter design should incorporate drapery or blind pockets inside and shading by landscape elements outside.



- Use of **photocell-controlled lighting** is a natural complement to day lighting design, and can be used both inside the building and for site lighting, entry canopies, and parking areas.

- **Low-energy fixtures** are appropriate for some uses, such as light-emitting diode (LED) exit lights and high-pressure sodium lamps for parking lots. LED fixtures have long expected life, and sodium vapor lighting produces twice as much light per watt as mercury vapor lighting and five times as much per watt as incandescent fixtures. The location, mounting height, and orientation of sodium lamps must be carefully controlled to avoid light spill onto neighboring property or glare back into resident rooms. Energy conservation is particularly important since many seniors might systematically forget to turn the light off.

- **Even distribution of light levels** on the floor surface so as not to create visual barriers of dark and light spots.

- Appropriate light levels for the aging eye – **footcandle levels** 15-20 percent higher than for younger adults.

- Consistent light levels from one area to the next to accommodate the slower adjustment of the eye of the senior to high contrast.

- Provision of **transition areas** to give the eye time to adjust to spaces with different levels of light.

- Design should permit a variety of light levels and flexibility. This can be accomplished by using several light sources, such as cove, decorative, and downlighting. Dual switching and dimming capabilities are available for fluorescent light sources, and it is often advisable to mix incandescent lighting in decorative fixtures with more energy-efficient fluorescent fixtures.

- Use lighting to highlight architectural features such as vaulted ceilings, beams, wood ceilings, etc.

- **Dining areas** should have light levels as high as 200 watt so the residents will be able to clearly see the colour of the food. One of the better light sources is indirect because it minimises glare and shadows.

- **Lounge areas** should not rely solely on accessory lighting from table and floor lamps because bulbs are not always replaced swiftly.

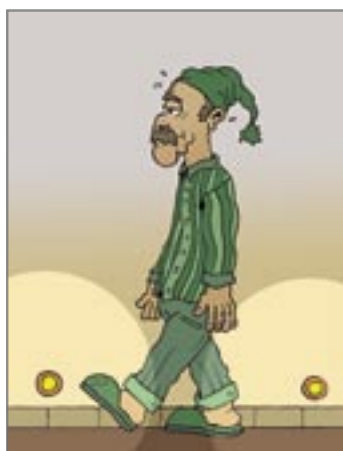
Accessory lighting should be considered supplemental to general light levels of a minimum of 100 watt.

- Variation in light source is a key design element to help visually shorten the length of corridors. The integration of lighting with architectural features creates visual cueing to support wayfinding and areas of interest along the resident's trip down a corridor.

- **Decorative light fixtures** placed at house entries not only serve as wayfinding elements but also provide supplemental lighting for residents to find their keys and locate the keyhole. An alternate way to highlight entries is to install a recessed cove over the door, bathing the entry in accent lighting.

- **Ceiling fixtures** for general lighting can be combined with a supplemental light source such as a table lamp on the bedside cabinet.

- **Night-lights** assist the residents in finding the path to the toilet. Their design should properly direct the light to the floor surface, and the cover design should not permit light leaks that could disturb sleep.



- **Ceiling-mounted fixtures** that have multifunction light sources to address ambient, reading, examination, and night light are available from several manufacturers. Specular aluminum reflectors allow for precise light control and a glare-free environment, and fixtures may be recessed or surface-mounted.

- **Kitchen/entry vestibule:** This area is usually provided with a

light source upon entry as well as general illumination for the kitchen and adjacent closet. Since the light source is overhead for a person standing at the sink counter, shadows will be cast on the work surface. Therefore, it is very important to have under-cabinet lighting to enable the resident to see at the sink and counter area. Proper lighting will encourage residents to use their kitchenette.

- In **bedrooms** a switched outlet is more typical. However, the bedside lamp that might be plugged into the outlet linked to the switch will always be turned off at bedside, thus eliminating the ability to turn on the light at the doorway. Ceiling fixtures are recommended in this area. More reasonably priced fixtures have a standard incandescent lamp or a less efficient fluorescent circleline. There are other options, such as more efficient fluorescent lamps. If the bedroom is not provided with a ceiling fixture, all closets should have their own light sources. **Over bed lighting** can incorporate direct and indirect light sources with varied switching options. Rooms with higher levels of care, bedside treatments, and medical evaluation in the elderly person's room will require a supplemental light source over the bed or mounted on the wall for exams.



- **Bathroom:** Since most accidents occur in this area, the light must be evenly distributed so the resident can clearly see the location of all assistance devices such as grab bars and be able to read the medication labels on items stored in the medicine cabinet. As discussed previously, an indirect light source is the most effective to minimize glare.

Fluorescent lamping is the best light source to provide the higher light intensities necessary to recognise colour and clarity of image, and provides higher light output at lower wattages. Because toilet areas for senior populations are large due to the accessibility guidelines, extra care should be taken so that the lighting is sufficient.

•Supplemental lighting provided by a **heat lamp** is also desirable. It not only warms the area but also serves as additional task-lighting for drying and dressing. Many times a combination unit is used that include an exhaust fan if there is no central exhaust system. It is also a good practice to install a night-light to illuminate the path to the bathroom at night.

(see also Lamps, Sight Lighting, Day Lighting, and Glare)

Linking different rooms

A continuity of rooms has the advantage of defining the extent of a room in more than one way. It is the ambiguity of the extent of a space that often makes it interesting. Rooms that visually lead into one another provide opportunities for visual stimulation while also helping the senior preview the next space.

Changing floor material is a common approach to defining the spatial extent of a room. However, even subtle changes in floor materials can cause level differences or surface friction differences that could lead to tripping. Windows and atriums in corridors and between rooms also allow natural light to penetrate these spaces as “borrowed” light.

A **half wall** is one of the most effective edge treatments available because it defines a space with a wall that meets the floor but is open above. This makes it possible to look into adjacent rooms while precisely defining the extent of each room at the baseboard. Half-walls are often accompanied by vertical columns that provide additional cues to the extent of a room. Walls formed by materials that provide a partial view into an adjacent space create another effect. These materials can be patterned glass, wood grids, horizontal slats, fixed window panels, glass block, or metal screens.



It is important to keep in mind that dementia residents often perceive only what is within their immediate visual field. If a solid door is closed, they may have no idea what lies on the opposite side. What is out of sight is literally out of mind. Therefore, **doors with windows** should be used wherever possible, for example in the case of exits but also in closets.

Kitchens with open shelves or cabinet doors with glass faces facilitate residents’ participation in meal preparation because they can see exactly what is located in a pantry or upper cabinet. A graduated dressing cabinet with a glass front is also easier for a resident to identify. **Transparent window walls** that reveal an adjacent room or a half-wall separation is effective in making adjacent spaces more visible to dementia residents. The furniture and the layout of the room can also provide cues about its use.

A living room is easier to identify when it is anchored by a fireplace flanked by book shelves with a couch in front. A dining room makes more sense when it is visually connected to a kitchen on one side with a family-size table for eating. An appropriately proportioned room with the right furniture placements imbues a space with meaning, making it easier to understand.

(see also Movement, Corridors and Accessibility)

M

Materials

It is very important for a senior to live in an environment that is not bland and boring. The colour palettes, material choices, and general ambiance must create a home atmosphere. Smells, sounds, and scents that contain references to positive places and experiences can transform a place.

In general, having a **variety of textures** is an excellent. People who are blind or partially sighted often use texture to differentiate and identify spaces they are entering. In the United States, some textures, like stone or brick, might be considered too abrasive for interior applications, but in northern Europe, exterior textures like brick and stucco are often used for interior wall surfaces.



When considering interior material selection, the following are important:

- **Durability and appropriateness for specific use:** For example, while some residential products can be used, most often commercial-grade products, with a residential appearance, are most appropriate for senior living environments.
- **Maintenance:** Most products provide specific maintenance guides, which need to be followed to assure longevity of material.
- **Life-cycle costs:** Initial cost, maintenance cost, and operating cost over the useful life of the material.
- **Appropriateness** for a senior population.

Movement

Residents with impairments so severe that it is impossible for them to walk need to be lifted into and out of bed. The **portable lifting devices** manufactured by medical equipment suppliers are U-shaped and contain wheels and a hoist-style hydraulic or electric lift. The major requirement for their use is a relatively large bathroom and bedroom area so that the resident can be easily moved to the toilet seat.

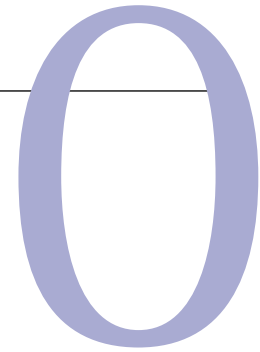
These portable devices are bulky and slow. The most common lift technology used in Europe today consists of devices that are attached to a ceiling track. They utilise a similar electric power plant that, in combination with a canvas support, lifts the resident from the bed. The overhead rails are designed as either single or multidirectional.

Single-directional models link the bed to the bathroom. They can be used to transfer a resident to a wheelchair or carry the person directly to the commode or the shower. Lifts also allow residents to be transferred to a chair or a wheelchair so that they can be out of bed for part of the day.

When designing **ramps**, a maximum 8.00 percent slope is allowed, 5 percent, or 1 in 20, is preferred for seniors. Landings should occur every 9 m. The minimum width is 1.20 m, but a 1.5 m width will allow two-way wheelchair traffic. Handrails should be mounted 80 cm above the ground.

(see also Linking Different Spaces, Corridors and Accessibility)





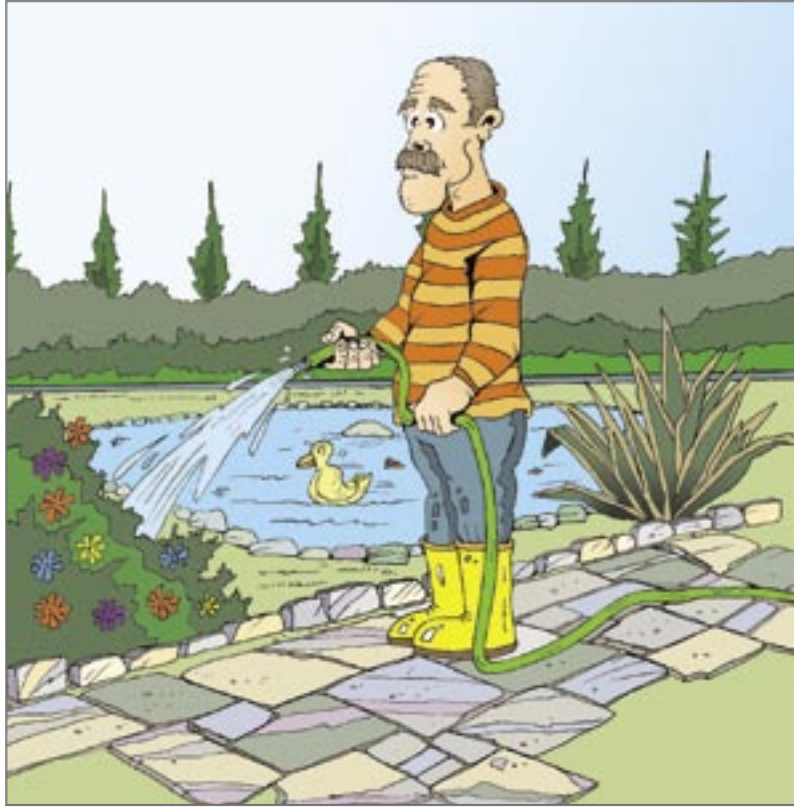
Outdoors

The vast majority of senior citizens have had experiences with **gardening**, either as a hobby or a pastime. There is something about nurturing plant that is attractive particularly to many elderly women. It is an activity that provides continuity in their lives from past to present. It also provides a way to interact with the surrounding environment.

Raised gardens allow plants to be accessible to people in wheelchairs and also allow residents to care for them without having to bend over. When raised 0.80 m to 1 m, gardens are closer to the eyes and the nose, making it easier for seniors to sense and appreciate the plants. Gardening should always be tried with residents in dementia or in assisted living.

Gardening doesn't involve a major investment in time or money. Resident garden installations can vary in scale from a few pots to a large, raised planting bed surrounded by a fence, often with access to a **water source** and a small potting shed. The process of nurturing a garden is intrinsically satisfying to many people.

Most senior citizens are interested in going outside on the nicest days. These are often days when the sun is brightest. When sitting outdoors, they want the option to sit in areas that offer sun, shade, or partial shade. Shade is particularly attractive in mid-summer, near the end of the day, or when the temperature is highest.



Structures like **gazebos**, **umbrellas** and **garden trellises** are interesting places to experience shade, as well as interesting objects that can be seen from indoors. A bright, sunny summer afternoon is very different from a cool spring morning. Seasonal change as well as the time of day can affect the attractiveness of a particular spot. Also, if the day is hot or cool, one often feels differently about the desirability of direct sun.

P

Paint

Paint is the most popular wall finish. Like vinyl, it can be durable and low-maintenance, but it is important to use the appropriate type of paint for the correct area. For example, the wrong paint used in bathing and shower rooms or kitchens can lead to cracking, flaking, chipping, and fading because of the high levels of heat, humidity, and expansion and contraction of surfaces.



As a general rule, the higher the proportion of solid components, the more expensive the paint, because of superior durability and colour retention.

Paint considerations:

- It must be **environmentally safe**.
- **Colour:** The colour of paint used in walls should be sufficiently different from the colour of flooring.
- **Types and proper location:** The choice of paint finishes is dependent on application. As noted above, the conditions in bathrooms mandate a more washable surface. However, the benefits of increased durability and stain resistance offered by higher-gloss paints are balanced by the increased glare, which can be hard on aging eyes. Thus eggshell finishes are often recommended for most walls in senior housing.

S

Safety alarms

A security and safety alarm system for senior residents that live alone could be life- saving. Such systems consist of an **alarm call**, connected via the local or national telephone company and activated by the touch of a button. The sender can be worn in a string around the neck or in the pocket. If activated, the alarm call is received at the nearest police-station or at the local services. Some alarm systems offers the possibility of direct contact with staff at the local services.



Shading

Awnings are perhaps the most common shade structure. These are easy to attach to a building and, if large enough, they can provide shade inside as well as outside. Those used in senior housing are often controlled by a motor with a switch located inside the house. **Trellis shade structures** attached to buildings can be designed as an extension of the building facade. When arranged this way, they appear more substantial. Over time, plant materials can be trained or shade cloth can be attached to a trellis to create a partial shade condition. If flowering plants are used, they may attract bees and insects. Air flow and breezes are also important considerations.

A **sheltered pathway** between the car and the entrance to the building is recommended. This is especially helpful in cold, northern locations and in areas where heavy rainfall is common. It is surprising how a small inconvenience like walking 6 m – 9 m in inclement weather can discourage frail residents from participating in activities and outings. A **porte cochere** eliminates this problem.



Sheet vinyl/vinylised wood flooring

Resilient flooring materials are ideal for use in wet areas or areas of high maintenance, such as utility and bathing areas. In addition, some care-givers, concerned with incontinence and maintenance

issues associated with carpeting, prefer resilient flooring in resident rooms and other areas. The disadvantage of these materials is that they require frequent buffing and cleaning by specialised machines that may cause significant disturbance and noise.

Resilient flooring issues:

- **Glare:** Often seniors view high sheen as signifying cleanliness. However, by definition high-sheen flooring materials produce significant glare and are thus not appropriate for senior housing. Instead, there are low-luster finish products available, which reduce glare and often increase traction to prevent slipping.

- **Cost:** Cost usually drives the selection of the product. Vinyl composition tile has the lowest first cost of the available options. However, vinyl tile requires frequent and serious cleaning and buffing, giving it a high life-cycle cost. Other types of resilient flooring can be as much as three times the first cost of vinyl tile, but require less maintenance.

- **Colour trends:** Consider colour longevity in use of materials and avoid colours that may become dated.

- **Slip- and water – resistant options:** In wet areas, use flooring materials with a slip-resistant coefficient. Slip-resistant products require more maintenance because their rough surfaces are more susceptible to dirt collection and are more difficult to clean.

- **Seaming:** Heat and chemical seals may be used for sheet goods, depending upon the product.

- **Transitions:** Transitions between flooring materials are very important because they help keep the edges of the material in place and prevent the loose edges that can cause tripping. Designers are encouraged to use vinyl transition materials that create a smooth, gradual transition appropriate for wheeled traffic. In addition, it is very important that flooring materials are carefully cut and adhered, and that transitions are properly installed.

- **Maintenance:** As mentioned above vinyl tile requires high maintenance because it is more porous. Products that feature a solid vinyl wear layer are more scratch-resistant, less porous, and require less sealing and buffing. Thus, these products have lower maintenance costs and are ultimately less disruptive to residents.

Showers

Showers seem to be preferred over tubs by many seniors and their care-givers, but this may be due in part to a lack of satisfaction with bathing equipment.

Frequently cited **shower problems** include:

- Slipping is a common hazard in shower areas.
- Negotiation of a shower threshold can be difficult.
- Integrally molded seats and fold-down seats are not recommended, unless required by law, as these seats are often small, sometimes difficult to fold up and down, are far from controls, and make it difficult for the care giver to assist in reaching all parts of the body.

Desirable features include:

- An **adjustable handheld shower nozzle** improves cleansing flexibility, avoids a harsh or noisy shower spray, and supports resident autonomy.

- Although a **raised threshold** does not always meet accessibility requirements, the threshold can help to maintain water within the shower area. Shower thresholds that collapse when stepped upon or rolled upon with a wheelchair are a newer means for providing accessibility and for containing water within the shower.

- A **freestanding plastic shower chair** is an inexpensive option that adds flexibility and can be safer than an integral seat.

- European standards, upon which most accessibility codes are based, designate clear inside dimensions of 90 cm x 90 cm for a transfer-type shower stall and 75 cm x 1.50 m for a roll-in type shower stall.

Features important to both tubs and showers include adequate space for



▲ *A typical shower.*

toiletries, robes, and clothing adjacent to the fixtures. This helps to shorten the time the resident must wait to dry off or cover up just after bathing, as well as supporting resident independence and privacy during the process. A shelf within the bathing enclosure should be large enough to hold several bottles and soaps, with a continuous surface rather than open slats, so that contents remain stable.



▲ *Example of a shelf, attached to the wall for safety reasons, with attached soap holder with glass dish and tooth-brush holder.*

Showers and baths are not the only means of attending to resident hygiene. Cleansing with a washcloth is sometimes the only option for residents who are unable or unwilling to sit in a tub.

The 0.9 m and 0.75 m shower are the two sizes recommended to meet accessibility/adaptability standards. 1 m or 1.2 m showers (with the capability of being retrofitted to 0.9 cm) are preferred sizes. The dam at the base of the shower should be removable or it should be a flexible rubber material that can be crushed and thus reduced in height for wheelchair passage.

Bath stools for showering are available with or without arm rails, back supports and wheels, and in number of sizes and heights. Some models can be fixed on the wall of the cabinet and be folded when not used. It is possible also to have padded seats in order to prevent pressure sores. In the shower, hand rails should be fitted to ease the acts of sitting down and getting up. If someone cannot reach the mixer taps when seated in the shower, a shower handset is available with a turn-on/turn-off device on the spray head.

Site shape and topography

Site shape and topography are two of the most important factors in establishing the layout or organisation of the house. Because so many senior frail residents utilise canes, walkers, or wheelchairs to get around, flat, walkable surfaces are ideal. However, a good site location with a **challenging topographic condition** is often much better to work with than a poorly located site that is flat.



A pathway that has only ramps can be restrictive. Whenever possible, ramps should be planned in conjunction with stairs. In frost belt settings, **ramps** alone can be dangerous, especially for ambulatory residents who have balance control problems. Ramps should be avoided within the building. Residents using canes and walkers can lose their balance, and residents in wheelchairs can easily lose control.

Site lighting

Lighting prominent landscape and garden features is one of the best ways to deal aesthetically with lighting at night. Elements like trees, hedges, garden areas, trellis structures, and gazebos located in the landscape are often visible from the street as well as from the house.

In contrast to lighting the building, landscape effect lighting gives everyone something to look at after the sun goes down. Indirect lighting on porches and light emanating from interior windows gives the building a glow that is attractive from the street. This is always preferable to commercial lighting aimed at the building.

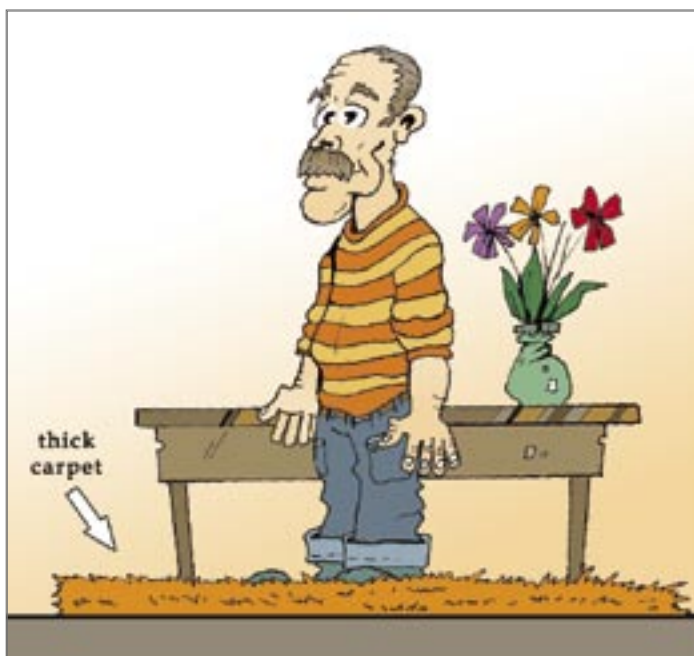
Sidewalks that link the parking lot with the front entry should be well lit at night for security purposes. **Parking lot lighting** at night should be at least 15 cm-candle throughout. The specification of attractive residential-scale light fixtures for both sidewalks and parking lots gives these areas a less commercial feeling. Pathway lighting around the site is handy for those who might want to take a walk after dinner, especially in the winter, when the sun goes down early.



Soft finishes and carpets

Usually, the first interior product addressed when designing the interior of a safe house is flooring. Due to market competition and the desire to create a hospitable residential environment, carpet is being used more frequently in all houses for seniors. This is primarily because of recent developments in carpet construction, including advances in fiber type with soil repellent treatment, very effective antimicrobial treatments, and improved backing systems. These backing systems increase the tuft bind rating of loop carpet, so that pulling on a single loop does cause the carpet to “zipper” or unravel, as well as providing a moisture barrier against spills and incontinence.

Dense loop carpet is ideal for senior living facilities because it provides the best walking surface for the frailer population; it allows sufficient friction to prevent slipping and provides a soft yet firm surface for shuffling feet without impeding the use of wheelchairs or walkers by those with compromised mobility or balance. It is recommended to use a loop face weight of 700 gr - 900 gr.



Carpet considerations

- **Carpet construction:** Designers must be aware of the types of backings, fibers, types of pile (loop or cut), and weight of the carpet they are going to install, and be sure that they are specifying the appropriate carpet for each space.

- **Slab treatment:** Carpet with moisture-barrier backing is recommended for senior housing because of the risk of spills and incontinence. It should be noted, however, that the backing might require special installation and compatible adhesive. Some sealant products, for example, absorb moisture that is locked between the slab and the waterproof carpet, causing the sealant to degrade and crack.

- **Volatile organic compound free adhesives:** Minimise the use of products that produce off-gassing, as frail seniors are particularly susceptible to airborne contaminants, which may cause irritation to eyes and respiratory systems.

- **Installation guidelines:** If proper installation procedures are not followed, manufacturers' warranties may be voided. For example, some moisture-barrier carpeting is perforated for easier rolling and shipping, and must be resealed when installed with a special adhesive. Failure to use the appropriate adhesive voids the warranty and renders the moisture barrier ineffectual.

- **Cost:** Product selection should be tailored to work within the project budget. There are often ways to maintain desired aesthetics even within a limited budget, such as reducing the face weight of carpet, selecting all products from one mill to increase buying power, and understanding mill minimum yardage requirements to provide the client with the advantage of a custom-coloured carpet without spending significantly more than you would for a standard colour.

- **Broadloom versus carpet tile:** For some spaces, carpet tile might be worth the extra cost. In others, it is superfluous and broadloom carpet is sufficient or even preferable. Use of carpet tile is an advantage on floors that conceal computer raceways or equipment below, or where incontinence or spilling will require tiles to be removed for cleaning or replacement. Some care-givers find that the machines used to clean a heavily soiled carpet in pace

are too disturbing for seniors, especially those with dementia, and thus carpet tile is preferable because it can be temporarily replaced and cleaned off-site.

Staircases

Some wheel chairs are constructed to be able to climb staircases. Another way to climb staircases is to have a so called **stairclimber**, which is combined with the wheelchair and climb the stairs. There are models which the user can manage himself and other models, which need an assistant.

Steps and staircases by the **entrance** will almost always cause problems if seniors walk with difficulty or are wheelchair users. A rail or perhaps just a grip is very convenient if residents are forced to climb one or two steps. If the entrance door is at the same level as the adjoining ground and the doorstep sticks up, this problem can be overcome by placing a roll-up ramp on the side free of the door.

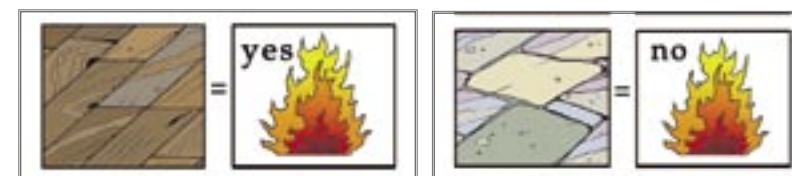


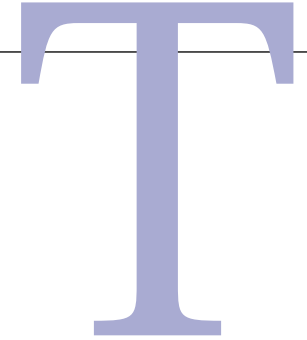
Stone/wood flooring

Stone and wood are appealing options for senior housing because they help create a residential atmosphere. However, both have their drawbacks, and designers should be careful when specifying these materials. Although stone floors are generally slippery and thus not

recommended for senior housing, a **sealer** can be applied to meet slip-resistant coefficient requirements. However some stone products can still appear slippery and inhibit residents from using those spaces. Thus, such materials should be used sparingly and limited to such areas as prominent entries or a fireplace hearth. Wood, though not necessarily slippery, has a high first cost and requires significant maintenance.

The inherent **flammability** of wood may also be an issue. Because of its thick construction, transitions between wood and other flooring material can be problematic, and may require a slab depression, which adds additional cost. Instead consider using sheet vinyl goods that provide a wood look, cost less, require less maintenance, and are easier to transition.





Telephone

A wide range of telephones and devices to assist in the use of the telephone are available, no matter whether the seniors have visual impairments, are hard of hearing, need a voice amplifier, or have difficulty in remembering telephone numbers or moving around. Here are some examples:

- A **keyboard** attached to the telephone, which have extra large numbers.
- Telephones which have a **number memory**, are available with raised keys and extra large figures. Keys could be marked in different colours, or photos or drawings could be fixed on the keys. This not only caters for people who have visual impairments or people who are hard of hearing, but also people who have memory loss etc. The handset can be placed in a telephone holder, which rests on the table.
- **Voice-operated telephones** are also available. They connect whether the receiver is lifted off or not, enabling the residents to walk around the room while talking.



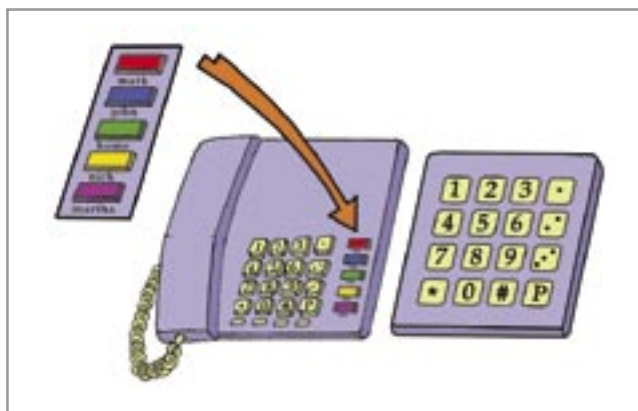
- If someone is hard of hearing, an **extra bell** or a **call indicator** can be of use. The call indicator flashes when the telephone rings. Telephones, which ring very loudly, are also available, allowing you to choose the ringing sound from a scale of tones. Extra loud ringing could also be achieved by connecting an amplifier to the ordinary telephone.

- Telephones with **text input** and/or output, which means people with hearing impairment can write to each other instead of talking to each other. These telephones come in a variety of types, and offer the freedom of communication to deaf people, to people who are both deaf and blind, or people who have severe speech deficiencies.

- Service may be integrated with voice mail, Internet, etc.

- **Phone-switch software** may be used to track and report important calls and billing information.

- Phone equipment may respond to aging users, with features such as **enlarged numbers**, **enhanced speakers** (potential for hands-free use) for auditory clarity, and **handset/cradle design** for ease of use by those with compromised mobility.



Temperature control

One of the most frustrating environmental issues is a room with poor temperature control, particularly to infirm people with a poor understanding of how the temperature control works. This can not only make life miserable but can also lead to chills and ultimately to health problems.

In the case of multistory buildings, the use of a **conditioned** or unconditioned but **ventilated central atrium** is a common solution.

Roof ventilators are installed at the highest points of the roof to allow hot air to escape. These are triggered to open by thermostats that activate when temperatures in the atrium rise above a comfortable level.



Toilets

To make the toilet more accessible, placing it at the correct height is vital. There are several means of providing a higher sitting position. A **raised toilet** may replace the existing toilet, or the existing toilet could be mounted on a raised base, available in a number of sizes. Alternatively, a raised toilet seat may be mounted on a raised base, also available in a number of sizes. Raised toilet seats are available in affixed as well as removable versions, and a free standing model is also available. Some of these versions are adjustable. If someone is in need of an even higher toilet, a toilet chair to wheel over the existing toilet might be a solution.

A raised toilet seat slanting slightly down towards the front is convenient for people recovering from hip operations. If necessary, a model accommodating persons in need of only one slanting side is available. **Arm rails** can be fitted on the toilet, on the wall, in the floor, or be free standing. Most wall-mounted rails fold up against the wall to be out of the way when the wheelchair-user moves sideways between toilet and wheelchair.

If none of these solutions provides adequate support, the **adjustable toilet seat** could prove a solution. The toilet seats are available in various shapes: with an open front, also usable as a bidet seat; with extra width and anatomically well-shaped seating comfortable for heavy people; a curved, bowl-shaped seat which stabilises the balance etc.

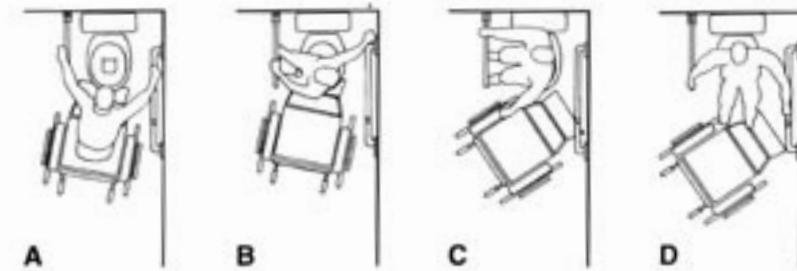
Loose covers to fit onto the seat are available in a number of types, such as the inflatable seat or seats made of soft fibre-filled materials. If it is difficult to wipe one's bottom, special tongs for toilet paper are available. The paper is fastened and wrapped around the tongs. If these measures are inadequate, toilets with built-in bidet and also an air-drier function are available.

For those who are less mobile, a **bedside commode** could be a good solution. These are available in a number of different models catering for bucket or bed-pan, and fitted with a lid. Wheeled commodes or a combination of a commode and a bath seat are also available.



▲ Ceramic toilet with special side safety support with vertical movement.

Provision of **grab bars** should be made at toilets. Codes provide for toilet seats to be placed 50 cm from a sidewall with a grab bar and a second grab bar located behind the toilet. These provisions respond to the needs of young adults with good upper body strength who are wheelchair bound. It is widely believed by experts that, for the aging, two grab bars (usually flip down from the wall behind the water closet) would provide better support – like two armrests in a chair – and respond to the possibility that the user might be right – or left-arm strong.



▲ The sequence of passages normally used to move the user from the wheelchair to the toilet bowl.

Also, to reduce care-giver back injuries occurring from lifting of the user who requires assistance in transferring to the toilet, the toilet is better located 60cm from the sidewall to allow two care givers to assist in the transfer.



Transfer, turning and lifting activities

Transfer board can be used to bridge the gap between one place to another. A **turning disc** may be helpful if the person can stand for short periods. Sliding sheets and cushions may be helpful in moving and rising in a bed and a chair.

Lifting poles are available in many models for beds, chairs and bathtubs. They are a good help for people with strong hands. A **mobile hoist** is used for lifting people from one place to another. It stands on the floor and has wheels. There are several types of hoists, so it is important that the disabled person and his family are involved in assessing and selecting the hoist. You can have them hydraulic/ manual-operated and electric operated. Lifting by a hoist always needs a helper.



One type of hoists called “**standing hoist**” lift the person while he is standing on his legs, which are supported in such a way that the person do not collapse. Many people, including the helpers feel that this type is more convenient than the traditional type.

An **electric hoist** consists of a hoist motor attached to traversing trolley, a spreader bar with sling or other attachments which are fixed at the lower end of a spool of tape fitted in the motor box, and pull-cords or a pendant control-box. It runs on an overhead track which is either ceiling or wall, mounted or on a track fitted to a portable frame gantry. It is suitable for use by a helper, who cannot manage a mobile hoist, and in some cases the user can use it by himself. It is also suitable where space is too restricted.

Tubs

The tub is an important aspect of personal hygiene, and its proper and efficient use is critical for the well being of the senior. The more familiar the tub and its use in comparison with the resident’s memory, the less likely it is to cause agitation.

Frequently cited tub problems include:

- Slow-filling tubs which chill residents.
- Complex controls, making the control of spray strength or temperature difficult.
- Unfamiliar, oversize, and otherwise improper equipment upsets many residents, as does noisy equipment and the sound of high water pressure flowing through pipes.
- Lifts, transfer devices, and moving tubs can be source of anxiety and disorientation.



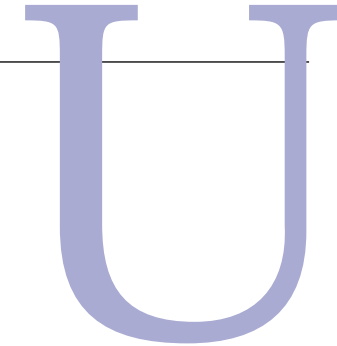
Like furniture or clothing, there doesn't appear to be one tub that fits all. However, the following are features found to be desirable:

- **Non-slip floors** and **temperature-control-systems** that prevent scalding are important.
- Tubs for senior residents or those in early and midstage dementia should allow for independent entry and for bathing in the sitting position, while tubs for those with advanced dementia need to accommodate a sitting or reclining position, providing ready access for the caregiver to all body areas.
- Some models offer a feature with jets of warm air for resident comfort while the tub fills. Many seniors perceive the movement of air as a cold draft. An **integrally heated sitting surface**, similar to heated seats in luxury cars, might be a solution to mitigate the problems potentially created by moving air.
- Some models now provide a **water reservoir** that can deliver warm water gradually once the user has been seated



▲ *New tubs such as this one with a pull-up side and a built-in seat facilitate entry and exit for the frail seniors.*

Using the bathtub might prove more difficult to use than a shower if residents have a tendency to lose their balance, if they have stiff muscles, or if they have reduced mobility. Hand rails should be mounted on the wall perhaps combined with floor-fitted support rail. Bath rails clamping onto the edge of the bathtub might also be useful. Many seniors find that sitting down or getting up from the bathtub causes difficulties. To ease this problem, a bath seat, perhaps with a supporting back, could be a solution. Alternatively, a board resting on the bath edges or braced firmly against the sides of the bathtub could be a comfortable solution. Bathtub swivel seats are also available, making the tub more accessible. To minimise the risk of slipping, non-slip strips should be attached to the bottom of the bathtub.



Upgrades

The choice of **finishes** for independent living is very much budget-driven, depending upon the location and market demands. Usually, due to financial constraints, prospective renters or buyers are offered a base choice of finish with associated upgrade packages available at additional cost. Many tenants allow the residents to do their own upgrades with a clause that the house must be returned to the original condition. The kitchen and bathroom offer the widest range of potential upgrades. Common options for these spaces include the following:

Kitchen

- **Cabinets:** base choice: white or natural wood; upgrades: special cabinet wood finishes.
- **Countertops:** base choice: plastic laminate; upgrades: solid surfacing such as stone
- **Flooring:** base choice: residential grade-sheet vinyl with a no-wax finish; upgrades: vinyl wood-look floor, ceramic tile, wood flooring

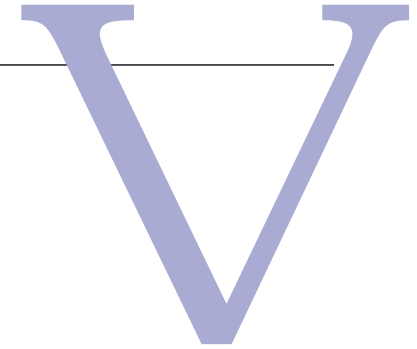
Bathroom

- **Vanity:** white or natural wood that coordinates with kitchen choice.
- **Vanity top:** base choice: plastic laminate with a rimmed sink or a cultured marble top with integral sink; upgrades: solid surfacing with an integral sink or an under-counter sink.



▪ **Flooring:** base choice: residential sheet vinyl; upgrades: ceramic tile, wood or stone

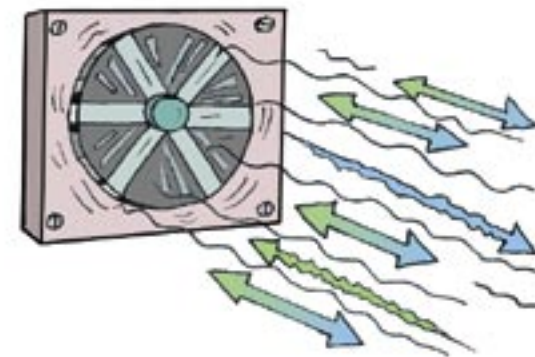
It is important for living areas to have the **proper flooring**. The base choice is a cut pile carpet with a face weight of 900 gr to 1 kg, and upgrades as high as 1.4 kg are frequently offered. The cut pile carpet should be dense construction so as to provide a firmer surface for elder residents that require the use of a walker or wheelchair.



Ventilation

In many houses, the most common complaint of family members concern **offensive odours**. The smell of urine is the greatest problem. Today there are a number of new products and practices that reduce this problem. Krypton fabrics for chairs and sofas, as well as the **moisture**-proofing products available today, keep urine from soaking into furniture coverings. **Antimicrobial carpets** with attached resilient backing and concrete sealing protocols also make carpet absorption less problematic.

Finally, the ventilation systems used today introduce continuous fresh air under positive pressure to common spaces and corridors. This air migrates through the rooms, exiting the building via ventilation shafts in the bathroom. When the system is designed this way, it constantly moves foul air away from areas, where it is most likely to be noticed by guests.



Vinyl wall covering

Vinyl wall covering is relatively resistant to stains and abrasions, and is durable (depending upon its thickness). Fabric-backed vinyl (as opposed to paper-backed vinyl and vinyl-coated paper) coverings are recommended for senior housing because they are more durable and stain-resistant, and more stable since the fabric effectively adheres to the hanging surface. The fabric backing increases the abrasive strength as well.



There are two types of vinyl wall covering on the market:

- **Type I**, or light-duty wall covering is typically used for residential applications. When the wall covering is located above a chair height, so that it is more exposed to rubbing by cart or wheel-chair traffic, this lighter-weight material can be used.
- **Type II**, or medium-duty wall covering is specified primarily for corridors and other heavy duty areas.

The trend in recent years has encouraged designers to specify wall-coverings in lieu of a solid-coloured paint. Wall covering patterns can bring texture and detail to spaces and make them feel more comfortable, especially when used in rooms where one would expect to find wallpaper in a home, such as kitchens, bathrooms, living rooms, and bedrooms.

Because residential-character wall coverings are generally offered only in Type I material, designers often specify these patterns in places that should really receive Type II covering. One solution to this problem has been the development of protective acrylic finishes, which help resist staining and contain antimicrobial additives to protect against bacteria, fungi, and molds. There are many such finishes on the market, which differ in terms of how long they resist staining and what solvents or detergents may be used to clean them.

The most important vinyl wall covering considerations are:

- **Environmental issues:** Despite their wide use to private houses of senior citizens, their environmental impact is a concern. Vinyl production produces potentially dangerous inhalants. There are also problems with disposal. Chemical may escape landfills after disposal, polluting nearby water sources. If it is incinerated (or catches fire unintentionally), chemicals are released that pose a risk to fire-fighters and incineration-plant workers. Though PVC is recyclable, very little of what is produced actually gets recycled. Manufacturers of vinyl wall covering are beginning to explore more environmentally friendly means of creating the product. The durability and affordability of vinyl continue to make it a top choice for most projects.

- **Proper wall prep for future removal:** It is imperative that walls be properly prepared to receive vinyl wall covering. With such preparation it can be easily removed for future renovation; improper installation makes removal difficult.

- **Maintenance:** Vinyl is often chosen specifically because it is easy to clean and requires little maintenance. Because different coverings and finishes are compatible with different cleaning products, it is important to consult the manufacturers' cleaning suggestions.

- **Cost:** Prices range dramatically. Some manufacturers offer protective coatings free of charge. Vinyl can be a very effective and low-maintenance option if evaluated on a life-cycle cost basis.
- **Colour trends:** Although coloured and patterned vinyls are increasingly popular with senior housing designers, be wary of trendy colours or patterns, which may become quickly dated.

W

Walking Therapy and Design

The following list presents simple therapies that can be accommodated in a building's design:

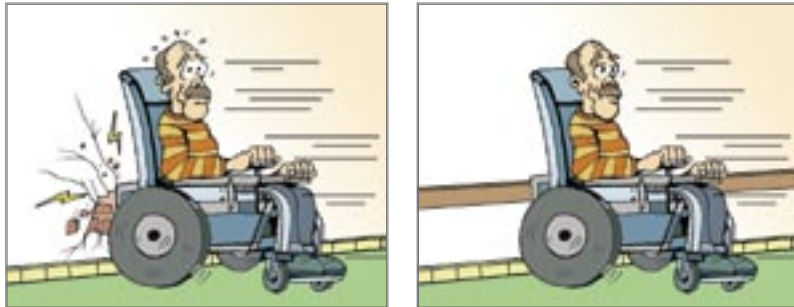
- **Walking therapy:** A corridor system with regularly placed seating, connecting interesting destinations.
- **Outdoor exercise therapy:** An exterior walkway that loops the building, with comfortable benches every 3 m -3.5 m to sit and rest.
- **Access to the surrounding community:** A sidewalk that leads residents to pathways in the neighborhood or to nearby neighborhood destinations.
- **Stretching therapy:** An activity or entertainment room with comfortable seating where chair exercises can be carried out every day.
- **Plant therapy:** Places either inside or outside where the senior can work with his/her hands and nurture plants.

(see also Movement).



Wall covering and protection

Select textiles and wall coverings with **easily recognisable patterns** that will not be perceived as objects, faces, or animals. **Corner guards** and **rub/crash rails** are important. They are installed to protect against damage from wheelchairs. Corner guards come in several materials appropriate to each use:



- **PVC bumper:** PVC bumpers are bought by the sheet. Their mounting height should be based on the use of the carts or equipment, but generally corners should be protected at heights of 30 cm-45 cm from the finished floor.



▲ Typical crash rail.

- **Steel:** Steel protection devices are typically most appropriate in areas where the residents' wheelchairs cause frequent damage. For example, resident doors typically have a plate or steel material to protect them from damage caused by wheelchair foot-rests.

(see also **Ceramic tile wall covering**, **Fabric wall covering**, **Paint and Vinyl wall covering**)

Washbasins

If the washbasin is used by people sitting as well as standing, an **adjustable washbasin** should be considered. Manually operated as well as electrically operated washbasins will, of course, need to be supplied with a flexible drainpipe, allowing for the up-and-down adjustments. **Small knobs and handles** are easier to turn if you use a tap turner with extended handles. Alternatively, either the old handles or the entire mixer tap can be replaced by long handles or a model more suitable for the user. Extended handles are available for one-handed taps as well as two-handed taps.

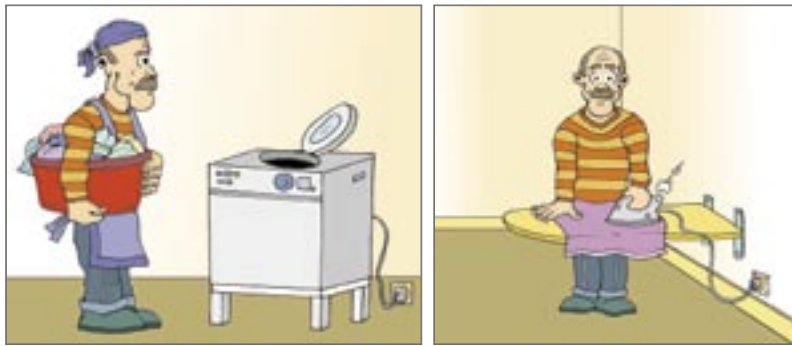


▲ Washbasin including bracket with control-bar and pneumatic adjusters.



Washing up and ironing

Before purchasing a **washing machine**, you should consider carefully if the desired functions are available, and whether the senior can manage the door opener, the control panel, detergent container etc., or another person is needed. Small washing machines are available and convenient if someone is living on their own or there is lack of space. A specially designed, narrow, washing machine loaded from the top is convenient, if there is a difficulty for the senior to bend down or there is lack of space, however, it is slightly more difficult to operate compared with washing machines fitted with front control panels.



The **combined washer/tumble-drier** could be a good solution saving time and space. The capacity is less than that of an ordinary tumble-drier, and someone should expect two rounds to one full machine wash. The control panel varies from one make to another. The programme and temperature selector requires either a turn or a push; however, some knobs are less friendly to operate, being too stiff for weak fingers. A good solution could be a **touch-operated machine**, where a slight touch of a finger activates the functions. If someone has visual impairments, sorting the laundry could prove difficult; in particular nets to keep socks together during washing and drying are available. Before buying a tumble-drier, considerations such as mentioned in the section about washing machines, are of course of similar importance here.

For **ironing**, it is a good idea to have the ironing-board fixed on a wall, so that it is easier to unfold.

Windows

Because many seniors typically spend more time indoors than outside, **views** of the surrounding neighborhood often take on greater significance. There are two types of views. One is an **active view**, often toward a city, that overlooks the sidewalk, the streets, and the front entry. The other is a **passive view** of a garden, lawn, trees, a park, a lake, or a nearby creek.

Buildings often have both an active and a passive view available from different sides. Each view has its own character and rhythm, and residents benefit from access to both. Views of the street are hard, energetic, active, noisy, ever-changing, and stimulating. The garden provides a passive green landscape that is soft, soothing, subdued, slower in pace, and relaxing.

Each view has its pros and cons. Activity implies stimulation and noise, while the passive landscape is often subdued, at times boring. Common spaces like porches and overlooks are better suited to active views, while the dining room benefits from the relaxed view of a garden. Views from various common spaces should embrace the full range of view possibilities.

One of the best views is one that captures both the neighborhood and the city. These views stir the imagination and lift the spirit. Houses on an upper floor take full advantage of the surrounding environment. Views from a glazed, conditioned space are often more popular with senior frail people than views from an open balcony, where drafty breezes and concerns about safety can cause problems. Both of these views are pleasurable but offer different sensations. Residents like a porch with sides that protect it from the wind, especially when it has access to both shade and sun to complement the climatic conditions of the day. The use of larger windows enhances the perception of space within the house. A window 1 m wide and 1 m tall should be considered minimum. A sill height of 0.80 m allows residents a view out of the window while lying in bed. A low sill height creates an extension of the house into the garden rather than a separation from outside.

Another interesting design idea is the **dutch erker**, an attached alcove window that resembles a square bay window. It projects 1 m beyond the front face of the building, allowing light to enter the building from three directions. This type of window allows more light to enter a room while providing a more enhanced viewing platform. The space created by the erker is at the edge of the house and connects the inside with the outside. In concept it is like a glazed balcony. The configuration makes it possible for residents to view activities up and down the street. It is large enough to accommodate a chair for viewing purposes.



By building code, most sleeping and other habitable rooms require operable windows. Low first cost and maintenance requirements often lead to the selection of windows made of wood, aluminum with a long-life finish. The selection should also accommodate the requirement for ease of use by senior residents. Few have sufficient arm strength to **open heavy double-hung** or **slider windows**, and casements with small opening mechanisms may be hard for an arthritic hand to use.

Conclusion

Here, we summarise a number of critical points that must constantly be kept in the mind of the seniors, their care-givers, as well as architects and buildings of housing for them.

- Care should be taken for the house of the senior to maintain its **warmth and individuality**. Special provisions for the seniors, such as special flooring, hand rails, etc., should not give the house an institutional look. In other words, the interior design of the building should exude a friendly, familiar, dignified, residential character. It should be the antithesis of the institutional nursing home.

- **Outdoor spaces** are important sources of views from rooms inside the building. You should treat outdoor site areas as destinations for residents to visit or places to walk to and through for exercise.

- One of the most dangerous places in the house is the **bathroom**. Safety devices like grab bars, nonslip floor surfaces, and emergency call hardware must be specified and placed in the right location to be effective. Adequate heat and light are also very important components of a successful design.

- Senior frail people are often in need of **more light** to see at the same level of visual acuity as younger people. Natural and artificial lighting is necessary for basic illumination, mood lighting, and aesthetic purposes.

- The house should be **safe from hazards** like fire, smoke, and natural disasters, with an up-to-date emergency call system.

- The seniors should feel that they have choice and **control over the environment**. The house should allow the seniors to maintain continuity with choices that facilitate their pursuit of habits and interests they may have developed over their lifetime.

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